Proceedings of the International Conference on

Recent Advancements in Artificial Intelligence and Soft Computing

ICAISC 2022

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Proceedings of the International Conference on

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Methodist College of Engineering and Technology, India

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Methodist College of Engineering and Technology (MCET), a non-minority institution was established in the year 2008 on a sprawling 5.0 acres of historic Methodist campus at Abids, Hyderabad. The college provides a serene and tranquil environment to the students, boosting their mental potential and preparing them in all aspects to face the global competition with a smile and emerge victorious. The MCET has been established under the dynamic leadership of Sri K Krishna Rao, who has rich experience in the field of engineering education. The MCET is approved by AICTE, New Delhi and affiliated to Osmania University, Hyderabad. The College is Accredited by NAAC with A+ Grade and all eligible Undergraduate – B.E Programmes are accredited by National Board of Accreditation (NBA). The UGC has granted autonomy to the college for ten years w.e.f Academic Year 2021-22.
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- Civil Engineering
- Mechanical Engineering

PG - PROGRAMMES

- M.E. in Mechanical Engineering (CAD/CAM)
- Master's Degree in Business Administration, MBA

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About the Conference

The AICTE Sponsored International Conference on Recent Advancements in Artificial Intelligence and Soft Computing ICAISC-2022 organized by the Department of Computer Science and Engineering, at Methodist College of Engineering and Technology, Abids, Hyderabad, India held during 2nd and 3rd December 2022. ICAISC-2022 provides a premier interdisciplinary forum for researchers, engineers and academicians to present and gain knowledge on the most recent trends, innovations, technologies and solutions adopted for Sustainable development. The conference also focuses on mutually sharing the advances and innovative technologies for the scientists, scholars, engineers and students from different universities and industries to present ongoing research activities, focused on solutions to achieve the sustainable development goals and hence to foster collaborations among stakeholders and researchers from distinct universities, national laboratories, government funding bodies and the industry. This Conference aims to gain valuable insights and contributions from researchers and practitioners facilitating interdisciplinary perspectives. This conference creates ample opportunity for discussions, debate, and exchange of ideas and information among participants. We are very much grateful to the committee members, student volunteers and faculty of the Department of Computer Science and Engineering, who contributed to the success of this conference. We are very much thankful to the management of Methodist College of Engineering and Technology, Abids, Hyderabd, India, for their support in every step of the journey towards the success of this event, which inspired organizers and motivated many others.

Extended work of the articles of this conference proceedings, will be published by the Grenze Scientific Society and it will be made available in the CREWE International Journal of Engineering and Technology (GIJET). The same papers will be then indexed in Scopus as Conference

Total 153 papers were received for the conference and 70 papers were shortlisted by the Committee. All the accepted and presented papers of the duly registered authors were published in various journals and the conference proceedings.

We would like to thank all participants for their contributions to the Conference program and for their contributions to these Proceedings. It is our pleasant duty to acknowledge the financial support from the All India Council for Technical Education (AICTE) for the financial aid provided under the **AICTE-GOC Scheme (AQIS ID: 1-10255421151.)**.

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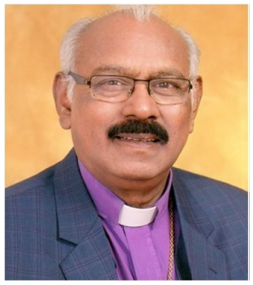
Message from Chairman



Bishop M. A. Daniel
Chairman, Methodist College of Engineering and Technology

I am extremely delighted to know that the Methodist College of Engineering and Technology is Organizing an **AICTE Sponsored International Conference Recent Advancements in Artificial Intelligence and Soft Computing ICAISC-2022, 2nd – 3rd December, 2022**. I congratulate the Staff and Students of the college for undertaking such an enormous responsibility of organizing the conference. An educational institution has a profound role in building an individual, the nation and the society. The conference provides a platform to researchers, teachers, practitioners and policy makers to interact and exchange their views and learn from each other. The theme of the conference encompasses all the vital components of Science, Engineering and Technology and provides scope for exhibiting state- of-art practices in Artificial Intelligence and Soft Computing. I am sure the presence of eminent speakers, Researchers, Faculty members and students would add splendour to the deliberations during the conference. I wish the conference a grand success.

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Message from Correspondent

Mr. K. Krishna Rao
Correspondent
Methodist College of Engineering & Technology

It is a momentous event for Methodist College of Engineering And Technology (MCET) to organize the AICTE Sponsored International Conference on Recent Advancements in Artificial Intelligence and Soft Computing-ICAISC-2022 during December 2nd and 3rd 2022. MCET, a Non-Minority educational institution, established in the year 2018 is situated in the heart of the city of pearls, Hyderabad, Telangana and is affiliated to 100 years old Osmania University, Hyderabad. I deem it as a privilege to place on record that the students from MCET so far have secured Three University First Ranks and Gold Medals. This is an ample testimony for the academic progress and the quality of education offered at the college.

The aim of the conference is to provide a vibrant International Forum for the researchers to present, discuss and exchange their significant contributions in all major domain of Computer Science and Engineering.

I am confident that the proceedings and deliberations in the conference would be eventful and fruitful. On behalf of MCET it is my pleasant duty to extend a hearty and warm welcome to all the Dignitaries, Guest Speakers, Delegates and other participants.

I would like to place on record the constant encouragement and support extended by the Management in organizing this conference.

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Message from Director

Dr. M. Lakshmipati Rao
Director
Methodist College of Engineering & Technology

It is a momentous event for Methodist College of Engineering and Technology for hosting the AICTE sponsored International conference on Recent advancements in Artificial Intelligence and Soft Computing – ICAISC during 2nd and 3rd December, 2022. Though this is the third International Conference being organised by the College, it is the first International event planned after the College has been granted Autonomous status in the year 2022. On this occasion I would like to compliment the Department of Computer Science and Engineering for organising the Conference with financial support from AICTE.

The aim of the conference is to provide a vibrant International forum to the researchers and practitioners from both academia as well as industry to meet and share cutting-edge developments in the emerging areas of Artificial Intelligence and Soft computing. I wish that the Conference will be a memorable event for sharing knowledge and results in theory, methodology, and applications of the recent advancements in the areas of interest.

I am confident that the proceedings and deliberations during the two days would be eventful and fruitful and I also wish that the faculty and students of MCET will be immensely befitted by this conference.

On behalf of MCET it is my pleasant duty to extend a hearty and warm welcome to all the dignitaries, guest speakers, delegates and other participants. I would like to place on record our sincere gratitude to AICTE for sponsoring the Conference.

I would also express my appreciations to the Management of the College for extending their constant encouragement and support in organising this event.

I wish the event being organised by the Department of Computer Science and Engineering a grand success.

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Message from Dean

Prof. S. Venkateshwar Rao
Dean of Engineering
Former Principal

I am extremely happy that Methodist College Of Engineering and Technology, is organizing an AICTE Sponsored International Conference On Recent Advancements in Artificial Intelligence and Soft Computing-ICAISC-2022 during December 2nd and 3rd 2022. Theme of the Conference comprises recent updating of various domains of Computer Science and Engineering including the state-of-the-art methods in Artificial Intelligence and Soft Computing. I am sure that this International Conference will address the needs of the Engineering Industry, Research and Development.

Moreover, it is the forum to share knowledge, experiences and exchange of ideas amongst academicians, researchers, professionals and managers of industry from different parts of the world in particular our country.

I hope that our college will take up more of such events to disseminate information on recent technological developments in various Engineering Disciplines and Applied Sciences and act as nuclei in the field.

I wish the organizers a grand success in this endeavour.

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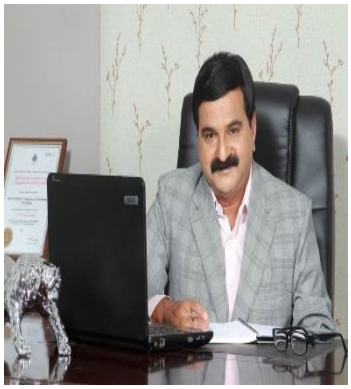
Message from Principal



Dr. Prabhu G Benakop
Professor and Principal
Methodist college of Engineering and Technology
(Autonomous)

It gives me immense pleasure that Dept of CSE of our college is organizing **AICTE Funded International Conference on Recent Advancements in Artificial Intelligence and Soft Computing - ICAISC-2022** on 2nd and 3rd Dec 2022. It will provide a prestigious international platform by bringing together local and overseas technical researchers and students to exchange their experienced knowledge and expertise issues relating to the dominating technology trends in the field of Computer Science and Engineering.Research activities across all the engineering fields pave the way for the industrial world to strive forward with huge advancements. As an educational institution, encouragement and support to research can be provided by establishing a suitable platform for the research community, to interact with each other and to share the knowledge. Having this objective, 2nd **International Conference** which was organized during 2018 received an overwhelming response. **ICAISC-2022** has been planned to provide the same benefits and learning experience to all the participants.

Under the able guidance of our management, continues to march on the way of success with confidence. The sharp, clear sighted vision and precise decision making powers of our management has benefited our college to say competitive.

The dedicated HOD and faculty members and disciplined students of CSE are the added features of our college. The role of students in building nation cannot be overlooked and students at MCET are trained in all aspects to become a successful Engineers and good citizens.

I also congratulate HOD, staff members, students of CSE department, Participants from our colleges and other colleges for their efforts in organizing and participating in this conference and wish the conference all the success.

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Message from HOD CSE, OU

Dr. K.Shyamala
Professor
Dept. of CSE, UCE
OU

I am delighted to know that Methodist College Of Engineering has completed 14 years of dedicated service in the cause of Higher Education and is organizing AICTE Sponsored International conference on recent advancements in Artificial Intelligence and Soft Computing-ICAISC-2022. During December 2nd and 3rd 2022 is bringing out a souvenir to mark the special occasion.

I congratulate the organizers for arranging such an enriching event and I am sure that at the end of the conference the participants will be charged with newer thoughts and ideas to serve the community in a much better way.

Wishing you all a very fruitful and rewarding conference.

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Message from International Speaker

Dr. Abdul Hafeez
Associate Professor
Hasan Kalyoncu University

I am delighted to note that Methodist College of Engineering and technology is organizing an AICTE Sponsored International Conference on recent advancements in Artificial Intelligence and Soft Computing, ICAISC-2022 on 2nd and 3rd December 2022. The organizers deserve high appreciation for their commendable effort in conducting this International Conference in the online mode.

I am with the fond hope that this International Conference would provide an opportunity for sharing and exchanging views, ideas and opinions among the researchers, scientists, and academia. I hope that this International Conference would provide all the delegates with a transformative experience.

I wish that the deliberations of the conference would be prolific and meaningful and make genuine and reliable contributions to the scientific community.

Eventually, I express my special thanks and appreciations to all. I wish the conference a grand success.

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Message from HOD

Dr Lavanya Pamulaparthy
Professor and HOD
ICAISC 2022

It is a matter of enormous pride that the Department of Computer Science and Engineering is elevating its scholastic quality in the form of an AICTE Sponsored International Conference On Recent Advancements in Artificial Intelligence and Soft Computing-ICAISC-2022 during December 2nd and 3rd 2022.. This event is another jewel in the crown of Methodist College of Engineering and Technology.

The main objective of the conference is to provide common platform to researchers and scholars to share with delegates their views, knowledge and their achievements in the field of Artificial Intelligence and Soft Computing . I hope this conference will unfold new panorama in the sphere of new technologies.

Such a large multi-disciplinary conference event is the culmination of many individuals. I thank the Management, Principal and all the Head of the Departments, members of various conference committee for extending their valuable time in organizing the program. I also congratulate and appreciate all the authors, reviewers, and other contributors for their sparkling efforts. I would like to express my sincere gratitude to the Faculty Members and Organizing Committee for their immense support in organizing this event.

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Message from Convenor

Dr M Sharada Varalakshmi
Professor and Convenor
ICAISC 2022

It is fair to conclude that the AICTE Sponsored International Conference on recent advancements in Artificial Intelligence and Soft Computing, ICAISC-2022 on 2nd and 3r December 2022 was a great success. People have contributed in many ways to turn this event into smooth running meeting with interesting presentations and good atmosphere for discussion and networking. My sincere thanks to the Management of Methodist College of Engineering and Technology that has helped in obtaining the necessary administrative approval for organizing the event. They supported in all possible manner to organize this conference. I am thankful to my faculty colleagues and nonteaching staff members for their constant help and guidance that radiated a source of energy within me. I feel proud and thank you for making this event a successful one. I am thankful for the enormous and high-quality support of all authors, reviewers and session chairs. I wish that ICAISC will keep on growing in coming years with more impact on the International research community.

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Preface

It is our pleasure to welcome you to the AICTE Sponsored International Conference on Recent Advancements in Artificial Intelligence and Soft Computing ICAISC-2022 organized by Methodist College of Engineering and Research, King Koti, Hyderabad, Telangana, India. The major goal and feature of ICAISC 2022 is to bring academic scientists, engineers, industry researchers together to exchange and share their experiences and research results about various domains of Computer Science and Engineering particularly on Artificial Intelligence and Soft Computing Methods. Furthermore, ICAISC 2022 provides a platform for discussion of the practical challenges encountered in different domains and the solutions adopted.

We hope you will have a technically rewarding experience, and use this occasion to meet old friends and make many new ones. ICAISC 2022 promises to be both stimulating and informative with a wonderful array of keynote and invited speakers from all over the world. Delegates will have a wide range of sessions to choose from and decide to attend the sessions based on their areas of interest.

The program consists of invited sessions, and technical workshops and discussions with eminent speakers covering a wide range of topics in area of Artificial Intelligence and Soft Computing. We hope your experience with ICAISC 2022 is a fruitful and long lasting one. With your support and participation, the conference will continue its success for a long time.

We would like to thank the organization staff, the members of the program committees and reviewers. They have worked very hard in reviewing papers and making valuable suggestions for the authors to improve their work. We also would like to express our gratitude to the external reviewers, for providing additional help in the review process, and the authors for contributing their research result to the conference. Special thanks go to IDES and Grenze Journal.

We wish all attendees of ICAISC 2022 an transforming scientific experience. We look forward to seeing all of you next year at the conference.

Program Committee

AICTE Sponsored International Conference on Recent Advancements in Artificial Intelligence and Soft Computing (ICAISC) 2022
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Grenze International Journal of Engineering and Technology, Jan Issue

A Semantically Analysis Deep Learning and Feature Selection Technique to Detect Phishing URLs Attack

Preeti[1] and Priti Sharma[2]
[1-2]Maharshi Dayanand University Rohtak Haryana, India
Email: Miskhokhar121@gmail.com, priti@mdurohtak.ac.in

***Abstract*—Phishing is an attack that targets internet users, organizations, e-commerce websites, financial institutions, and government institutes on the internet. To resolve this problem, many techniques are used, like heuristic-based, DL (Deep Learning-Based) and ML (Machine Learning-Based). This paper provides a detailed understanding of all DL models and their feature selection and extraction techniques. Feature extraction techniques play an important role in reducing the dimensions of existing datasets. This study is very helpful to the researchers to analyse which model and feature extraction technique are best to resolve the problem of phishing attacks on the internet.**

***Index Terms*— Phishing Attack, Deep learning, Feature Extraction technique.**

I. INTRODUCTION

Phishing is a cyber-attack based on social engineering (Alper Ozcan) [11], which aims to abstract user personal information like account numbers, credit or debit card numbers, Facebook account information, and so on. Typically, the attacker creates the fake website and then sends an email to the target audience instructing the recipient to click on a link on the fake website [11]. These emails contain various kinds of viruses, such as warms, malware, and so on. Nowadays, phishing is extensively used in social media, traditional media, and research literature. Since different researchers give distinct definitions of phishing attacks, according to the APWG [30], "Phishing is a crime employing both social engineering and technical subterfuge to steal consumers' identity data and financial account credentials." Because of varied definitions, "phishing" is a scalable act of deception whereby impersonation is used to obtain information from a target "[31]. Fig. 1 Described "APWG saw 384,291 attacks in March 2022, which was the highest monthly total in APWG's reporting history. In the first quarter of 2022, APWG observed 1,025,968 total phishing attacks. In the area of research, there are many techniques to resolve the problem of phishing attacks, like character-based techniques, content-based techniques, genetic algorithm-based techniques, machine learning-based techniques, and deep learning techniques. All techniques have their own advantages and disadvantages. So we can't say we have a single technique to resolve the problem of phishing attacks. Machine learning is a good technique to solve the problem of phishing attacks, but it has some limitations. In machine learning, you extract the feature manually, etc. Apart from this, deep learning is also good for resolving the problem of phishing attacks. In detail, it is described in Section II. The main goal of this study is to analyze the performance of DL models like RNN, CNN,

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LSTM, BI-LSTM, and others. Also, describe various types of feature selection and extraction techniques. Feature selection and extraction play an important role in building the model. In feature selection, consider Variance Threshold, Feature Selection with Correlation, Mutual Information in Classification, and the Chi-square Test for Feature Selection.

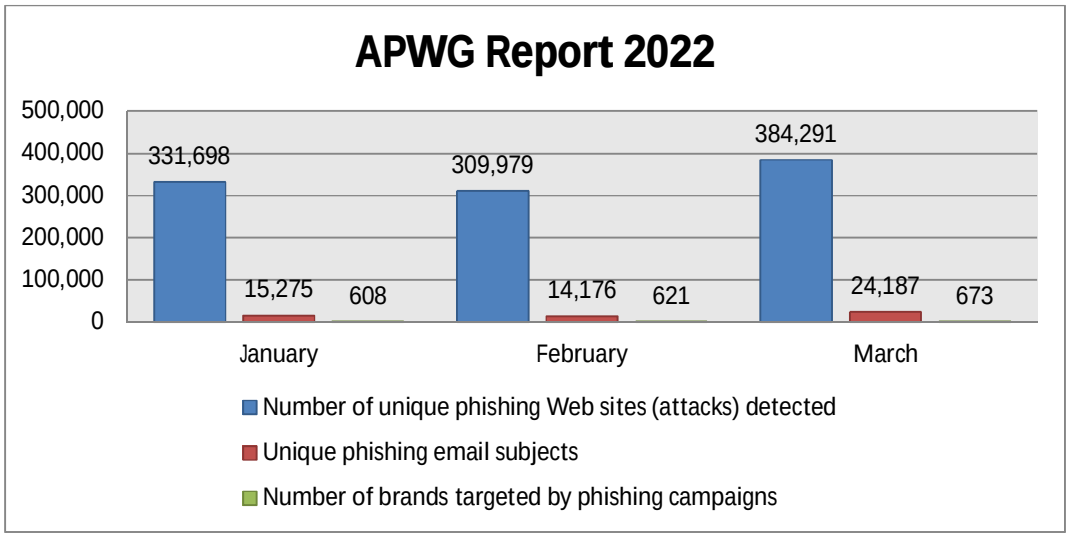


Fig.1. APWG Report of Phishing Attack (6 month 2022)

II. Literature Review

BU Seok-Jun: In this paper, Propose a model using DL(Deep Learning) and genetic algorithms for feature selection. This study is split into three steps. In the first step, select the feature of URLs. In the second step, select the genetic algorithm for feature extraction. After applying the genetic algorithm, select fifteen features from URLs to propose the model. The third step used CNN and LSTM to propose the model. The primary goal of this study is to enhance recall (sensitivity). Recall and accuracy improved by 4.13% and 7.07%, respectively. used a dataset containing 222,541 URLs.

Ali Aljofey :In this study, they proposed a model using CNN (convolution neural network) and the character level embedding technique. This considers the features of the URL rather than website content and any third-party services. They used sequence pattern features for the classification of the URLs. URL feature classification is classified into four groups. These are hand-crafted features; character level count vector features; character level TF-IDF features. This paper collects the datasets from Phish-Tank, Common-crawl, and Alexa. For the evaluation of the proposed model, they used four datasets (D1,D2,D3,D4).The D1 dataset contains 318,642 URLs.

Chidimma Opara: In this study, they proposed the model using CNN. Which classifies the web page as a basic HTML document? Extract the features from the HTML document. used word and character embedding techniques to extract the features. The dataset contains 50,000 HTML documents. The proposed model gives 93% accuracy. In an HTML document, consider the web page text, images, tables, hyperlinks, tables, and lists. HTML-Phish learns the semantic meaning using characters and words present in the HTML document. A Web Crawler is used to collect the HTML document data. To create a parser and extract the features of an HTML document, we used the soup library in Python. **Feature work**: In the future, compare the research work with the feature engineering-based model that is used to extract the feature from the HTML document. Also, try to make extensions and plug-ins for the web browser to implement in a real-time environment.

RASYMAS, Tomas: This paper proposed the model using CNN and LSTM. For feature selection and extraction, we used lexical features, character-level embedding, and word embedding techniques. Which proposed model gives 94.4% accuracy? which uses the ReLU activation function. It contains 60 lexical features of URLs. Collect the data from Phishtank.com.

YANG PENG: This paper proposed a model using multidimensional features with a deep learning model. Multidimensional features contain the features of URLs, Web text features, and webpage code features. The proposed model gives an accuracy of 96.78% and the false positive rate is 0.59%. Collect that dataset from

Phish-tank.com containing 1021758 phishing URLs and 989021 legitimate URLs from Dmoz.net. For the classification, they used the soft-max function for classification. It uses CNN and LSTM models to propose a model for phishing URL detection. In the feature, try to make extensions and plug-ins for this browser to solve problems in a real-time environment.

Hung Le :- This paper proposed the model using CNN. To extract the features of datasets, they use word and character level embedding techniques. Firstly, test the model based on the character-level embedding technique and then apply the word-level embedding technique. On the basis of accuracy, combine word and character-level embedding techniques. Collect the data from

Virus-Total The dataset contains 14,050,275 benign URLs and 949,725 malicious URLs. To train the model, it uses lexical patterns that contain the primary domain, path, and file extension. The proposed model gives an AUC of 0.9929.

In this paper, we proposed the model using the Multifaceted Function Phishing detection method. They developed multidisciplinary apps to detect phishing websites. This app contains URL data samples, website textual information, homepage software features, and classification outcomes based on deep learning techniques. For feature extraction, the proposed model uses the character encoding technique.

Rundong Yang:- This paper proposed the "Multidimensional Phishing Susceptibility Prediction Model" (MPSPM). For the experiment, they selected 1105 volunteers and identified volunteers as susceptible or not susceptible. This used seven supervised learning methods. The proposed model gives an accuracy of 89.04%. The main aim of this paper is to identify and analyze those factors that affect network susceptibility**.** In this study, they proposed a model using the DNN (Deep Neural Network). For feature extraction, they used the character embedding technique. The proposed model has good accuracy.

In the feature, consider the feature of the web page to propose a model to detect a phishing attack.

Umer Ahmed Butt: In this study, they proposed the model using SVM, NB, and LSTM. The accuracy of the proposed model is SVM: 92.622% NB: 95%, while LSTM is 96%..The Linear Kernel is a good choice for text classification. For dataset-preparation include Data Integration, Data cleaning, Data transformation, Normalization, and Smoothing techniques. A confusion matrix is used to evaluate the performance of a proposed model. To extract the features using regular expression and NLP-Kit in Python programming.

Alper Ozcan :A deep neural network and short-term memory were used in this paper's model, which was proposed. NLP and character embedding were both employed for feature extraction and selection. Two datasets were utilized during model training. 90.79 percent Accuracy is obtained based on the first dataset. 91.79% accuracy is obtained based on the second dataset set. To increase accuracy, the suggested model employed a hybrid approach that combined DNN and BI-LSTM. Limitation: New datasets are only suggested after careful examination of existing datasets. A noisy data set may have been utilized to train the model. The Word embedding technique was utilized to extract the features in order to improve the suggested model's accuracy.

III. RESEARCH GAP

S.No	Author	Technology	Feature selection technique	Accuracy	Limitation	Feature work
1	Seok-Jun Bu[1]	CNN, LSTM	Genetic Algorithm	Improve Accuracy 4.13%p and Recall 7.07%p.	Consider only URL-based features.	In feature consider the text, HTML, And image features to propose the model.
2	Ali Aljofey[2]	CNN	Character embedding technique.	95.02%with D1 dataset and 98.58%, 89.46%, and 85.22% on the Benchmark dataset.	Consider only URL features.	Consider using the multidimensions dataset to increase the suggested model's effectiveness.
3	Chidimman Opara	CNN	Character and word embedding techniques are used.	Accuracy 98% and 2% False Positive Rate.	Not used in a real-time environment.	Make extension add with browser to recognize phishing websites in real-time.

4	Tomas RASYMAS	CNN AND LSTM	Character and word embedding techniques are used.	Accuracy is 94.4%.	Consider only URL features.	In feature use more methods on the same dataset.
5	PENG YANG	CNN AND LSTM	CNN AND LSTM	96.78%.	Not used in a real-time environment.	To use in a real-time environment make an extension and plug-in with a web browser.
6	Hung Le	CNN	Character and word embedding techniques are used.	AUC-0.9929	Used only URL features.	Use Multidimensional features to propose the model.
7	P. Vigneshwaran	Multifaceted function Phishing detection method	Character embedding Technique	90.25%	Take more training time.	To increase the accuracy of features used the word embedding technique.
8	Rundong Yang	Seven Supervised Machine learning model.	Character embedding technique.	88.27%	Analysis the result is based on the outcome of 1105 volunteers.	To enhance the accuracy of features using deep learning techniques.
9	Mohammed Alshehri	DNN	Character embedding technique, word-level encoding,	88.13%	Doesn't contain the feature related to web content.	In the feature, consider the feature of the web content to propose the model.
10	Umer Ahmed Butt	SVM, LSTM, NB	Character level embedding technique is used	SVM-92.62% NB-95% LSTM-96%	Doesn't contain the feature related to web content.	In the feature, consider the feature of the web content to propose the model.
11	Alper Ozcan	LSTM, DNN	Character level embedding, NLP feature extraction.	91.79%	Collected dataset may be noisy.	The feature used the word embedding technique.

IV. DEEP LEARNING TECHNIQUES

DL is a branch of ML. It is often used to simulate the behaviour of the human brain. In deep learning, neurons train based on different datasets and test them. Deep learning is a more powerful technique to figure out the problem of phishing URL detection because it creates neural networks, which are a combination of the input layer, hidden layer (as per problem definition), and output layer. The architecture of deep learning is defined in Fig.1.In this have three layer.

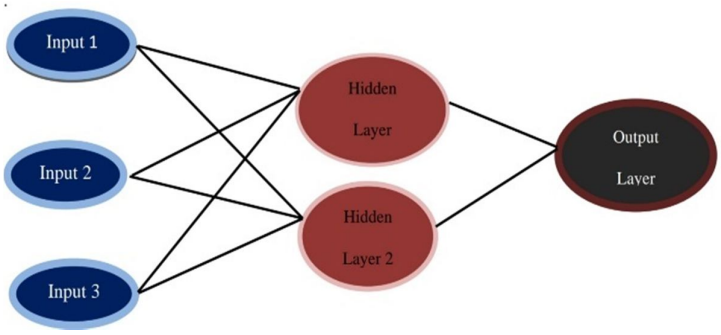


Fig 1. The Architecture of Deep Learning

A. Deep Learning Model Type

Deep learning models use several algorithms. While no one model is perfect to resolve the problem of phishing attacks, each model has some advantages as well as some disadvantages. Fig. 2 shows various types of deep learning models to resolve the problem of phishing attacks.

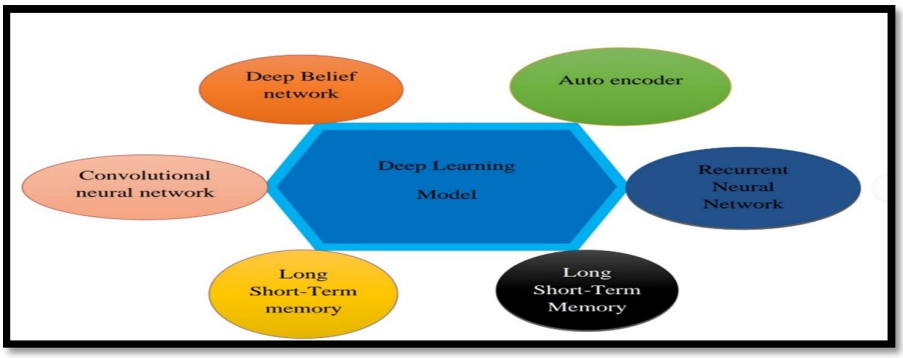


Fig 2. Type of Deep Learning Models

B. Deep Belief- Network

Yi and colleagues [12] It proposes the model using the DBN model of deep learning. To train the model using two features: interactivity and original features. This proposed model gives a 0.6% false positive rate and a 90% true positive rate.

Maneesh Kumar Verma [13] used DBN and ANN to propose a model to detect phishing attacks. The proposed model employs an input layer, multiple hidden layers, and output layers. These layers are connected to each other. There is no connection between the units within each layer. To train the model using supervised and unsupervised methods [14]. In a supervised way, DBN works with respect to the classifier and performs classification. DBN can learn from the knowledge and extract the features in the best way. Fig 3. Show the architecture of DBN.

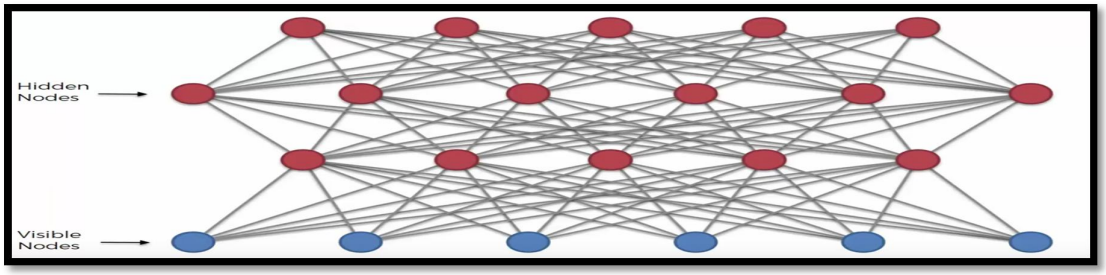


Fig 3. Architecture of DBN

C. Convolution Neural Network

CNN is used for image classification. To analyse the image, the image performs a convolution operation. First, convert the image into the form of a matrix representation, and then select the filler and perform the operation. To manage the quality of the image, they used the polling function and maximum pooling. In CNN, data augmentation plays an important role in creating multiple copies of the same object by applying flipping, horizontal shifting, vertical shifting, and zooming. CNN is also used for text analysis and classification using the character or word embedding technique. They used a back-propagation algorithm to train the CNN model. Update the value of the filler based on the loss function. Wei et al. [15] Apply CNN to the proposed model. This study considers URL features to train the model and apply the character-level embedding technique. [16] The proposed model used CNN and the character embedding technique to detect a phishing attack. How to classify images shown in fig.4.

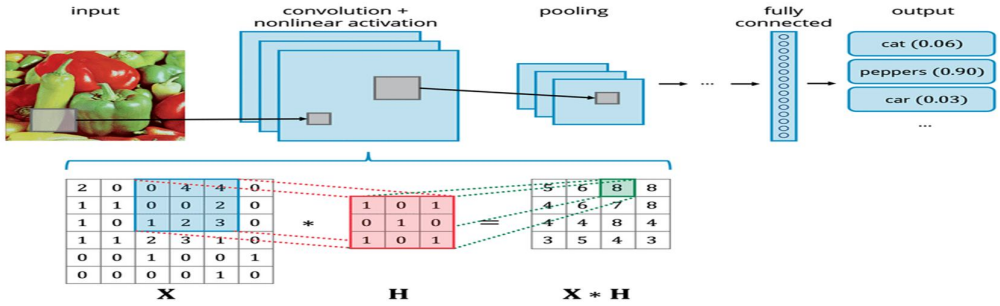


Fig 4. CNN Deep Learning Architecture

D. Recurrent Neural Network

RNN is used for semantic analysis, which checks whether it is a positive view or an opposing view. Analysis of the text in a sequential manner by RNN considers the current input and past output to produce the final output. The RNN takes the number of the word as an input matrix and then passes the first word to the hidden layer at the T1 time stamp. At the T2 time stamp, pass the next word and the output of the T1 time stamp. The detailed architecture of RNN is shown in fig5.

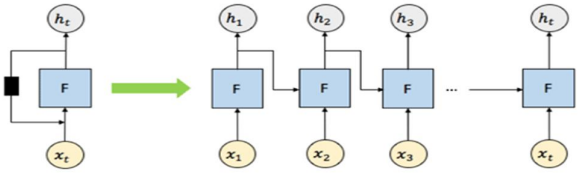


Fig 5. RNN Deep Learning Architecture

- F contains the function
- x1, x2, x3...x_n contains the input of words,
- The output is h1, h2, h2.. hn.Calculated using this equation:$h_t=f(h_{t-1},x_t)$,$h_t=\tanh(w_{hh}\, h_{t-1}+w_{xh}\, x_t)$

To train the model using a back propagation algorithm, to assign the same weight to each input in the forwarding direction, but in the case of backward propagation, the value of the weight is changed. RNN has a vanishing gradient problem. [17] Alejandro Correa Bahnsen proposed a model using RNN to detect phishing websites. The accuracy is 98.7%. Consider the features of URLs and determine whether the URL is phishing or not.

E. Long Short-Term Memory

Barah Mohammed, Alanzi [18]. proposed a model using LSTM to detect phishing websites. LSTM is a special kind of RNN. It is used to resolve the problem of long-term dependency that occurred in RNN.

LSTM uses a memory cell, a forget gate, an input gate, and an output gate. The complete architecture of the LSTM model is shown in Fig. 6. Memory cells are based on remembering and forgetting content. In the forget gate, the previous (h_{t-1}) and new information (x_t) multiply with weight and pass to the sigmoid function. After that, add the information to the memory cell. The input gate is used to add data to the memory cell. The input gate uses the Tanh function that converts input in the form of +1 to -1. At the output, the gate takes the information from the memory cell and passes it to the next layer of LSTM.

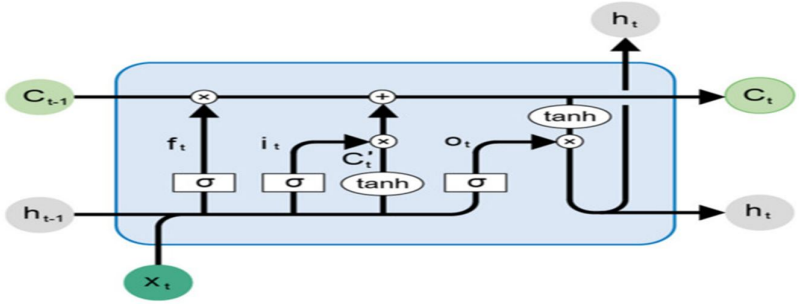
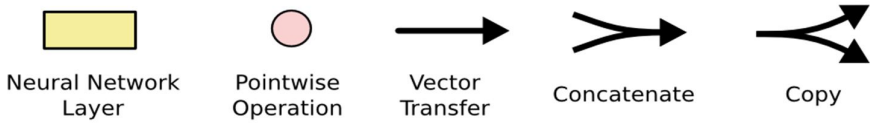


Fig.6 Architecture of LSTM Deep Learning model



An LSTM model is used to learn large-scale dependencies from the input sequence. It uses error gradients to calculate and combines iterative real-time learning with back propagation. [19].

F. Bidirectional-LSTM

BI-LSTM is an advanced version of LSTM."BI-LSTM is the process of making any neural network have the sequence of information in both directions, backward (future to past) or forward (past to future)." [20]. In BI-LSTM, input can flow in either direction, forward or backward. Input in LSTM can only move in one direction, but with the help of BI-LSTM, the feature and past can be preserved. Deng, [20], Liang, Y. They proposed the model using bidirectional LSTM with 95.7 accuracies. The architecture of BI-LSTM is described in Fig. 7.

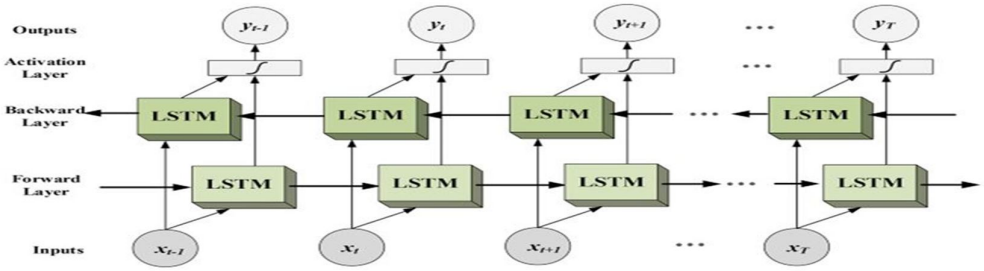


Fig 7. The Architecture of the BI-LSTM Deep Learning Model.

In Fig 7. Can see the flow of information from forward and backward directions. This model is used for NLP tasks. Guangxi Xu [22]. In which the self-attention Bi-LSTM neural network model is combined with ALBERT [22], a lightweight word vector model of BERT [23]. Compare the accuracy with a ML algorithm, but BI-LSTM gives a batter result as compared to others. The proposed model is 1% to 4% ahead of other models [23]. The proposed model adds ALBERT to get more accuracy.

G. Auto-encode

It is an unsupervised model. It is used to encode the data, pass it to the hidden layer, and decode the data. It is used to remove the dimension of the dataset. Reduce the size of data-driven applications. It can be used for image processing as well. Auto encoders can be used for several tasks, such as dimensionality reduction, effective feature learning, [23] nonlinear regression, etc. It is used to convert the input into the output with the least possible amount of derivation. It is used as an information compressor. [24] Sefer Kurnaz. They proposed a model using the deep auto encoder technique to classify phishing websites. Auto encoders are used to extract sensitive features and reduce the dimensions of features. For classification, use the softmax activation function. Collect the dataset from the UCI repository. [25] This paper proposed a model using an auto encoder and a denoising auto encoder (DAE). Therefore, to extract the complex features of the URL, the features space could be minimized significantly, thus reducing the phishing detection time. The architecture of the auto encoder is shown in Fig.8.

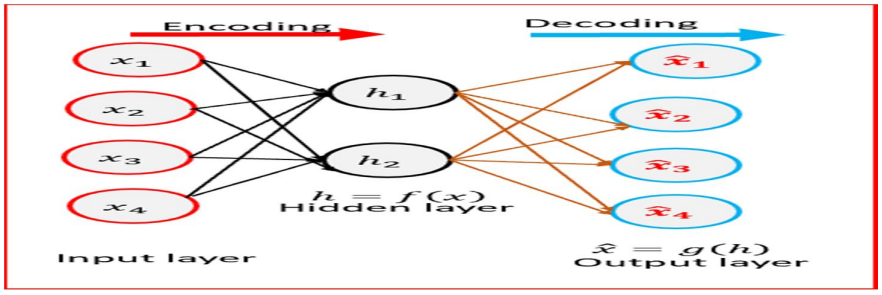


Fig.8 Architecture of the Auto encoder in Deep Learning

V. LEXICAL URL FEATURES OF URL DETECTION

To select the feature in deep learning, use the **sklearn library,** which provides many techniques used to extract the feature from the dataset. Some of them are described in detail:

- **It is used to remove all features with low variance.**It is used in unsupervised learning. Low variance contains constant values.
- **with feature selection:** In which to remove those values which are highly correlated. In which we remove highly correlated data from the training dataset as well as the testing dataset.
- **Mutual information in classification:-** Mutual information is based on information gain. It is used to find the dependency between variables. It returns that 0 means low dependence and 1 means high dependence between them. So, after applying mutual information in the classification, find those values which have low dependence between an independent and dependent variable and remove them from the dataset. To use the **Mutual_info_classify** library function. From sklearn, the python library used the SelectBest**()** method to dissect the best features that have the highest dependency between them. The library uses in Python is **Import mutual_info_classif from sklearn.feature_selection.**
- **Chi-square Test for Feature Selection:** It is used in univariate selection to select the best feature using **the SELECTKBEST library** function in Python. The library used in python is "from sklearn. Feature-selection import select best, from sklearn.feature-selection import chi2.First, convert the dataset into the format of independent features; then, convert it into the format of dependent features. Apply it to the proposed model after then applying the chi-square test and finding the best feature on the basis of average values.

Feature Importance: This technique gives you a score for each feature of your data. The higher the score, the more relevant it is. The library used in Python is from **The Ensemble Import ExtraTreesClassifier is used.Apoorva Joshi [25].** In which proposed the model using lexical features of URL and Machine Learning technique. To extract the feature, first understand the data, data preparation, data modeling, evaluation, deployment, and business understanding.

Data Understanding: -Include ~5 million URLs. Which was collected from Open phish, Alexa, and Internal FireEye.

Data Preparation :- In this phase, first take URL features and convert them into a numerical vector format. Used 23 features of URLs, which are described in table 2. To prepare the dataset with the help of NLTK (NLP Python package),mmh3(Murmur Hash Python package), and urllib (Python library for parsing URLs) in Python.

Data Modeling: Used Random Forest and Decision Tree to propose the model to detect malicious URLs.

Suresh Dara [27]. This paper gives a detailed description of various feature extraction techniques used in DL. In this paper, input image feeds to MLP-based feature, MLP-based image and CNN model. These three methods collect the input image directly and apply the image to the individual neurons for classification.

Innocent Mbona[28]. Benford's law is used to predict the frequency of distribution of a significant leading digit. This study shows that features sharply obey Benford's law on a human dataset, whereas a small number of features violate Benford's law on a malicious bot dataset. Principal component analysis is productive for resolving high-dimensional imbalanced data problems. It is used to reduce the dimension to a low-dimensional value. Ala Mughald [30]. In this paper, we propose a model based on machine learning techniques. Find the accuracy of the proposed model's analysis based on three datasets. The first dataset contains 20 features of URLs. The second dataset contains 50 features about URLs. The third dataset contains 2500 ham and 500 spam emails. The first experiment shows that boosted decision trees give the best accuracy. The second experiment showed that the booster decision tree again gave the best accuracy. In the third expression, neural networks give high accuracy. The restriction of this study was the discovery of the predefined dataset. In terms of features, try to develop an automated tool to extract current features from the latest raw emails to enhance the accuracy of the proposed model.

VI. PERFORMANCE EVALUATION

Fig. 8 shows the accuracy of the existing models. All models have good accuracy. So, in this feature, we attempt to propose the model that provides the highest accuracy compared to the existing model.

VII. CONCLUSION

In recent years, phishing URLs have become a common issue. Many methodologies have been used to resolve the trouble of phishing attacks. All techniques have some advantages as well as some disadvantages. Deep

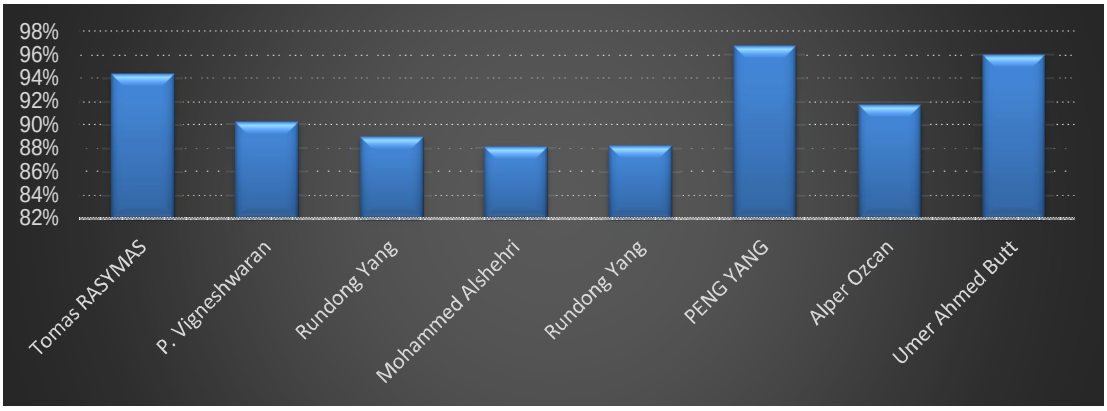


Fig 10. Analysis the accuracy of existing model

learning and machine learning are critical to developing a model to combat phishing URL attacks. This paper analyses various deep learning models using feature selection techniques. We analysed various techniques for feature selection (variance threshold, feature selection with correlation, mutual information in classification, and the Chi-square test for feature selection). In deep learning, we analyse the accuracy of an existing model. In this feature, we will demonstrate the model using the deep learning technique. CNN and BI-LSTM provide the highest accuracy in deep learning to resolve the problem of phishing URL attacks.

DECLARATIONS

"Conflict of interest the author have no relevant financial or non-financial interests to disclose."

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AI-IoT based Health Care Reminder for Medication

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***Abstract*—IoT application using Healthcare is the increasing concern for the people needs to take correct medications. Because the prescription of the medication given to the patients is long, it's tough for patients and conjointly for the care takers to recollect. Typically patients miss on taking their medicines or take over indefinite quantity of it, leading to extreme deterioration of physical health. The study has proposed to the remembrance of intake medicine. It's a mixture of physical equipment's and technology which will be useful for any age group of people to recall the intake of medicines. The use of ATmega2560 board, has interfaced with the arduino board. To get connectivity, need to insert the SIM in the GSM module with the patient mobile to send the message. The use of inserted SIM can send the alert messages to the registered number. This approach gives an effective and fast communication and better way to reminding people about my medicine.**

***Index Terms*— medicines, patients, deterioration of health, ATmega2560 microcontroller, RTC, ESP8266, APRP600, GSM module, LCD, Speaker, Smart Card.**

I. INTRODUCTION

Nowadays as the medication cost is increased abundantly, we need to monitor patient's every now and then in present situations. For those seniors who live independently in their own homes. A good surveillance on patients schedule and medication should be taken or else it would be difficult for the guiders. The main age group to concentrate regarding this issue is Old age people, they have to take utmost attention on their medicine intake but it is highly difficult. So to irradiate this problem we created this Smart Medicine Box which keep tracks of the dosage and duration. Hence, this Smart medicine box will solve the problem faced by them. This box will remind the patients to take medicines in time and stay healthier.

This Remainder box is a technical device which is programmed in such a way that when the medicine amount and time is set in it, the device will give an alert by ringing buzzer. The main equipped material in this device is RGB LED's-which is used for lightening purpose i.e it will give indication to the user and the next material is LCD- this will display the content of amount intake of medicine by the patient. What percentage medicines are left above all sub-box? Completely different colors of RGB junction rectifier are used for various functions.

There will be a privilege to set timings to require drugs, so the device at first will give the suggestion to set the line for alarm time setting. A speaker equipment is connected to the ARM7 micro controller. Here the main target is on switch of the device [2], the present time and date that's hold on within the RTC is displayed on LCD. The playback voice ought to be recording the voice before itself through microphone voice. The alarm time is compared to the present time by the micro controller and after they match, associate interrupt is generated. Then the junction rectifier on the pillbox glows and a voice replay is additionally generated indicating that pill ought to be taken.

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The wireless sensors network that has been specifically made to watch and valuate the well-being of the aged living alone during a home atmosphere is ZIGBEE [3]. Behavior of aged will be evaluated for prediction of unsafe things throughout observation of normal activities. This medicine box is smart enough, sturdy and will not use any cc camera or visualization because it maintains privacy. Supported a survey among aged we discover that it's an enormous satisfaction factor to be used reception thanks to nonuse of the camera or vision based mostly sensors. The intelligent software system, in conjunction with the electronic system, will monitor the usage of various unit appliances and acknowledge the activities to work out the wellbeing of the aged.
[4] Conferred IOT based intelligent medicine box to help the patients to take the medicines in time, medical prescription is incredibly long and exhausting to recollect for many users. This kit will be helpful as this will reduce the patient's sickness and there is no need to worry regarding those patients thus nurses or doctors who are taking care and concerning their health will live hale and strain free life.

II. Design Of The Proposed System

A. Block Diagram

In this system the alarm has to be set for different times of medicine intake. Each remainder will have to be set as a line for ringing the buzzer. Real world time is been monitored using RTC to recognize medicine taking time. If there is a match with both the times, the system alerts as it is the medicine taking time. At this particular moment a message notification will be given to the particular patient through mobile message, including with message notification there is an output coming out from the speaker through voice modulation giving a remainder to take up the medicine.

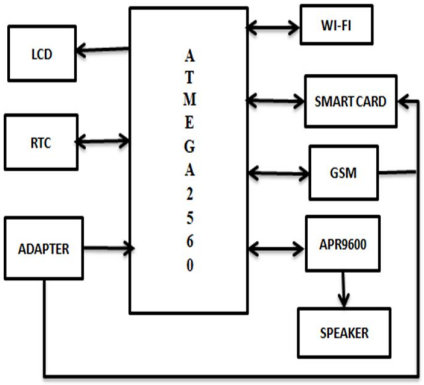


Figure 1. Proposed System Block Diagram

III. Components

A. Pin Description of ATMEGA 2560

The Arduino Mega 2560 has been built on ATmega2560. From PWM outputs has owned by 14pins , 16 analog input pins hardware serial ports of UART are 4 respectively. A USB Connector and ICSP header crystal oscillator of 16mhz and reset button were supported for the aximum shields for designing the Arduino Duemilanove.

Figure 2. Arduino ATMEGA2560 Pin Description

B. Wi-Fi Module

ESP8266 is associate degree UART-Wi-Fi clear transmission module with radical low power consumption, particularly designed for the requirements of a replacement connected world. It offers a whole Wi-Fi module which will permit to host the network or not to respond to the network.

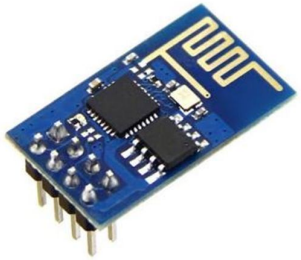


Figure 3. WIFI Module

ESP8266 – process are enabled in the sensors and specific devices has been used for the GPIOs token for improving the specific application devices. In the external circuit high degree of chip integration permits for the external for the front end module to occupy the PCB token spaces. ESP8266 Serial Wi-Fi Wireless Transceiver Module is appropriate for Arduino Uno, Mega 2560 and Nano.

C. GSM Module SIM 800

850MHz, DCS1800MHz and PCS 1900Mhz and EGSM900Mc frequencies are worked in the SIM800s to designed for the GSM/GPRS module in the world market. The voltage of SIM800L has accepted from 3.4v to 4.4v by the SimCom chip. It is preferable for LiPo battery. It is alternative way for placing the tons of house.

Figure 4. GSM Module

D. Real Time Clock

Real time clock or RTC, indicates square measure of clock modules. These Associate with eight pin device exploitation Associate in Nursing I2C interface. The RTC gives appropriate information about time. The data regarding months is appropriately adjusted in RTC as the number of days in a month is not the same for every months as some months have 30 days, some have 31 days and some have 28 or 29 days. The temporal arrangement sort of a clock maintains date as in a calendar. RTC is having an excellent battery backup which helps in running the clock throughout the time even though there is a breakdown. The potential consumption is very less for the association. We are able to notice these RTCs is several applications like embedded systems, motherboards and hard disks.

Figure 5. Real Time Clock

E. Smart Card

A smart card will offer identification, authentication, and knowledge storage and application process. It's a full thirty two KB or seventy two KB of EEPROM application knowledge. It have high speed transmission rate for nine.6 kbps to 223.2kbps with modifiable ATR (Answer To Reset).The user knowledge memory stores the info of the cardboard underneath the management of the appliance. The interior card configuration knowledge is employed by the cardboard OS to manage card functionalities.

Figure 6. . Smart Card Module

F. APR9600 Module

It is one chip, prime quality voice recording and playback resolution. It is no external ICs needed. It is minimum external parts and it conjointly has nonvolatile storage technology and no battery backup needed. It is user selectable electronic communication choices. it's random access of multiple mounted length messages. It is user friendly and straightforward to use operation. It is low power consumption and it's automatic power down.

Figure 7. . APR9600 microcontroller

G. LCD

It is the device which is used for displaying the content, matter or pictures related to the output regarding the input details given by user or patients here. JHD 162A Liquid Crystal Display (20x4), which is shown in the Figure is interfaced with the CPU.

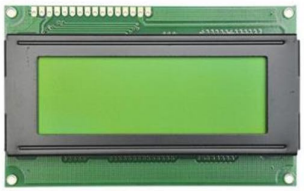


Figure 8. JHD 204A Liquid Crystal Display

The features of JHD 162A LCD is 20 Characters x 4 Lines, 5x7DotswithCursor, Built-in controller, +5v Power Supply, 1/20Duty Circle.

H. Power Supply

Any equipment has to be worked out or started up with the support of electricity itself. Below is the circuit diagram for the power supply.

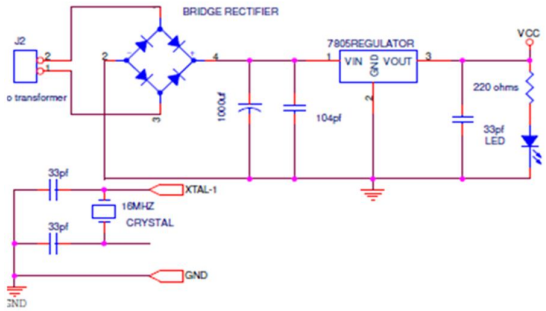


Figure 9. Circuit Diagram of Power Supply

IV. AURDINO SOFTWARE (IDE)

The Arduino Software - consists a toolbar which is helpful for programming. Sketches are the programs corresponding to Arduino Software. Firstly, sketches are developed by user or developer and are saved with extension .ino. Arduino (IDE) editor is with the feasibility of editing like searching, replacing, cutting, and pasting. Feedback is given by the message area when user tries to save and export sketches. Message area also prompts the errors. Arduino IDE's console portrays the output in the text format, it also comprises total faulty messages and any other details too.

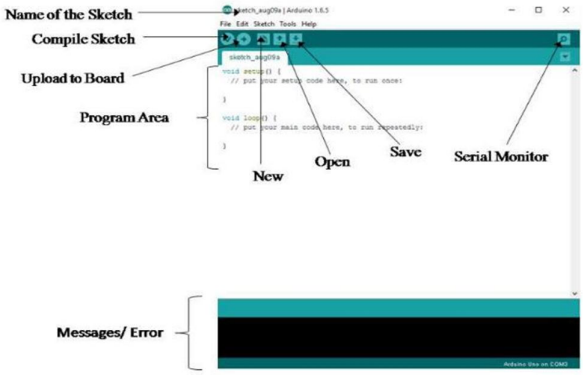


Figure 10. Arduino Uno IDE

A. Flow of Control

The below figure displays the Control flow graph of the system.

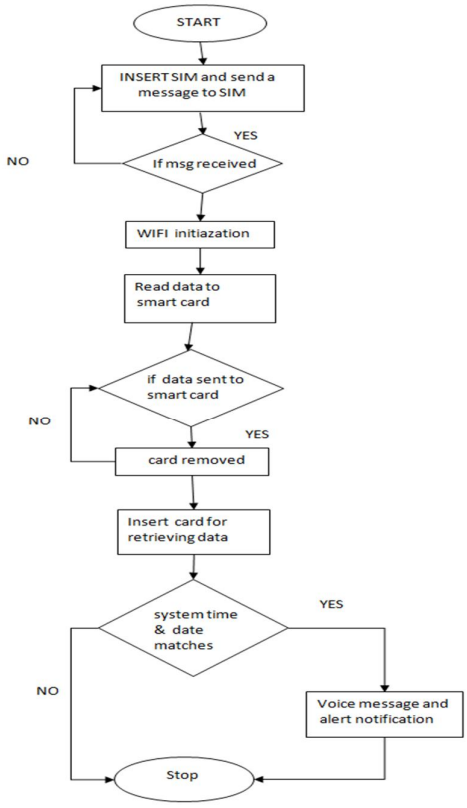


Figure 11. Flow of Control of the proposed system

V. IMPLEMENTATION

The entire system will be initiated once the power is switched on. We use ATmega2560 board, so that each and every module is interfaced with the arduino board. We need to insert the SIM in the GSM module to get connectivity with the patient mobile. After Wi-Fi initialization we need to send the message to the inserted SIM from the patient mobile for registering the number. So that it can send the alert messages to the registered number.

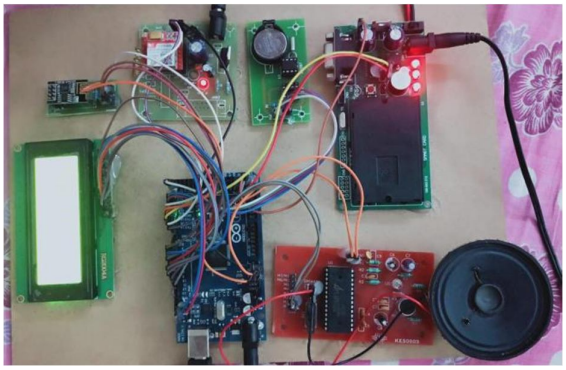


Figure 12. Implementation View

Here we also insert the smart card for storing and retrieving the information in the card. By using the webpage to give the information regarding the patient details about the medications. The data will be stored in the smart card through which the information is retrieved to all the modules. We use RTC to update the date and time automatically. As soon as the system time matches with the medication time, it will send the alert message to the patient mobile and voice message through speaker. Finally, data is stored in the cloud.

VI. EXPERIMENTAL RESULT

As soon as the code is uploaded the power supply is switched on which will trigger all the equipment's inside at once and then the output will be generated accordingly. The results are shown as below.

Figure 13. LCD display requesting to send message

Figure 14. Using Real Time Clock displaying date and time

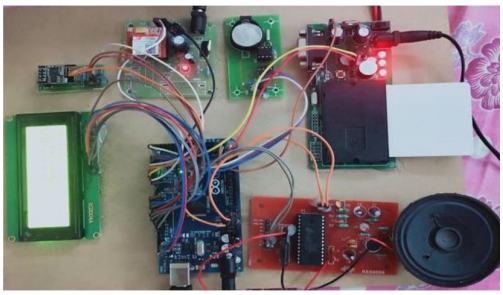
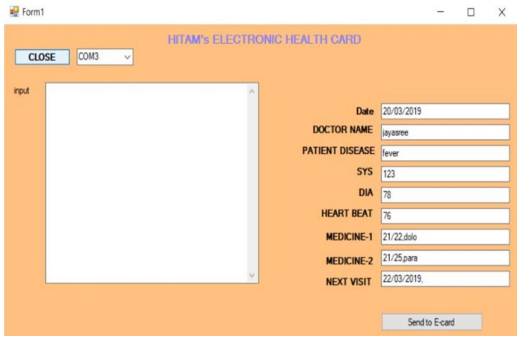


Figure 15. Card is inserted for writing the data

Figure 16: Displaying that writing is completed



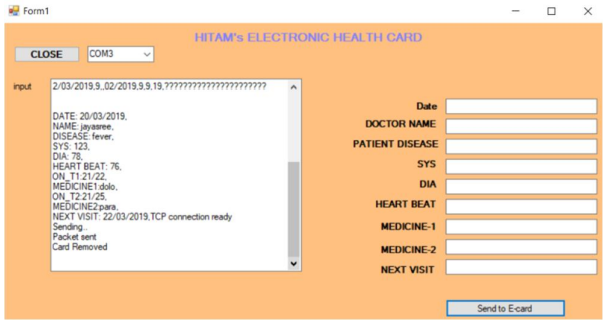


Figure 17. Writing data to the card Figure 18.Data is sent to card

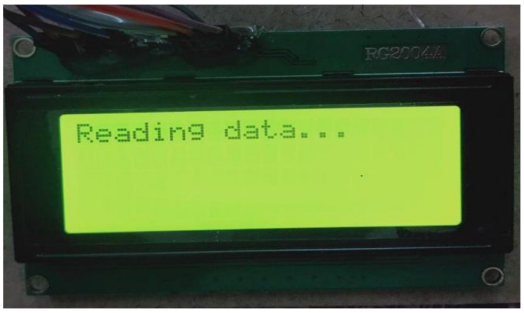


Figure 19. Reading values from the smart card

Figure 20. Displaying the data

Figure 21. Sending the message to the mobile

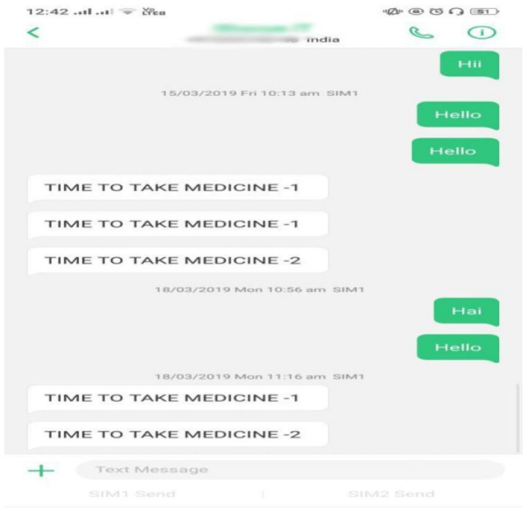


Figure 22. Alert message

VII. CONCLUSION

The main agenda of this health care remainder paper is that the old age people or the people who forget their intake of medicine in this fast growing world will take the proper medication at proper time. This will decrease the problems faced and also the death rate which is caused due the effect of not remembering with the busy schedule. To improve medication safety with remind and confirm their functions.Using our developed system as framework, the idea can be further expanded by integrating different other sensors to take the necessary actions without the human intervention. The system can also be connected to mobile thus making it reliable, flexible and user friendly. The IoT health maintenance network is one of the most vital elements of IoT in health care in leading Secured and Safety Life for long years.

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Grenze International Journal of Engineering and Technology, Jan Issue

An Approach for Finding Community Structures using Social Network

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***Abstract*—In Social Network Analysis,the emerging area is finding the similar interest of nodes to propoagate the information. The study has analysed the patterns of links to determining the integrity of the connection between each node.The study has reviewed the technical implementations of closely structured communities drive the faster transmission rate during the closely undirected links. Hence, if topological properties of the network are represented by the possible number of links connected in the community which signifies the Degree of the links between the geodesic. The analysis of node and link is feasible, to monitor the diffusion of information has been generated by the social interactions, these data have been serving as a significant source for understanding the nodes.**

***Index Terms*— Social Network Analysis, Link Analysis, Node Interaction.**

I. INTRODUCTION

The Social Network is an emerging area for grouping the similar interest people. The empowerment of human interaction is supported by the various services of the social media technologies. It provides the knowledge, inference among the users and their actions. The social media raises to discover key influence to choose their own interest field. It provides constant incitement, prompt, decision, and guidance. It has been focused on the links between the nodes. It analyzes the link between the nodes to examines homogeneous community and patterns to determine the conditions of the consequences to the relationship between the links. These approaches are integrated into the organized pattern of studying the network analysis.

These four features are together and define the study of:

1. Predicting the links in the Topical cluster.
2. It is ground truth roots in systematic empirical data.
3. Representation and Graph Analysis.
4. Focusing on the computational models for a time-consuming dynamic large network.

The ground truth roots are analyse the structure of community using graph theory. The network structure is made up of nodes (actors, things, or people), edges, and links (relationships or interactions). Interactions are a set of dyadic ties, triads, and a group of nodes in the community.

These links are analyzed the variety of patterns to the global and local of influences. The structural theories of social networks emphasize the "web of the group" in dynamic triads (Otte et al., 2002).

(John Arundel Barnes et al., 1954) introduced basic analytical methods of Analyzing the links in the structural network to denote the patterns of ties, bounded groups (families), and categories of social (eg., Ethnicity, and

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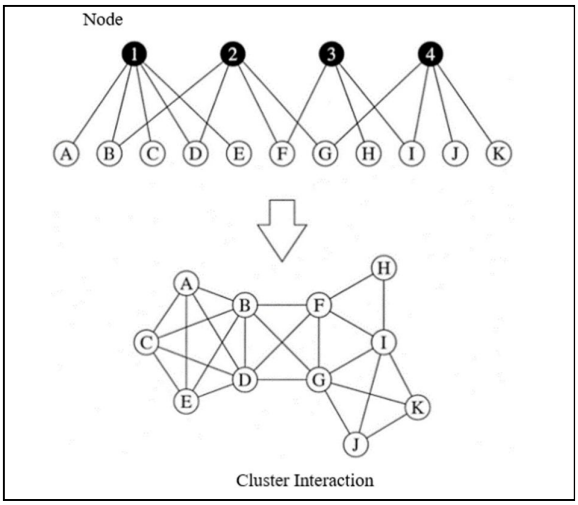

Figure 1. Development of nodes and cluster interaction

Gender). The first Sociogram to study the interlinks of the entity's approaches were mathematically formalized and became a pervasive and emerging field of social networks. It is emergent in the interaction of the entities that make up the structure. These patterns become more apparent to increase
the network size, ho6wever, the global analysis of ties in the structure is not feasible and it contains the information as to be uninformative. The divergences of local network analysis may be more important for understanding the properties of three general levels micro-level networks, meso-level and macro-level. White and Harisson White et al., (1954) expanded the systematic use of social network analysis. It has been applied in various disciplines of academics and terrorism. The exponential growth and popularity of social network ease in availability of online connectivity and specific characteristics.
(Seidman et al.,1978) determined the graph theory with kinship relations in the social network. (Heil et al.,1998) designed a program to equivalent uncover structural positions, it is concerned with position, cluster, centrality, the structure of the kinship and distributions of structural properties. The kind of analysis suggests that the social network community recognizes the structural approach in a wide range of empirical situations. The various genre of social networking sites ranging from multimedia, blogging sites and many more. It increases their users to link the sites. The sites are analyzing the data to improve their features in a scientific manner (Faust et. 1994). The field has supported for the decision making, finding groups in the social network sites. The societal bonding is tend to develop the sharing of information in the microscopic and macroscopic global level. The impact of social networking sites has two levels that are Microscopic and Macroscopic. The style of societal interactions and sharing information is terms of connectivity. The dynamic structure drives the development of community towards the techniques to enhance the social interactive environnment (Carley, 2012 & Manigoni, 2014). The Information Sharing across the firm significant areas of the organization, sales, and recruitment, for the formation the Social Network value has continually expanded to attract the users to the various sites is a challengeable task to analyses. (Borgatti et al., 2018) the survey had been conducted with 164 nodes on Facebook regarding the ubiquitous acceptance of related factors and satisfaction of users.

II. Literature Survey

[1] has been proposed the macroscopic level of sharing information n the social network analysis and the study has expanded in the structural network to find the community between the nodes.[2] has developed the representataion of structural features in the community structure by support vector machine to analyse the accuracy of clustering, the study has yielded better accuracy when compared to the Aggloromative hierarchy clustering tehniques. [3] approached the societal bonding for the decision making problems between the nodes in the structure, results were approached in the terms of connectivity in the structure.[4] determined the pattern of links in nodes between the edges to determine the integrity to found th goodness of communities in the set of nodes. [5] approached the user interect and charaterestics between the nodes to find the feasablity between the information, the study has been approached the modularity between communities the yielde accuracy was less when compared to the support vector machine algorithm, generated the interaction are more between the nodes ,

information diffusion is more but not acuurate between the nodes in the cluster. [6] approached the dependency of the continuous attribute, based on the sentimental analysis of users .[7] determined the most of the structural networks have certain community structures for understanding the dynamics of the network for instance, closely structured communities drive the faster transmission rate during the closely undirected links. [8] optimized the cost of link for the total access cost of all the influence maximization. The task access that must access a list of users and perform some computational process for the activity shaping.

III. ATTENTION MECHANISM POLICY

Link analysis to determine the integrity of connection between each network node to anlysed the links. With the data, analysts can find bottlenecks and possible fault areas and can patch them up more quickly or even help with network optimization.

The topological properties of a node requirements interactions and relationships are the major challenges, by their relationship the link has developed by the user's interests and characteristics. The analysis of node and link is feasible, and monitor the diffusion of information has been generated by the social interactions, these data have been serving as a significant source for understanding the nodes. For instance, it shows that the clustering for a single node among the actual number of links and the possible number of edges between the ego-centric nodes, suggesting that geodesic between the all pairs of vertices and the pattern of the links in the structured data. Its tie strength and a great commercial and practical value.

IV. PATTERN RECOGNIZING BETWEEN THE NOES

The main idea is to keep the data close to the user to make the access efficient and faster Social patterns, linkage structure is represented mathematically and studied topologically to reveal some unexpected structural features. The most of the structural networks have certain community structures for understanding the dynamics of the network. for instance, closely structured communities drive the faster transmission rate during the closely undirected links. Hence, if topological properties of the network are represented by the possible number of links connected in the community which signifies the Degree of the links between the geodesic. Communities are defined as the clustering coefficient and modularity of the links. Modularity is measured to maximize the leads to the presence of communities in a given structural network. It provides information about, how the communities are formed in the social network, and measures the community properties and yields the goodness of communities in the set of nodes.

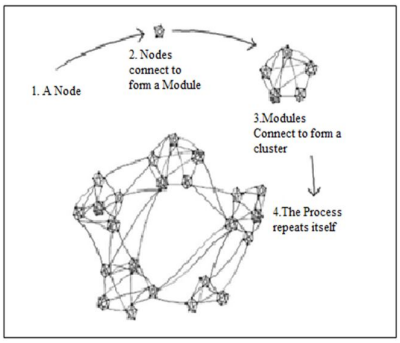

Figure 2. Process of Interaction between Nodes/Edges

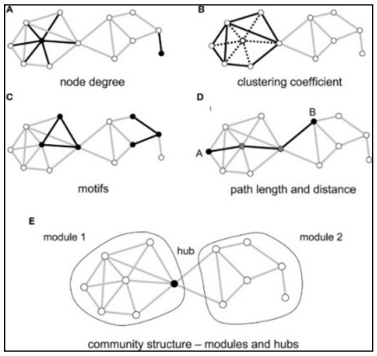

Figure 3. Community Structures

Social sites are primarily a major source of information exchange, attributed to both personal and professional; hence it is imperative to look into the authenticity of such communication. The presence of Social networks (SN) is being felt in every other sector for various activities example-: e-commerce, e-banking, e-learning, healthcare, and travel. The technological empowerment of communication in a social network has become vital for deriving optimum benefits from the emerging trend of communication. The large scale usage of the social networking site across the world, demands a systematic and scientific investigation of the associated properties and dynamics. Social media network is one of the best platforms to give propagations to the users and fast-growing technique to reach users.

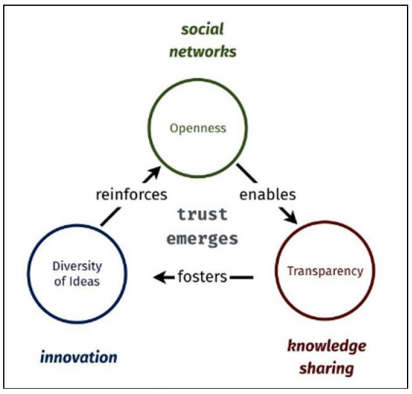

Figure. 4. Trust Emergence of Community Structures

V. RESULTS AND DISCUSSION

Social network analysis has defined communities by how nodes are linked to each other and clustering into similar groups. The group of distinct nodes is in a similar geographical location; the group of nodes could be connected by a common interest or shared characteristics. The connectedness nodes are fascinating about the detection of communities. Using the clustering algorithm in R program, to detect the hidden patterns in the structure. By using the Modularity Algorithm is searching for groups of people who are closer to each other than would be predicted if they were related by chance. A highly distributed network has dense node connections within clusters, but sparse node connections in different clusters, a unique cluster can be assigned to all individual nodes in the network as defined by the modularity algorithm. The study has explored Facebook ego-network, by when you find the influencers in the graph, to identify the node who are connected between different sub-networks in the graph. The modularity allows us to develop the granular understandings of the links in the graph.

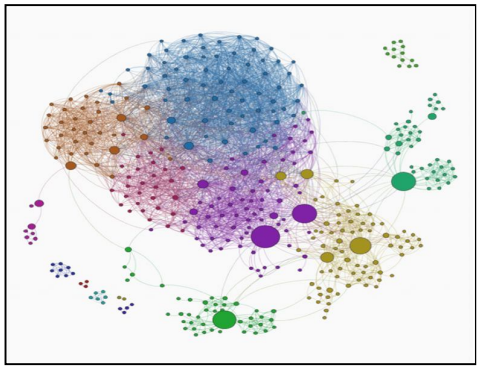

Figure 5. Clusters are in the Community

The nodes are separated by modularity, each belongs to a different cluster or a group colored accordingly in the Fig.5.

In the Links between the nodes are divided into four communities:

Blue Community is made up of connected nodes, but all nodes are identical (16 % of the network)

Brown Community of the nodes are closely connected nodes in the structure (9% of the network)

Red community is all connected node but who are all influenced in the community. (6% of the network)

Purple community is connectedness node with directly closed to the influential node in the network.

These color-coding shows which node has involved and the group of communities have segmented by very subtle differences and analyze the links in the structure of the connectedness network.

Network analysis to analyze the relationships between thousands or even millions of individual's nodes in networks. Where knowing the real-world relationships that make up the societies is not nearly as simple anywhere.

VI. STRATEGIES OF LINKAGE BETWEEN THE COMMUNITIES

A. Activity Shaping

It is the generalization of maximizing the influence the exogenous activity makes sure the user was linked to where it could most easily access the influence of users (U). It is the cost of incentivizing efficiently for large groups. The exogenous activity gives the desired average of overall activity at a given time. The "user"," idea" and "time" was the temporal point process of the representation. The user and time was the cost of the link of the total access cost of all the influence maximization. The task access that must access a list of users and perform some computational processing on the activity shaping. Multiple adaptions to lead the inference of users link which is the conditional intensity and the likelihood of idea option gives the more intensity of maximum likelihood.

B. Dynamic Influence

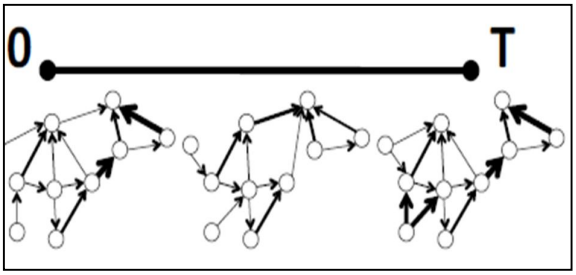

Figure.6. Temporal Process of Information with Time‘t’

From the temporal process the information has consist of users, time, and sentiment it gives the noisy observation of the latent opinion. From the latent opinion the sentiment of the user’s data has depends on the continuous and discrete distribution. The continuous distribution based on the sentimental analysis of the users and the discrete based on the likes and dislikes of the user's post, comments, and tag of the data.
From the stochastic process latent opinion of the temporal points has summarized by the Users Initial Opinion, Influence from one user to another user, and previous sentiment by the user interest.

C. Information Reliability

The source of trustworthiness comes from the contribution of the idea more frequently to the users i.e. Key and Simple idea has propagated over time at different levels of inherent unreliability. The Verification and Refutations come from the statements. The intensity of the statement has derived by the temporal evolution of the intrinsic reliability of the information and effect of past refutation (topic dependent and topic weight)
The Node Proximity Clustering Algorithm (NPC), Fast Greedy (FG), Binomial (B), and Socio Rank (SR) prediction algorithms were evaluated under quantitative values of Link Prediction Algorithms. The number of time link requests, Frequency of links, Last node access link, Size of the structure are used to find the performance of Link Accuracy and Efficiency. Each result shown was the average taken from 70 simulation runs. As each evaluation, the node run was independent of each other’s, the distribution of mean job times approximated a normal distribution.

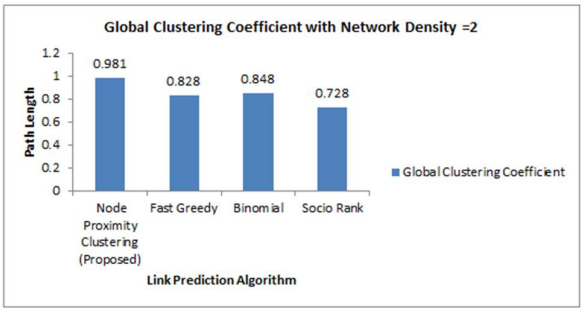

Figure 7. Mapping of Nodes by Global Clustering Coefficient

The NPC had been evaluated in the igraph package with a Link prediction Algorithm using an isomorphic query. The other exiting algorithms are Fast Greedy (FG), Binomial (B), Socio Rank (SR) algorithm were also evaluated independently in a igraph Package for comparative analysis. The NPC algorithm yielded a better Global Clustering Coefficient as 0.981 with Network Density =2 (Fig. 7).
The FG and Binomial algorithms provided the more or less same Path Length as 0.828 and 0.848 respectively. The SR algorithm produced Path Length as low as 0.728. The NPC yielded better Path Length as 0.372, 0.352, and 0.472 less than FG, Binomial, SR respectively (Fig 7).

VII. Conclusion

Link Prediction is the major challenge in the market. Secured. The study has analyzed the modularity, each belongs to a different cluster. The modularity allows us to develop the granular understandings of the links in the graph. The number of time link requests, Frequency of links, Last node access link, Size of the structure are used to find the performance of Link Accuracy and Efficiency. Each result shown was the average taken from 70 simulation runs. The NPC yielded better Path Length as 0.372, 0.352, and 0.472 less than FG, Binomial, SR respectively.

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An Efficient Approach for Identification of Copy- Move Image Forgery using SURF and SIFT based Techniques

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***Abstract*—Internet has changed the world of computers and how we use them. Now there is no field left that may not require internet. It has impacted mostly the fields like image processing, machine learning, cyber security, data mining etc. Technological developments today have made the life so comfortable and easy but also put forward a challenge of authentication of digital data generated from various domains. This has become a major concern for security. To address this concern, we are encapsulating facet point juxtaposition, adaptive over dissection for forgery identification in our proposal. We have based our work on Key point and Section based forgery identification techniques. Adaptive non-intersecting, irregular sections are utilized to uncover suspicious sections in the images. Dissection algorithms are used to assist in this process. Facet points are mined by comparing and juxtaposition each section with its facets. Super pixels are used instead of facet points in the proposed forgery section mining system. The neighbouring sections are melded into facet sections to acquire merged sections which have similar color facets. To end the process morphological operations are used over merged sections to obtain forgery section. The outcomes obtained shows that this proposed algorithm can achieve superior and accurate outcomes even in most critical constraints when compared to other existing approaches.**

***Index Terms*— Image Processing, Forgery Identification, Image Forgery, Juxtaposition, Digital Images.**

I. INTRODUCTION

Digital image processing in this modern era has become one of the most protruding domains for research in multidisciplinary fields. The core of electromagnetic spectrum and security is constituted by digital image processing. It has become the primary focus of research with huge scope to safeguard privacy and maintain confidentiality. Achieving the desired outcomes in image processing remains a challenging task that needs an apt solution. Digital images are primary source for forensics, deep learning, AI and thrust areas. Using deep learning techniques today, we can fake eminent personalities thus by posing challenge to forensics to detect forgery images. The disparity between forgery and original image has been narrowed done deeply that it's almost becoming impractical to identify the difference. This drawback is addressed by proposed work [1].
Image forgery has become very common today in social networks. Copy-move forgery is among well-known digital image manipulation practices today that copies portion of the image and is bonded at a different location

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on the that image. In our literature survey we found that there are so many copy-move forgeries identification techniques developed. Fridrich et al. demonstrated how dissection of input image into rectangular sections is done to determine the forgery sections utilizing Discrete Cosine Transform [2]. Luo et al. demonstrated usage of RGB color components and discrete data in this approach [3]. Li et al. proposed to use Discrete Wavelet Transform and Singular Value Decomposition for mining image facets [4]. Mahdian and Saic work showed us facet mining utilizing more than 20 blur-invariant points [5]. Fourier-Mellin Transform was utilized for mining facets and transformation by Bayyam et al [6]. Wang et al. proposed utilization of mean intensity using dissimilar radii for mining of section facets [7]. Zernike moments were part of Ryu et al work to get section facets [8]. Data Entropy was utilized by Ravo Solorio and Nandi to acquire section facets [9]. Scale Invariant Facet Transform technique was employed by I. Amerini and L. Ballan to acquire section facets [10].

Two process already exist for forgery identification namely Section and Key point based. The first approach utilizes input image by dividing into regular section, intersecting section and its counterparts by means of the image pixels for acquiring forgery sections else processing is done using transform. The later Key point-based forgery identification technique employs duplicate section identification. These approaches exhibit few drawbacks: one is high complexity involved in partition of image into overlapped sections, secondly complexity in forgery section geometrical transformation and thirdly low recall rate incurred due to partition of host image into regular sections.

A dominant approach was needed to address the drawbacks exhibited. Thus, we propose a unique copy-move forgery identification technique that encapsulates adaptive over-dissection and facet juxtaposition. Proposed technique adaptively partitions the host image into irregular and non-intersecting number of sections. Facet point mining is then carried out on each section and compared with others to obtain similar facet points which will assist in determining suspicious forgery sections. Identical facet points are exposed to morphological operations to acquire the forgery sections.

II. Digital Image Forgery

Morphed images are logjam in today's digital world. It is very often seen that these images are used primarily in scandals to create polemics. News agencies, political propaganda and defaming are a boom relying on forgery images for their personal gains causing disruption to harmony in the society. Thus, it is very essential to devise approaches for authentication and credibility of images to counter such practices.

Figure 2.1 Image retouching (left: original image, right: altered image)

Figure 2.2 Image Splicing

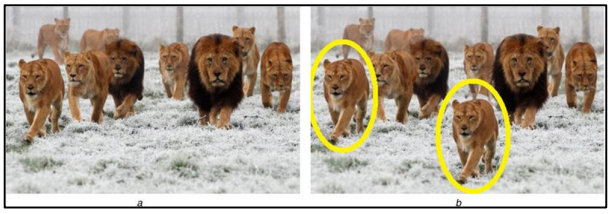

Figure 2.3 Copy-Move Forgery

Figure 2.4 Morphing Image

The vital forgery techniques are classified into four types:

1. Image retouching: This involves enhancing an image or altering certain facets to make the image attractive to the eyes of a reader. There are a plenty of tools like adobe photoshop that makes this task simple and look natural.

2. Image Splicing: This process involves copy and pasting of parts of sections from the same source or a different image. This is the primary step of an artistic collage creation.

3. Copy-Move (cloning): This process involves copying and pasting a section from an image to other location within the same image.
4. Morphing: This technique interpolates among two images to have a blend of two input images.

III. Existing Approaches

A. Identifying Duplicated Image

Alin C Popescu et al. presented an approach which successfully come across and localize duplicated sections in an image. This approach works by way of first applying a foremost element analysis on small, fixed dimension image sections to yield a discounted dimension illustration. This representation is strong to minor variations inside the photograph because of colorant clatter or lossy compression. Replicated sections are then identified by way of lexicographically categorization of entire image wedges [11].

B. Fast Copy-Move Forgery Identification

Hwei-Jen Lin1 et al. offered a fast copy-move forgery approach. This technique works by partitioning the source image into chunks of same dimension. Facets are then mined and stored in a sorted vector. Then shift vector is computed and evaluated. A section with all facet vectors like shift vector is taken and medium cleaning and connected component assessment is accomplished to get the outcome [12].

C. Robust Copy-move Forgery

Yan jun Cao et al. Presented an approach to detect such unique object. To begin, the unique image is separated into fixed-range sections, and discrete cosine rework (DCT) is implemented to each section, thus, the DCT coefficients form each section. Secondly, each cosine altered section is exemplified by a circle section and 4 characteristics are obtained to ease the measurement of each section. Eventually, the specific vectors are lexicographically taken care of, and duplicated photo sections will be tallied with the aid of a preset threshold price [13].

D. Identification of Digital Images Using SURF

B. L. Shivakumar et al. showed an automated and robust reproduction-circulate forgery identification technique based totally on surf, which detects duplication location with distinctive length. Experimental outcome illustrates that the recommended technique can come across copy-move forgery with minimal fake suit intended for images with high decision. However, a little insignificant, copied areas had been not efficaciously identified. As a part of our future paintings, we will keep having a look at replica-move forgery to become aware of tampered section boundary and reduce the fake fit charge [14].

E. Sift-based Forensic Process

Irene Amerini et al. stated the challenge of identifying if an image has been forgery is explored; This work focused specifically, how the image is duplicated after which inserted onto any other quarter to produce a replication or to abandon that is awkward. Usually, A geometrical conversion is needed to confirm replicated image on the new image. to conform the photograph patch to the brand-new context a geometrical transformation is wanted. To strike through such transformation, a distinctive procedure predominantly built on scale invariant facets transform (sift) is recommended. Like approaches permits us understand if a duplicate-pass incident has passed off. moreover, to salvage the geometric transformation employed to take out cloning. Considerable tentative outcomes are provided to substantiate that the approach can specifically individuate the revised location and, similarly, to assess the geometric conversion boundaries with excessive consistency [15].

IV. Proposed Process

Forgery identification has gained importance over a period with increase in the no of daily forgery cases online. The Proposed system achieves efficiency utilizing adaptive over dissection algorithm and the facet point juxtaposition techniques which is demonstrated in the figure 4.1 and is defined as below:

A. First step involves splitting of the source image into un-equal and non-intersecting sections by treating them with over dissection technique. The resultant sections are termed Image Sections (IS).
B. To extricate the section facets (SF) in a reliable manner, asymmetrical section dissection is utilized then Scale Invariant Facet Transform (SIFT) technique is applied, where it is utilized to each dissected section.
C. Another vital parameter in the proposed study is the suspected forgery sections, which is acquired by carrying out the juxtaposition between the BF with every section and the accorded facet points are labeled as

the Labeled Facet Points (LFP) which is beyond utilized as allusion for forgery identification. Ultimately, we recommend the Forgery Section Mining process to expose the forgery area in the source image corresponding to the mined LFP.

A. Adaptive over dissection

The adaptive over dissection exhibits complexity as dimension of the host images upsurges, resulting in expensive evaluation of the intersecting sections. This is overcome in our approach utilizing the adaptive over dissection technique, that can dissect when the host image is converted to non-intersecting areas of irregular shape as image sections, the forgery areas can be identified by juxtaposing these non-intersecting and irregular areas. In Dissection, the non-intersecting dissection eases the evaluation effort equated to the intersecting sectioning. In Addition, the erratic and profound sections better embody the forgery section in contrast of regular sections. Nevertheless, preliminary dimension of the super pixels in SLIC is challenging toward ascertain. The host image in real world is different in dimension and semantics which are utilized for identification of forgery. With our forgery identification process, distinct preliminary super-pixel dimensions can produce different forgery identification outcomes. As A Result, distinct host images ought to be sectioned in super-pixels of distinct primary dimensions, that are mostly part of the forgery identification process.

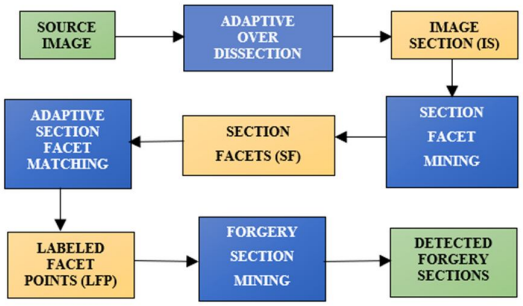

Figure 4.1 The copy-move forgery identification proposed scheme

We planned and organized many experiments to inspect the correlation amongst occurrence dissemination and the preliminary dimension of the super-pixels to acquire apt forgery identification outcomes. Then four-step DWT is performed utilizing Haar wavelet employed over current image. Minimal occurrence energy ELD, elevated occurrence energy EHD can be calculated using the formula given below. With the outcome of 1 and 2, one can determine the proportion of the low energy distribution PLD using (3), after which the preliminary dimension S of the super-pixels can be evaluated as in (4)

$$E_{LD} = \sum |CA_4| \qquad (1)$$

$$E_{HD} = \sum_i \left(\sum |CD_i| + \sum |CH_i| + \sum |CV_i| \right), i = 1,2,\dots,4 \qquad (2)$$

$$P_{LD} = \frac{E_{LD}}{E_{LD} + E_{HD}} . 100\% \qquad (3)$$

$$S = \begin{cases} \sqrt{0.02 \times M \times N} P_{LD} > 50\% \\ \sqrt{0.01 \times M \times N} P_{LD} \leq 50\% \end{cases} \qquad (4)$$

In the above, S is preliminary dimension of the super-pixels; (M ∗ N) implies dimension of the selected image; and PLD is proportion of the minimal occurrence distribution.

The alteration process can dissect the image into sections as well as the preliminary dimension as a provided image dimension, which can be defined by each photo to be the first apt dimension to maximize the negative search outcomes.

B. Section Facet Mining

We begin with dissection of the host image into sections and attributes of the host image are mined from obtained image sections (IS). When we look at the existing approaches the identification process mines facets of same dimension or precisely utilizes the pixels for image sections. The mined facets provide the knowledge

about the content of the IS thereby discarding the location information. The facets are vulnerable to various image transforms. So, in this process the facets are mined from IS which are resistant to various transforms. The facet mining processes SURF, SIFT are employed throughout the entire process. All the image processing operations either it may be scale, blur, compress or rotate, experiments have shown that the outcomes obtained with SIFT are highly coherent and have superior in performance compared to other facet mining process. So, in this work, SURF is utilized for facet point mining. Therefore, each section facet contains irregular section information and the mined SIFT facet points.

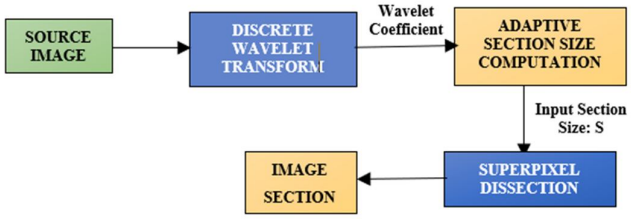

Figure 4.2 The adaptive over-dissection process

C. Section Facet Juxtaposition

In most of juxtaposition techniques, it generates a precise section pair only. An identical vector of shift is obtained if there are many juxtaposition points. Specified ceiling, the paired sections gave shift vector are classed as sections those could been emulated and turned. In this approach, as section function made up of a programmed distinctive set points, we recommended a distinct approach aimed for detecting the matching sections.

Section Facets (SF) are taken as the input for the Section Facet Juxtaposition. All the SF are then loaded, and the correlation coefficient are determined for the IS. Then juxtaposition threshold (JT) value is evaluated based on occurrences of correlation coefficients. Utilizing the obtained JT, we locate the matched sections (MS). The matched facet points are then labelled (LFP) that denotes suspected forgery sections.

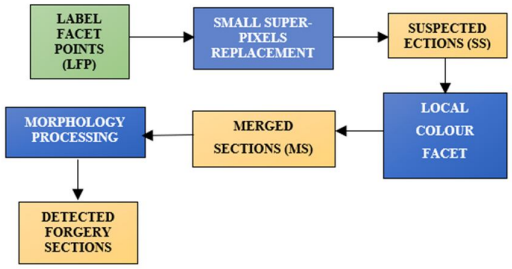

Figure 4.3 Flow chart of the Forgery Section Mining

D. Forgery Section Mining

Once the mining of LFP is done, then it becomes necessary to trace forgery sections. As these mined LFP are just the traces of forgery sections, A spoofing detection and mining process is required and employed to detect forged sections more accurately. To detect the suspicious sections (SS), a process is needed that supplants the LFP with small super-pixels, which is attained by dissecting the host image aptly as minor super-pixels. The indigenous color attributes in super-pixels neighbors of the SS are assessed to enhance exactitude and upturn levels.

When we detect that local color attribute is the one that was suspected neighboring super-pixels are melded into the related suspect sections. Then are put in outcomes as MS. Finally, to produce the identified copy-motion forgery sections, the geomorphologic process is employed to fused section. Figure 4.3 demonstrates the flow of the forgery section mining.

In the process, LFP are loaded and SLIC process is applied over the preliminary dimension S on selected image for dissecting to minor super-pixels termed facet sections. Comparing each LFP with related or similar section results in generating the SS. Next, we gauge the indigenous color facet in super-pixels which are adjacent at SS, termed as Adjacent Sections (AS) and blend the AS into resultant SS to obtain the merged section. Morphological clone identification process is applied into merged section to conclusively obtain the identified forgery sections [16].

V. EXPERIMENTAL OUTCOMES

Precision, Recall, F score and Processing Time are the four parameters we selected measure the performance [17]. Precision is the likelihood that the identified sections are pertinent and is classified as the ratio of the amount of precisely identified forgery pixels to number of totally identified forgery pixels. Recall is likelihood of appropriate sections are identified, and it is defined as the ratio of the number of correctly identified forgery pixels to the number of forgery pixels in the ground-truth forgery image. F0.5 score is utilized as a allusion factor to determine the forgery identification outcome; the score relates together the precision and recall as single rate, and it can be determined utilizing

$$F0.5=1 + 0.5^2 * \frac{\text{Precision}*\text{Recall}}{0.5^2*\text{Precision}+\text{Recall}}$$

TABLE 5.1 FORGERY IDENTIFICATION OUTCOMES OF PROPOSED ADAPTIVE OVER-DISSECTION PROCESS WITH SIFT AND SURF

IMAGES(PNG)	PRECISION		RECALL		F Score		TIME	
	SIFT	SURF	IFT	URF	IFT	URF	IFT	URF
BRICKS (3888*2592 pixels)	0.92	0.967	.899	.831	9158	9364	3.27	.27
EGYPTIAN (3039*2024 pixels)	0.87	0.923	.618	.596	8109	8318	4.35	.86
HORSES (3039*2014 pixels)	0.82	0.893	.656	.595	7878	8122	2.78	2.8
MYKENE (3872*2592 pixels)	0.81	0.859	.796	0.75	8101	8355	9.79	2.9
RED TOWER (3264*2448)	0.93	0.96	.649	.608	8577	8604	6.05	.44
BEACHWOOD (3264*2448)	0.94	0.982	.511	.486	.807	8159	9.04	.98
SHIP NUMBER (3264*2448)	0.93	0.959	.821	0.78	.907	9172	7.79	.89

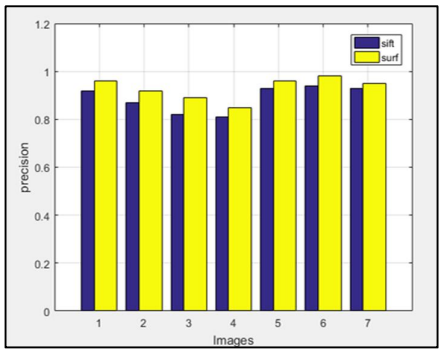

Figure 5.1 Precision

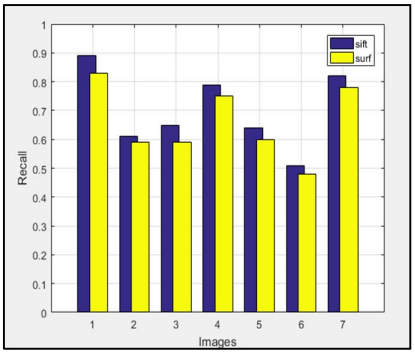

Figure 5.2 Recall

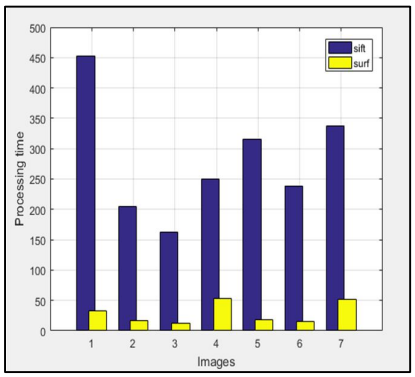

Figure 5.3 Processing Time

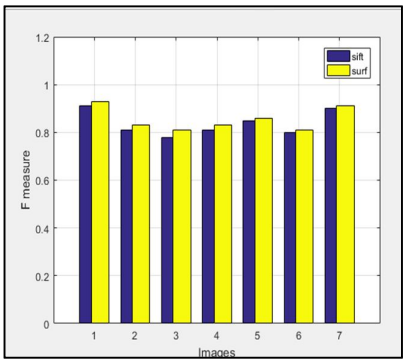

Figure 5.4 F measure

Table 5.1 is depicting evaluation outcomes of forgery identification utiliing recommended Over-Dissection with two different key point-based process SIFT and SURF. Now we may certainly perceive that for selected IS, the proposed Over-dissection process with SURF may yield much precise forgery identification outcomes thru elevated Precision=96.7% than Precision=92% OF SIFT and, at the same time gives a much lower

Recall=83.15% than 89.98%, higher F measure=93.648 than F=91.859% and remarkable low processing time of 33.278 sec than by 453.279 sec by using SIFT process. The outcomes indicate that the proposed algorithm with SURF shows good forgery identification outcomes and remarkably low processing time.

Precision outcomes of proposed process using SURF (indicated by Yellow Color) can be viewed in Figure 5.1 which also shows the comparison along existing scheme utilizing SIFT (Indicated by Blue Color). The precision of SURF employed process is higher than the later SIFT employed process.

The Outcomes of Recall of the proposed process are compared to existing techniques and performance can be viewed in Figure 5.2. We can say that the recall of proposed process using SURF is superior to exiting SIFT techniques when are exploited under various attacks. The Forgery Section Mining procedure assist significantly diminish the likelihood of the forgery being unidentified and improves the recall at high level.

The processing time of the proposed process using SURF is graphed in comparison to existing approach SIFT and can be viewed in Figure 5.3. We can conclude that processing time of proposed scheme is much lower of the latter case.

F scores that combine precision and recall as one for proposed process using SURF is compared with process using SIFT and the resultant can be viewed in the Figure 5.4. It also shows that proposed process is better than the latter.

A. Identification Outcomes under Different Transforms

The proposed process of forgery detection is not only tested against simple copy / move but with various transforms of attacks. The forged images are obtained using a geometric distortion of dataset. The distortions were scale, rotate, compression, noise reduction and down sampling. To diminish the impact of sample uncertainty, average precision, recovery, F measure, and processing time are calculated on all images in the data set.

1. JPEG compression is applied on the forged images at quality factor contrasting from 100 to 20, in steps of -10. Total of 8×10=80 images for both SIFT and SURF is tested.
2. The copied sections are rotated with the rotation angle contrasting from 2º to 10º is used to rotate the copied section in steps of 2º, Total of 7×5=35 images for both SIFT and SURF is tested.
3. Eight forgery selected images from data set are lowered 90%, 80%, 70% and 50%. Total of 8×4=32 images each for SIFT and SURF are tested.
4. The copied sections are scaled with the scale factor varying from 1.2 to 2, in steps of 2%, In this case, a total of 7×5=35 images each for SIFT and SURF is tested.
5. The forgery images are tested against noise attacks by applying noise with contrasting percentages from 10 to 90 in interval of 20. Total of 7×5=35 images each for SIFT and SURF is tested.

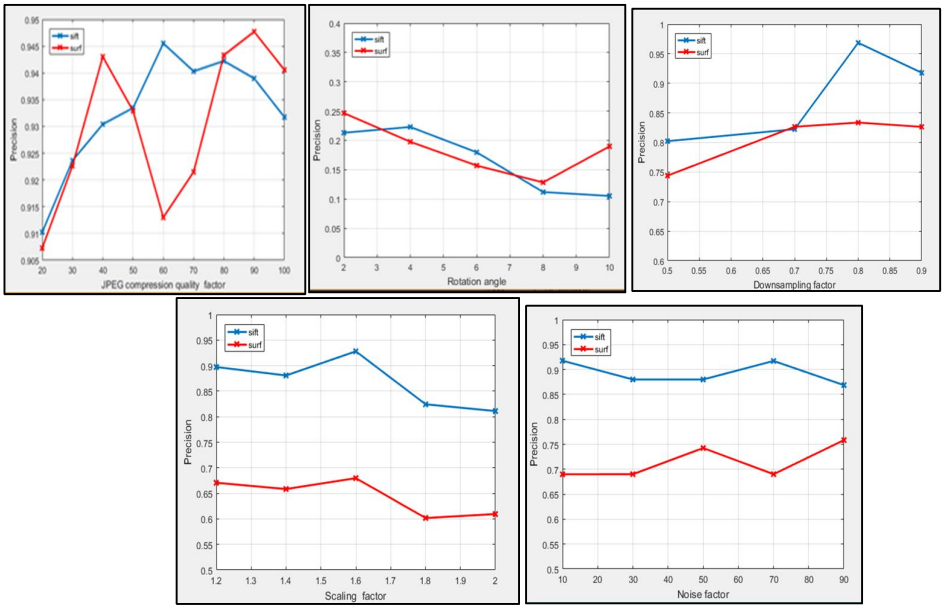

Figure 5.5 Precision outcomes at pixel point

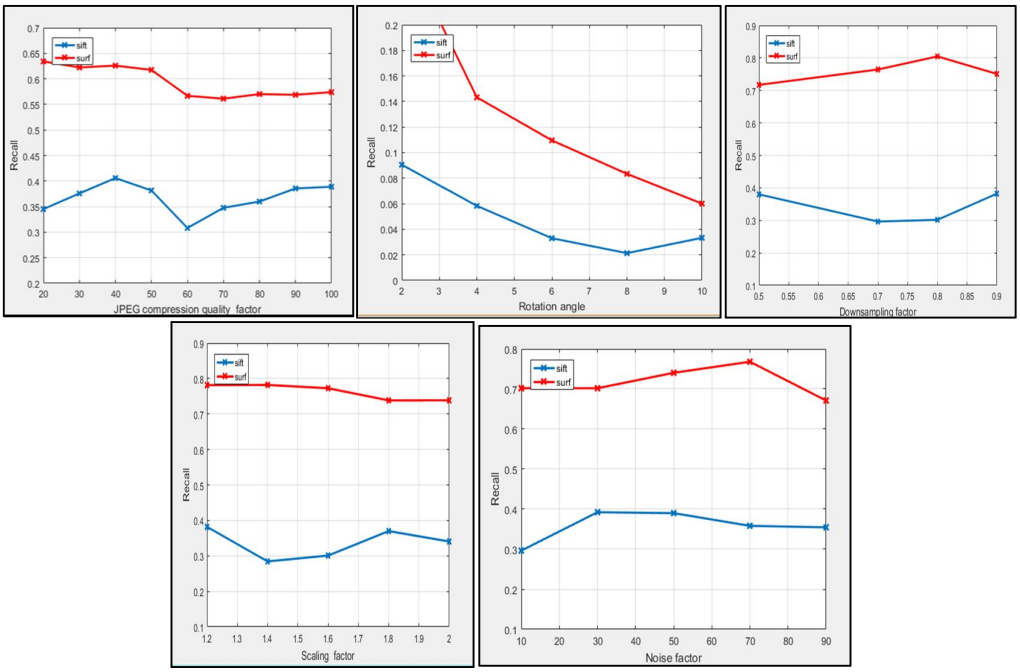

Figure 5.6 Recall outcomes at pixel point

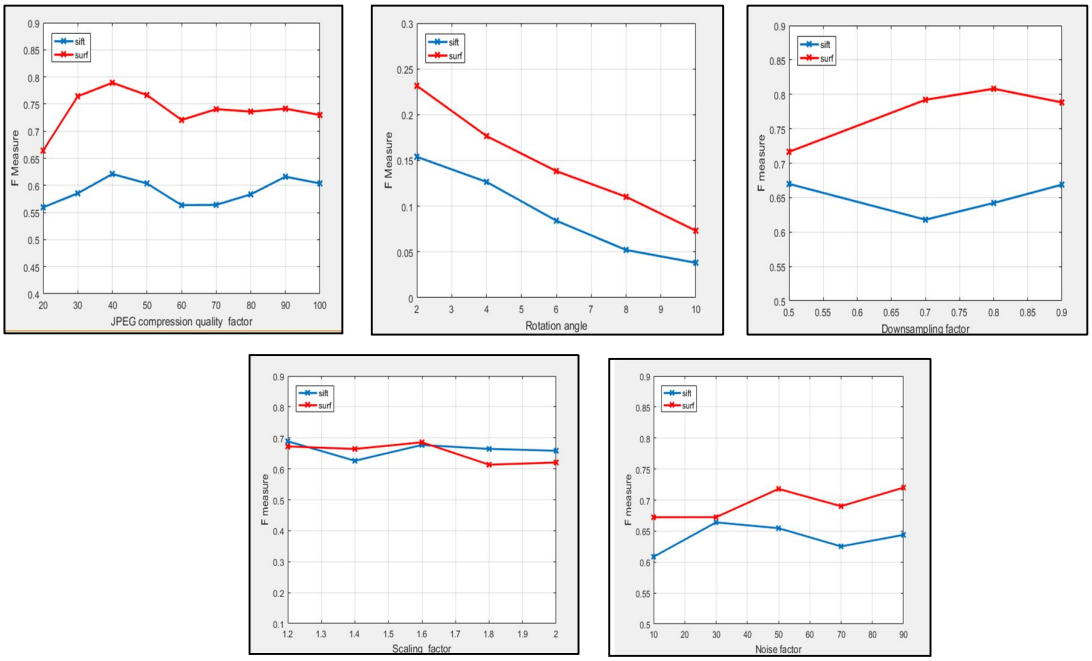

Figure 5.7 F score outcomes at pixel point

The Figures 5.5, 5.6, 5.7 and 5.8 show the identification outcomes at pixel point underneath distinct attacks. The red representation in graph denotes proposed adaptive section dimension dissection utilizing SURF technique and blue representation denotes outcomes using SIFT.

In the Figure 5.5 we compared outcomes of proposed work with existing approaches. We can strongly say that precision of recommended scheme with SURF outstrips that with SIFT.

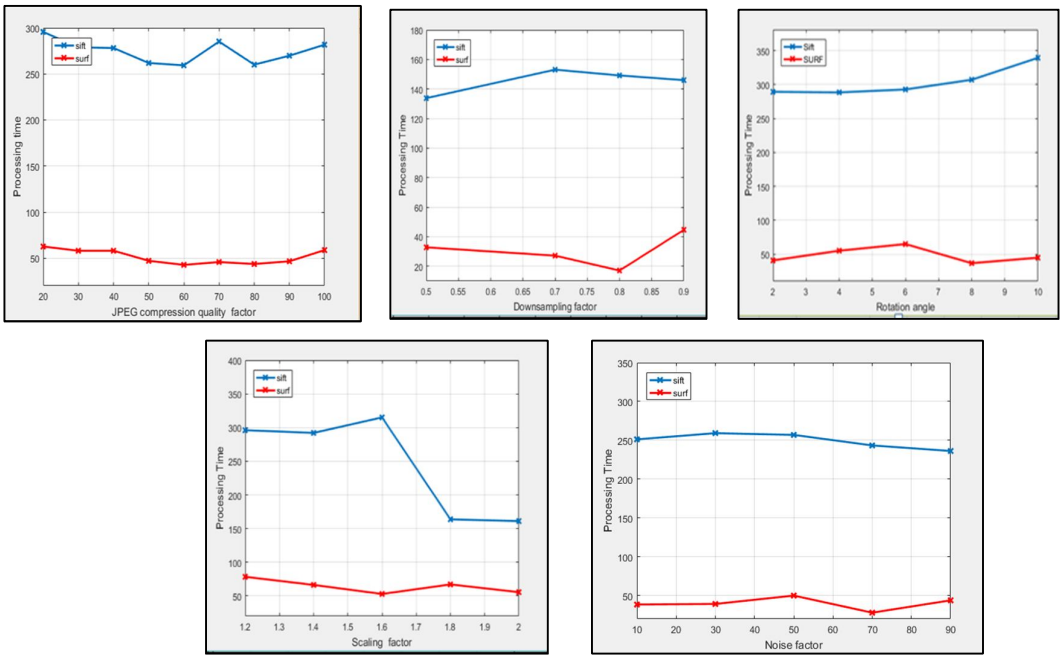

Figure 5.8: Processing Time at pixel point

When we look at the Figure 5.6, recall outcomes of recommended work are significantly nicer than existing approaches when exposed to various attacks.

F Scores in Figure 5.7 amalgamate precision and recall as one value, for recommended work are equated with the present process. We conclude forgery identification outcome of recommended scheme is superior than current approach as exposed to various attacks.

Processing time of proposed work with SURF and SIFT can be observed in Figure 5.8. It is observed that proposed work processing time with SURF is remarkably lower than with SIFT.

VI. Conclusion

This work proposes image forgery identification using adaptive dissection and juxtaposition of facet points. It is the integrated approach involving forgery identification process proposes, section-based scheme and key points. First the proposed adaptive dissection process dissects the host image in non-intersecting and adaptively irregular sections. The distinctive points are mined from each section and the distinctive components of the section are combined to identify the LFP that may approximately indicate the SS of being forgery. To discover forgery sections precisely in forgery section mining, we replace the distinctive dots with small super pixels as facet sections and then amalgamates the neighbor sections that exhibit analogous provincial color facets in facet sections for obtaining merged sections. We have demonstrated and proved that efficiency of the proposed process using above experimental outcome. The forgery section is identified by applying an adaptive algorithm on the dissection based on sections and two several key point-based process, i.e., SIFT and SURF. and by mining resilient SURF points of interest and corresponding signifiers. First, feasible duplicate sections in test images may be founded by juxtaposing the signifier vectors. The outcome of the experiment indicates that process quickly identifies copy-move forgery and withstand a variety of transformations and post-dispensation like resizing, rotation, down sampling, jpeg compression and noise attack.

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An Implicit Approach on Classification of Gender using CNN Methods with Crowd Analysis

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***Abstract*—As the urban population continues to rise, intelligent identification systems will become increasingly important to meet the computing analysis. According to the discussions on gender and age identification in public for the development an Intelligent transportation systems need to understand the relativity of identification in public places for providing appropriate facilities. Face recognition refers to the process of recognizing or tracking a person's identification by using his face. Individuals can be classified in photographs and videos. An image's content can include places, actions, items, people, and so on. CNN is used to generate a variety of complicated face appearances. Researcher surveyed through the previous works for identification of gender through CNN methods. Among the region based architectures researcher proposes to use the combination of models for fetching an image details with accurate pattern and right outcome. ImageNet is used for collecting dataset containing photos with varying resolutions. Network can be trained using the pixels' (centred) raw RGB values. Researcher uses combination of methods to provide better solutions with more accuracy, the approach of combinations can be put forth in a way to understand the limitations from previous work done and make an approach to combine a good method and yield better results. This research work will be utilized for the analysis of crowd at public places for public transportation with a blend of smart systems in the future development of transportation system. The most benefited sectors from this technique are real-time surveillance mechanisms and access management systems.**

***Index Terms*— Urbanized people, ImageNet, crowd analysis, Face recognition, Convolutional Neural Network(CNN), RCNN, Public transportation.**

I. INTRODUCTION

Over the last few decades, there has been an increase in the number of several research communities which have looked into the issue of object counting. As a result, object counting is their primary research focus. To count the number of works published, there have been many ways across a wide range of domains of objects in images or videos to count which leads to crowd counting. This process helps in finding the number of individuals at a crowded place. This leads to good identification system with a variety of mobility alternatives can have a substantial impact on people's quality of life by allowing them to get to desired destinations [2]. The quality of transportation networks influences each person's decisions and how they organize various activities like work, leisure, social gatherings, shopping, education, and health. Inequalities in society result from a lack of access to the transportation network. Ethnic exclusion occurs only when the chances are not identified, but rather due to a lack of access to them [3]. Difficulties in acquiring employment, as well as key public infrastructure and services

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such as health and education, are examples of social barriers, as well as participation in social and leisure activities [4]. Because mobility is so important in development, cities and increases individual quality of life [5], access to appropriate transportation solutions is tied to each individual's well-being [6]. Access to opportunity for all, elimination of negative externalities of transportation for all, and participation of representatives in decision-making, with a focus on urbanized populations, are critical for the provision of [1] inclusive transportation schemes.

The work attempts to contribute to the solution of gender biases in the provision of transportation services. By evaluating current gender-oriented approaches in transportation planning, A knowledge "library" of gendered mobility behaviour and gendered transportation service requirements is established [8]. This research seeks to analyze existing gender concerns in transportation planning methods and provide the results by investigating gender perceptions and attitudes about mobility services[1].

Hence to identify the gender races the work proposes the best Convolutional Neural Network(CNN) methods for predicting the gender and age which is the major scope to be achieved in this platform. The various methods of CNN are being experimented to identify the gender by using the still images, live images or real time images using the cameras or sensors which helps in projecting the picture. The focus is towards the crowd located near the bus stop or railway station or places where we can locate maximum people and identify the crowd with individualistic view.

The idea behind this study is that face detection offers a wide range of potential applications. From digital cameras that concentrate on people's faces automatically to security cameras that can match a person's face to their identity. Webcams are widely utilized as a security measure while protecting a computer. Only if the webcam's facial recognition system detects a person's face may they gain access to the computer. This technique can be reduced down to eye tracking and recognition.

Face Recognition has recently come in to popularity. In the learning stage, CNNs have a high computational cost in terms of memory and speed, but they are capable of some shift and deformation invariance. Furthermore, in order to tackle gender diversity, we employ an inter-sectional perspective, which is founded on demographical grounds, such as ethnicity, gender, age and disability, which must be regarded as mutually influencing and closely interwoven [11,12]. As a new area of machine learning research, the Deep Learning framework was introduced. Deep learning evolved from artificial neural networks (ANNs), is also known as Hierarchical learning [9] is a powerful technique in comparison to other machine learning algorithms.

It makes use of a step-by-step paradigm for achieving amazing progress toward data abstraction It is becoming increasingly popular as a result of the exponential increase in data access and remarkable advancements in hardware technology. When compared to standard neural networks, deep learning outperforms them significantly. Deep learning provides a kind of autonomous extracting features with little to no human interaction [9]. Deep learning, in general, necessitates two key characteristics: layered nonlinear dispensation and learning (supervised or unsupervised)[10]. Layers form a hierarchical structure in which the output of next layer helps in generating the input for next layer and so on multiple layers are worked out.. Automatic further improvisation of extraction can be found in a wide range of utilization.

Section 2 provides the different types of CNN with the study of models. In next section 3 we highlight on the use of the CNNs methods stated in the previous work for the different set of sample dataset used for this article for our initial phases of understanding the work with the images or pictures which were considered previously. The study of performance analysis of CNN for various models for the future development in Transportation Systems in section 4. In section 5 we summarize the study and propose how the comparison of CNN's performance to those of other ways and have firsthand knowledge with its effectiveness. This review focuses on CNN's fashionable paradigm, its increasing advantages, and current applications.

II. Convolutional Neural Network Models

Convolutional Neural Network may be a framework composed of various layers and stages, every of that is created from a group of arrays referred to as feature maps. These arrays function the inputs and outputs for every stage. A CNN is created from 3 divisions:

- Convolutional Layer - Extraction of Characteristics- The functioning of non-linearity- Layer of pooling or subsampling- Layer that is fully connected

Essentially, based on the study of CNN stages, one is created from these 3 parts. Multiple convolutional layers could be natural ability in multiple phases. Layers that area unit pooled area unit followed by layers that area unit entirely connected. Confined relationships, weight sharing, pooling, and therefore the use of various layers is one among the four key ideas of CNN that creates use of natural signal options for convenience[13]. The Fig. 1 CNN

architecture describes the process of handling the images in a Non linearity, Max pooling methods which helps in detecting the image to identify the minute particles and generate the clarification of the single image.

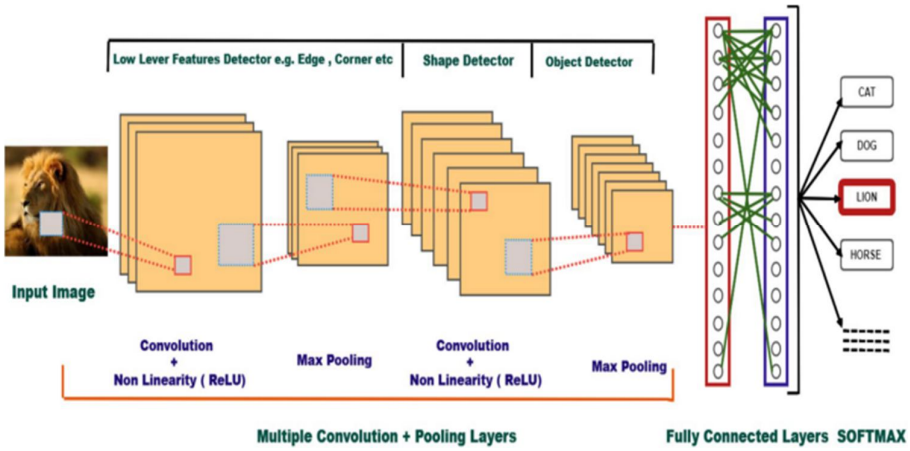


Fig. 1 CNN Architecture

The three activation functions are depicted graphically in Fig 2. Among all activation functions, ReLU [27] is the best. The mathematical definition of ReLU is y = max (0, x). It works on the non positive values and assigns zero.

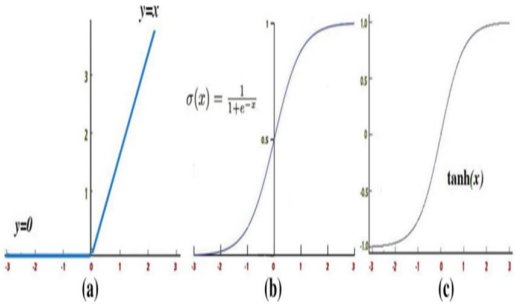


Fig. 2 Functions used are a. ReLU b. Sigmoid c. tanh[27]

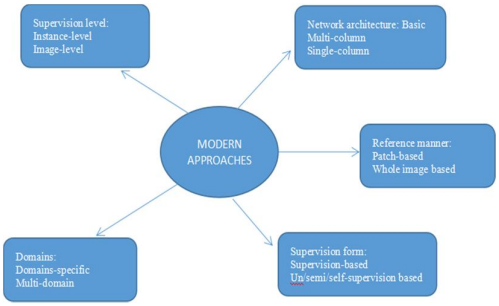


Fig. 3 Modern Approaches of CNN

It balances the CNN by tightly controlling the minimum and maximum thresholds. In this work we utilize the following concept in a crowd analysis where there is huge crowd and identifying the individuals is the key factor. The Fig. 3 below states the modern methods in CNN architecture paves us to think on the possibility of utilizing the approaches based on the requirement with accuracy and efficiency. The approaches are organized around network topologies, reference modes, supervision forms, domain specifics, and supervision levels. We classified network architecture types as basic CNN-based approaches, multi-column and single-column methods.[14]. The basic CNN adopts here the layered feature as shown in Fig. 1. The multi-column method employs distinct columns to record multi-scale information based on the various receptive fields, resulting in improved performance. Often single column network study with the purpose of not expanding network complexity utilizes single and complex CNNs instead of bulky structure of multi-column network study. Based on their training methodologies, CNN-based crowd counting systems are classified into two types: patch-based inference and completely based inference.

1) Patch-based: To train utilizing randomly cropped patches from an image, this inference approach is necessary. During the testing process, a sliding window is dispersed throughout the full test image, and the estimations of each window are gathered and then combined to obtain the image's final total count. 2) Methods based entirely on images: Because of the sliding window method, patch-based techniques do not focus on overall data and incur a high computational cost. Full image-based algorithms, on the other hand, usually use the entire image as input and produce a density map or total number of crowds, which is more efficient but may occasionally omit internal data.

2) In Table I an overview of the required architecture and their description has been approximately provided in an order.[22] For representative network architectures for crowd counting it is broadly divided into basic CNN based, multi column and single column based methods.

TABLE II. SUMMARY OF THE STATE-OF-THE-ART

Methods	Year & Venue	Network architecture	Reference manner	Supervision form	Learning paradigm	Supervision type
Fu et al. [16]	2015, EAAI	Basic	Patch-based	Fully	STL	Instance -level
Wang et al. [17]	2015 ,ACMM M	Basic	Patch-based	Fully	STL	Instance-level
MCNN [18]	2016 ,CVPR	Multi-column	Whole image-based	Fully	STL	Instance-level
Crowdnet [1]	2016, ACMMM	Multi-column	Whole image-based	Fully	STL	Instance -level
CNN-Boosting [19]	2016, ECCV	Multi-column	Whole image-based	Fully	STL	Instance-level

The below table II summarizes the different literature review for the work on the crowd density estimation through systematic survey the title provides the areas wherein they have focused in the year and the venue where they have have conducted it. The description is very crucial as it states the a study on mass density calculation and rate-counting methods utilized for visible investigation in view of computer visual sense research, another reference describes the statistical evidence from existing research and recommends focusing on broad elements of approaches rather than any specific algorithm. Crowd analysis is been divided into two areas like statistics and behavior understanding. Recently the new trends have been highlighted about the CNN based single image crowd counting.

TABLE III. ANALYSIS OF LITERATURE REVIEWS

Sl. No	Title	Year	Place	Brief Description
1	Recent study on mass density computation and counting for visual investigation [18]	2015	EAAI	This research paper introduces a study on mass density calculation and rate-counting methods utilized for visible investigation in view of computer visual sense research.
2	Enhancements and modes in visible multitude study: A systematic study and valuation of mass modelling techniques [19]	2016	Neurocomputing	This study aims to contribute deriving significant applied math data from the recent literary study and present towards focusing on the universal elements of approaches rather than any peculiar methodology.
3	Crowd scene understanding from video: a survey [1]	2017	TOMM	It studies on the two major keys for further study first is crowd computation and next is behaviour comprehension.
4	A survey of recent advances in cnn-based single image crowd counting and density estimation [20]	2018	PRL	A new approach of CNN based methods have to be identified based on the earlier study of single based image.
5	Convolutional NN for mass behaviour analysis: a survey [21]	2019	VC	Analysis of crowd using CNN based architecture.

III. DATASET

ImageNet is a collection of more than 10 million tagged perfectly framed photos organized into over 20,000 collection. The pictures were gathered over the online store and categorized by person via Amazon's Mechanical Turk crowd-sourcing programme. An annual competition named the “ImageNet Large-Scale Visual Recognition Challenge” (ILSVRC)[22] has been designed as part of the “Pascal Visual Object Challenge” since 2010.

ILSVRC use a subset of ImageNet, with approximately 1000 photos in each of the 1000 categories. The amount rises up to 1.2 million training images, 50,000 validation images, and 150,000 testing images in all. ImageNet is made up of photos with varying resolutions, however our algorithm requires a consistent input dimensionality.
As a result, we down-scaled the photos to a fixed resolution of (256x256). Given a rectangular image, we first re-scaled it so that the shorter side was 256 pixels long, and then cropped the resulting image of removing the centre (256x256) patch. We did not preprocess the photographs in any way other than subtracting the mean activity throughout the training set from each pixel. As a result, we trained our network using the raw RGB values of the pixels (centre).
Table III sums-up some representational datasets, including counting of crowd datasets using scenario from real world and one with synthetically generated data. To get the accuracy, we additionally study many datasets used in other fields to assess the abstraction potential of the constructed algorithmic program. Figure 4 depicts several samples from the represented datasets. Reference[23], have stated that convolutional neural network(CNN) is a sort of multi-layer network that comprises of numerous alternating convolutional and pooling (subsampling) layers, followed by a sequence of full-connected layers, as shown in Fig. 1. A convolutional layer network's input is often an image (m*m*x*r), where m is the picture's height and width combined and r is the number of channels. Convolutional layers have l kernels (or filters) with dimensions of (n*n*q), where (n and q) are determined by the designer (where generally q is equal to r). Each filter is (m - n + 1)*(m - n + 1)*q in size. This is produced by a convolution map of features or characteristics, where p denotes the number of filters to be used. Table III lists the specific statistics for the datasets, which are arranged by chronology order in year.

Fig 4. Some samples of datasets for Gender, age and crowd analysis

The datasets samples used are from the Shanghai Tech for the initial work for understanding the CNN method for identification of gender, age and crowd with more specific computations and accuracy.Shanghai Tech [2] is with 1198 pictures and 330,165 annotations, being the most popular and having maximum amount of dataset available in it. Part A and Part B of the dataset are divided based on different density distributions. Part A has photographs chosen across the network and picked up randomly, Part B features pictures picked up from a busy place of a city Shanghai resident area. In contrast of Part B has a much lower concentration than Part A. The store of images delivers a tough amount of data spanning a wide range of view types and concentration. However, because the number of images in different density sets is unequal, the training and test sets are frequently light concentrated sets. Regardless, the size alterations and viewpoint damage in the given store of data present situation which are new and potentially on the development of multiple Convolutional Neural Network-based approach.

TABLE III: OBJECT COUNTING DATASET STATISTICS, INCLUDING CROWD COUNTING AND OTHER FIELDS. TOTAL-THE TOTAL NUMBER OF OCCURRENCES IN THE DATASETS, AS WELL AS THE NUMBER OF INSTANCES

Dataset	Year	Attributes	Number of Images	Training/Test	Average Resolution	Count Statistics Total
CrowdFlow [24]	2018	Synthetic	-	-	300~450	-
UCF-QNRF [29]	2018	Real-World	1535	1201/334	2013 x 2902	1,251,642
CIISR [25]	2019	Real- World	1000	-	1080 x 720	-
Indoor[26]	2019	Real- World	148,243	-	352 x 288 or 704 x576	1,834,770
ShanghaiTechRGBD [27]	2019	Real- World	2193	1193/1000	1080 x 1920	144,512
DroneCrowd [28]	2019	Drone-based	33,600	-	1920 x 1080	4,864,280

IV. A REVIEW OF PERFORMANCE ANALYSIS OF CNN MODELS

According to the discussions on gender and age identification in public for the development in Intelligent transportation systems we need to understand the relativity of identification in public places for providing

appropriate facilities [41]. The different CNN models for identifying the objects like vehicle, human beings with RCNN, Fast RCNN, YOLO, Mask RCNN for region based. These models provide the platform to study the various aspects defining them with the proper parameters to find the objects. Lets check the architecture of the following models:

A. RCNN(Region based CNN)

The RCNN helps in identifying the region for the CNN to work but it has some disadvantages like it take too much of time to train the network as we have to classify roughly 2k to 3k region proposal per image, cannot be taken for real time as it takes seconds to scan on one image. Selective search algorithm is used. The below fig. 5 gives the depiction of its working.

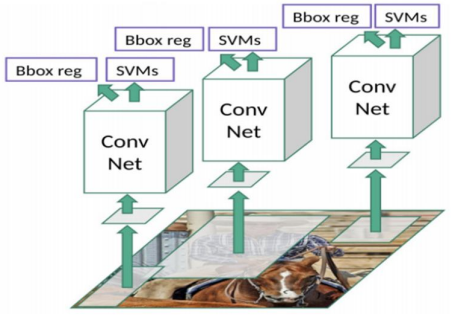


Fig 5 R-CNN Architecture

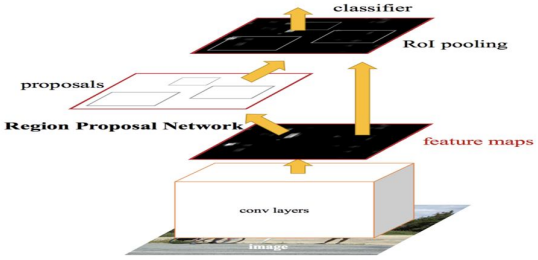


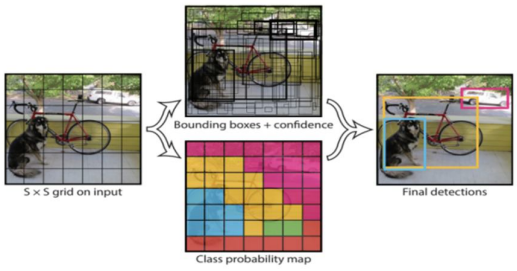
Fig 6 Fast R-CNN Architecture

B. Fast RCNN

In Fast RCNN the method used is to compute the given image faster than RCNN method, the RCNN method has to check the whole image with a multi region wise approach whereas in Fast RCNN dose it at once for a given image which produces a feature map as a result. The below figure 6 provides the details about its working.

C. YOLO

All previous object detection techniques used regions to locate the object within the image. YOLO is one of the many methods known as You Only Look Once used by CNN for detecting entities. The approach is of a network is not just interpret a whole picture but also each part of it and from there to pick the right portion of it. A single neural network generates the conjugated boxes as well as their class probabilities. The figure 7 depicts the working model of YOLO with proper approach. Other object detection techniques are orders of magnitude slower than YOLO the rate of frames per second is 45. The YOLO formula efforts has issue with small particles in the given image.



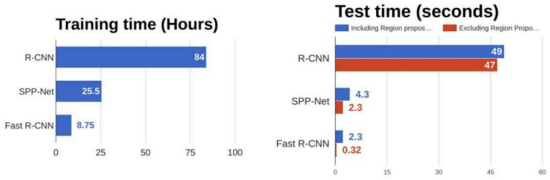


Fig 7 YOLO working style Fig 8 Train and Test

The above figure 8 provides the time taken to train and test the objects in various object detecting algorithm.[40] The below figures of 9 (a)(b)(c)(d) represents the outcome of CNN based state-of-the-art. The eight methods with four approaches are depicted in a chart representative traditional approaches over the crowd counting work. The valuation is done using the MAE and RMSE metrics for evaluating the models' reliability and precision.The charts below state the results of the earlier study.[14] The approach to utilize the methods in combinations would help on getting a more accurate result for identification of gender in crowd.

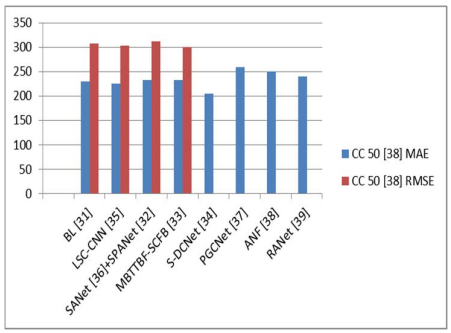


Fig 9(a) Methods and CC Approach

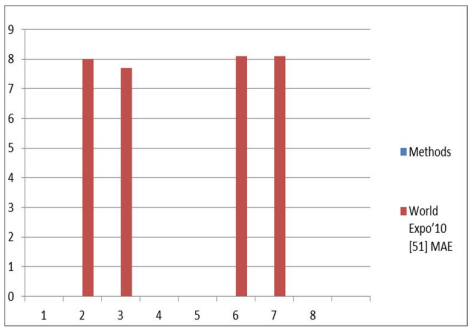


Fig 9(b) Methods and World expo'10 Approach

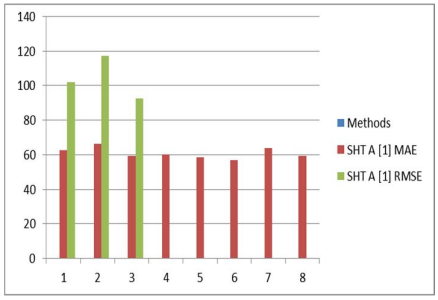


Fig 9(c) Methods and CC Approach

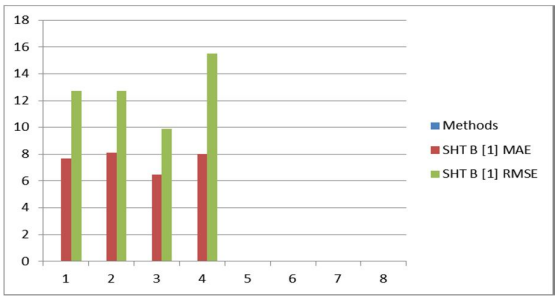


Fig 9(d) Methods and CC Approach

The above chart provides an idea of the valuation metrics of MAE and RMSE for the the CC 50 dataset for the place ICCV in 2019. The above chart provides an idea of the valuation metrics of MAE and RMSE for the the world Expo'10 dataset for the place ICCV in 2019. The chart above 9(c) states the statistics of evaluation metrics of MAE and RMSE for the SHT A dataset and 9(d) provides the data of the calculations carried out for SHT B dataset. The comparison of the above charts helps in understanding the evaluation metrics for the methods and the representing a proper picture about accuracy and precision from each method for the different dataset.

V. Proposed Work

The above points have helped in understanding the overall idea about crowd analysis, gender identification using various CNN methods. Among them we can use combination of methods to provide better solutions with more accuracy, the approach of combinations can be put forth in a way to understand the limitations from previous references and make an approach to combine a good method and yield better results. Below listed references provide us some inputs for the different methods utilized, with few considered parameters and the limitations which have been observed.

Mean absolute error (MAE) for the evaluation of age and is defined as the mean error between predicted age and actual age for the input or test image. Mathematically, it is expressed in (1) as:

$$\text{Mean absolute error (MAE)} = 1/N \sum_{i=1}^{n} |\hat{A}i - Ai| \qquad (1)$$

The table below states the boundary of the approach mentioned in earlier literature.

TABLE V. RELATED WORK OF VARIOUS METHODS ON GENDER IDENTIFICATION APPROACH

References	Method	Evaluation Parameters Used	Observations
Yang et al. [42]	The methodology used was ScatNet, PCA and fully connected layers	MAE score on MORPH 2 dataset was 3.49, LIFESPAN was 5.19, and for FACES was 7.04	Required more database for training to enhance the performance further
Yi et al. [43]	Multi-scale CNN was used with sub-network per patch	MAE on MORPH 2 is 3.63	For gender classification achieving higher accuracy can be taken as future work
Wang et al. [44]	CNN with dimensionality reduction and classification (SVR, PLS, CCA)	MAE on MORPH 2 is 4.77 and for FG-NET is 4.26	-
Rothe et al. [45]	VGG16 architecture was used	MAE on MORPH 2 was 2.68 and for FGNET was 3.09	The training dataset could be further enlarged

The combination of methods can help us in increasing the accuracy so we suggest to consider the test analysis of dataset in large scale and small scale. The approach of CNN methods with dimensionality reduction and classification with feature extractions methods. Another approach is to work with dimensionality and fully connected layers. These two combined approaches can help in generating better results.

VI. Conclusion

Face recognition refers to the process of recognizing or tracking a person's identification by using his face. Individuals can be classified in photographs and videos. The most benefited sectors from this technique are real-time surveillance mechanisms and access management systems. Deep learning-based algorithms are capable of extracting more complex face features. CNN can generate a variety of complicated face appearances, and it performs rather well in comparison to humans. It is a sub-field in computer vision. An image's content can include places, actions, items, people, and so on. Convolutional Neural Networks out perform other algorithms on large datasets due to its combination of feature extraction and classification mechanisms. These are the outcomes we have surveyed through the previous works for identification of gender through CNN methods with their architectures, factors and models stated earlier. Among the region based architectures we need to use the combination of models for fetching a image details with accurate pattern and right outcome. This work will be utilized for the analysis of crowd at public places for public transportation with a blend of smart systems in the future development of transportation system.

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Analysis of Prediction Algorithm for Recognitions of Skin Disease Report in Hyderabad City

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***Abstract*—Hyderabad is highly affected by climate change and is reported to be a highly prone skin disease-endemic area. This study investigates the association between skin diseases and climate factors. For selecting the best-fit climate prediction method for skin diseases occurrence in Hyderabad city, we have considered 3 different machine learning regression models namely: Poisson Distributed Lag Model [PDLM], Seasonal Autoregressive Integrated Moving Average Model [SARIMA] and other model Standard Multiple Regression [SMR] directed toward investigate the relationship between skin diseases and climate attributes incident during the time period 2000 to 2018. We verify the models lag predicting skin diseases for the time duration of January month to December month 2019 using the MAPE. ROC curves were considered to examine the prediction rate of a skin disease outburst. The results show that relative humidity and temperature are significant parameters which promote skin diseases where there is no rainfall effect. The PDLM model presents the finest fitting prediction of skin disease occurrence and identification of an outbreak when analyzed for a 6, 9, and 12 month time. Nevertheless, the SARIMA algorithm enacts a better prediction of skin disease occurrence for a short 3 month time period. The standard multiple regressions present a high loss prediction of skin disease incidence. From our results we are encouraged to carry out an extensive analysis to validate and examine the modelwith more data in Hyderabad city and contribute in prevention and control of skin diseases at an early stage.**

I. INTRODUCTION

Skin Cancer related Diseases is the most widespread disease during summer and winter around the world. Skin cancer occurrence has increasedsince 3 decades,the skin is the organ most exposed toenvironmental UVR and it is roughly calculated that 40 lakhs skin diseases take place each year. Nearly2 crore people reside in skin cancer effected countries[1].Tropical areas America, Australia, India, central Asia andPacific locations are mostly bundled with skin diseases, and in which southeast india and the central Asia area bear nearly 30% of the presentworldwide diseases bundle due to skin[2]–[4]. Some type of Skin are vulnerable toor higherTemperature that result from worldwide global warming which cover an increasingoccurrence of skin diseases [5]–[7]. The annual investigation by has confirm the increase of skin diseases at higher temperature. In-room temperature UV radiations getcarcinogenic. In human beings, theoccurrence of squamous cell sabal and cell carcinoma rises by 45% and 2.4%, respectively, per 1C rise in atmospheric temperature [8]. These estimates correlate to a rise in the virtual UV dose of around 1.5% per 1C rise. Skin cancer can give rise to a change of skin color with more than 6

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typesof skin diseases. At present there are specific medicines available for treating skin cancer and vaccine to prevent skin disease. the most constructive way to control this type of disease is through control of population and proving prevention medicine by forecasting occurrence of diseases using advanced machine learning techniques at particular area [9]–[12].

A prior warning method, utilize prediction models asan effective method for skin diseases outbreak control and preparedness. Climatic attributes likehumidity, rainfall, and temperature have been examine broadlyin studies for their prospective prediction task as an initial warning method to prevent skin cancer as a climate-sensitive disease[13][8], [14]–[17].Previous studies reveal strong association or Interconnection between skin diseases and climate factors like humidity, rainfall and temperature[1], [9]–[12], [18]–[22]. Nevertheless, the skin disease prediction method has diverse due totheir very complexity, research location and methodology[7].Therefore, recognition of the best fit prediction algorithms may be suitability to develop and validated for a particular geographical location.[23][24], [5], [25]

Hyderabad capital of telangana state is prone to be the most vulnerable for climate change and is reported to be with highest inflatedoccurrence of skin diseases in state. Nevertheless, there is a model by using climate attribute to assist evolving and initial warning method at effected location. The main objective of this study is. (1) To inspect the relationship or among climate attributes and skin diseases.(2) To examine the finest algorithm for predicting skin disease occurrence using climate attributes in and around the Hyderabad

A. Data Collection

In this study, data of the quarterly andmonthly number of reported skin cancer cases in Hyderabad city from January month 2000 to December month 2018 was collected from the disease controldepartment of Hyderabad medical center (HMC).HMC is the chief agency in charge of analysis and obtaining reported data for prevention of contagious in the city. Daily weather data from 18 Jan 2000 to 24 December 2018 was collected from IMD IndianMetrologicalDepartment Pune India. The data was collected throughsatellite sensors at Hyderabad city including daily Maximum, Average and Minimum Temperature, dailyrainfall, humidity. The obtain complete data has to be converted to average, meantemperature and maximum and increasing rainfall and monthly humidity for investigation.

B. Data Analysis

In theinitialstage, the relation amongmetrological attributes was inspect by utilize different machine learning regression methodsStandard Multiple Regression, Poisson distributed lag model and Seasonal autoregressive integrated moving average .Above 3 modelsare most commonly applied in a literaturethatto assesses the association between climatic changes and skin diseases, in the next step, the algorithms were validated to examine the machine learning models for prediction of skin cancer incidence and skin diseases outbreak.

C. Standard MultipleRegression

The initialphase of the investigation applied crosscorrelation technique to analysis the relationship among the skin diseases outbreak and various lags of the exploratory attributes like rainfall, humidity, temperate to regulate the best time interval for the initialmodel. which is expressed in Eq. 1.

$$In(S) = Y_0 + Y_1T_{min} + Y_{max} + Y_3H_{min} + Y_4H_{max} + Y_5R \quad \ldots Eq\ (1)$$

Where S is the monthly count of skin diseases, Tmin and $T_{max}$are monthly minimum and maximum of temperature; $H_{min}$and H_{max}asmonthly min and maxhumidity and rainfall is denoted as R.

To avertthe remarkable co-linearityof associated lags involves in the machine learning methods, we design aadvanceanalytical attribute using the abrade value of two lasheswhich is possess the veryhighest correlation among the predictedattributes, Prior to utilizing the attribute in the last approach. By using a few statistical tests like Kolmogorov Smirnow,augmented Dicky falter test, and Shapiro-wire are examined normality andstability to make it very clear that there was no single violated beliefs for SMR. Furthermore validation of skin diseases,wehave build a multiple regression algorithm using collected data during the study 2000 to 2018 and then we have train the model to predict outbreak case from 2018.

D. SARIMA Model

TheSARIMA algorithm is first proposed by author Jenkins and we have try to hybrid the model and expanded using skin disease occurrence data from 2000 to 2018.Than the train algorithm was used to forecast skin disease occurrencein 2018.

ARIMA algorithmwith S as seasonal SARIMAtry to examination seasonal period, which is express by SARIMA$[x, y, z]\ [X, Y, Y]_s$,is given through model Eq-(2)

$$Pt = \frac{\Theta z(B)\Theta y(Bs) + at\phi x(Bs)}{\Theta x(Bs)\Theta(S)(1-B)d(1-Bs)D} + x \ldots Eq\ (2)$$

Where $\Theta_x(B^s)$ is the seasonal auto regression(AR) $\Theta_x(B)$ is the AR operator, $\Theta_y(B)$ moving average(MA) Θ_y is seasonal and ordinary differentcomponents, X external variable Pt is dependent variable and a_t is white-nose.

SARIMA model involves many proceeding stepsthrough the study. Initial, the variancevalue of skin disease count was stimulatedby applyinga natural lag variation of dataset.By testing with Dicky fuller metrics. By using time series data mean is stabilize the selection of a sequence of different [D and d] attributes was found on time series plot and comparing with their standard deviations the time series with more stabilize mean is consider. Next phase, the examination of the order of non-seasonal and seasonal [AR(X,x),MA(Y,y)] attributes were managed using theACF and PACF.With the help of a few feasible methods was screened using AIC for the goodness of best-fit comparison among distinct methods.Depends On the AIC lower score algorithm is selected for prediction. At leastthe best model, fine-tune for climate attribute,which was remarkably associated with skin disease occurrence,was develop for the time period from 2000 to 2018.Then we can predict skin disease cases in 2019.

E. PDLM Model

A Distributed lag algorithm [DLM] merge with the passion time series model was adapted to predict the consequence of climate attribute on skin diseases and to build a prediction model. Construable of a number are involved to build the model. Initially,forchecking for very long duration seasonality and trend of collected data, we create a pair of basis variable it's a part of main time variable,make use of 3 degree of freedom annually, In creating the spline basis, 4 knots annually was used 8 year multiply by 4 and minus by 1 to generate mathematical spline function. Even though is no agreement to choose a degree of freedom. From the previous studies, 3 years are consider and pound as a balance between if adequate manage trends and seasonality in monthly datafrom which gives more precise informationbywhich we can estimate the exposure effects. All they have variable involve in the PDLM model for both multivariateregression and bivariant analysis subsequent. Next phase auto regression of skin disease cases recommended very strong autocorrelation between current and past cases; in PACF [fig 2B] a cut off for 1 month of a lag time. Few studies carried out research on climate and infectious diseases strongassociation among them.Consequently, in this study,we inspect lag time extend from 2 to 3 monthly and to choose optimal lag time for the prediction model. In the third phases due to delay, it affects the independent variable on skin diseases that were determined by systematic literature review and cross-correlation function.Therefore we formulate a Poisson modelby interconnecting to identify autocorrelation order. A backward phase-wise analysis was considered for selecting the final model in the level which is approximant vale 0.04.with the help of AIC value as lowest help to build the best predicting model for skin diseases in upcoming years.

$In(\mu_t) = \beta_0 + \sum^{2}_{x=1} \beta_{t-x}\ AR + \sum^{p}_{L=1} \beta_{tl}(Temp_{l,p}) + \sum^{p}_{L=1} \beta_{hl}(Humid_{l,p}) + \sum^{p}_{L=1} \beta_{rl}(Rain_{l,p}) + S(t) + \mathcal{E}_t + In(POP).$

Where $In(\mu_t)$ is average predict skin diseases at model; β_r is constant number of skin diseases cases; AR_{t-x} is skin diseases cases at lagperiod k, $Temp_{l,p}$, $Humid_{l,p}$, $Rain_{l,p}$ are matrix for DLM to rainfall, humidity, temp respective; β_{t-x} is parameter of auto regression at lagperiod k; L is lag month; β_{tl}, β_{hl}, β_{rl} are coefficient for $Rain_{l,p}$,$Humid_{l,p}$, $Temp_{l,p}$ in lag period; p consider to be maximum lag; S(t) is the Spline function. Which help to control seasonally trends.

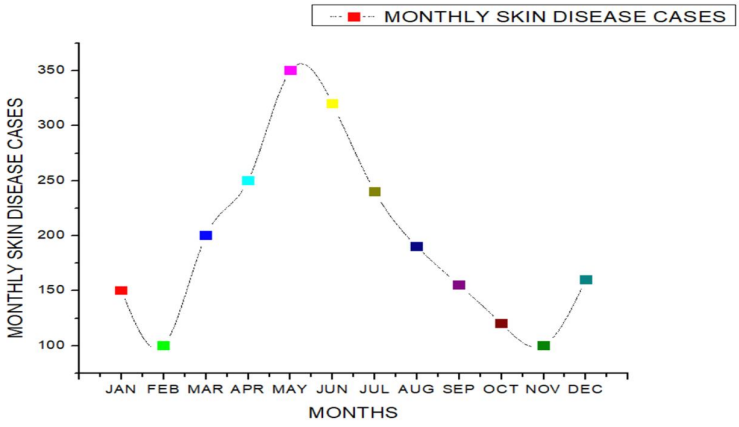

Fig.1 Monthly counts of skin disease cases (2000-2018) in Hyderabad city

F. Sensitivity Test and Model Validation

The prediction accuracy of each and every model they evolve was abscess by comparing precision outbreakagainst real worldrecognized skin diseases cases, With the help ofsome metrics like mean absolute percentage error[MAPE] was applied to verify and validate predicting model for the different time period 3 lags,6 lags,9 lags and 12 lags and models with lower MAPC value consider as best fit model for further analysis.

$MAPE = \frac{1}{n} \sum^{n}_{t=1} | x_t - \hat{x} / x_t |$

Where n is a number of the month, x_t and $\hat{x}$ are observed cases and predicted cases no. of skin diseases in a month.

Our Study indicate, we have examine outbreak of skin disease cases increased 80th% of skin disease cases recorded thought out the time interval from 2000 to 2018. Wear additionallythe optimal algorithm used as ROC to calculate and analyze the sensitivity ofthetrain model in identifying their skin diseases outbreak during study, The ROC metric is used to analyze True positive Rate(TP) or sensitivity oftrain modelto predict outbreak against the False Positive Rate(FP) [1-specificity]. ROC curve gives a detailed outbreak and non-outbreak of cases.

II. RESULT

A. Descriptive analysis

There were 6000 skin disease cases in the city of Hyderabad during study. On the mean monthly indecentnumberof skin diseases,instances were 65 withoccurrence rate as 5.4per 99999 person in a month. The occurrenceestimate the rising from summerperiod [Feb – June] to wets period [July – Dec]the excessive monthly occurrence rate 80 per 100000 person month was in April, and lowest occurrence rate is 2.5 per 99999 people was in the ofJanuary. This is show in [Fig 1].

TABLE I. SUMMARY OF SKIN DISEASES AND CLIMATE ATTRIBUTES FROM 2000 TO 2018 IN HYDERABAD

Variables	Minimum	Maximum	Average	Median	Std.Deviation
Skin diseases cases	10	629	127	105	96
Min Temp	23.2	27.4	25	25.1	0.93
Max Temp	29.3	36	32	32..3	1.3
Min humidity	50.9	71	62	62	2.7
Max humidity	90.5	100	95.5	95	2.6
Rainfall	0	445	127	121	109

In regards of climate variable data the range of rainfall varies from 5MM in the monthJanuary to 160 MM in the month of May the mean peak temp varies from 37 ^{0}C in the month of Feb& March to 43 ^{0}Cin the month of April&May andthe average min Temp varies from 20C to 26C in November, Avg min & max humidity varies from 88% march to 92% may and from 49% in Nov & Dec to 60% in January. Respectively in table1 show different between dependent &independent variable using statically method.

B. Multiple linear regressions

The outcome of autocorrelation occurrenceshows that the heightscorrelationamong skin diseases rate and min temp were initiate at lag1, lag2(r,0.3), maximum temp at lag3,lag4,and lag5(r,0.34 and 0.31), min humidity at lag12 and lag1 (r,0.53,0.51), max humidity at lag3,lag4 (r,0.35,0.37) and relative rainfall at lag2,lag3 (0.53,0.45).based on this a new independent variable build added;$Tmax_{3,4}$,$Tmin_{1,2}$,$Hmax_{12,1}$ and $R_{2,3}$.In table 2 mention the effects of climate attributes ($Tmax_{3,4}$,$Tmin_{1,2}$,$Hmax_{12,1}$ and $R_{2,3}$) on skin disease and shows that gradually decreases in skin diseases instance value β= -0.1 and p value = 0.04 for correlated with 1C^0 rise in Maximum temp, because 1C^0 increase maximum humidity value β = 0.04,1MM of relative rainfall(40.002) monthly skin diseases significantly increase with a levelsignificant value of 0.06.

The model exhibit that min humidity and min temperature were no statistically significantly related to change in no. of skin diseases. After removing insignificant variables, the remaining independent variable are $Hmax_{2,1}$, $Tmax_{3,4}$, and $R_{1,2}$ were significantly related to skin disease with much greater prediction strength R value = 0.38 compared with previous value = 0.35; RMSE0.49 compare with 0.51 ad second model used to predict skin diseases cases from Jan to Dec 2018.

TABLE II. SMR COEFFICIENT OF THE SKIN DISEASE VS. MIN AND MAX TEMPERATURE, RAINFALL, AND HUMIDITY FOR 2002 -2011 FOR HYDERABAD CITY

Variable	Root MSE	R-Squared	p-value	95% CI	Coefficients
Model 1					
$T_{min2,3}$ [a]	0.59	0.39	0.07	-0.5-0.009	-0.3
$T_{max4,5}$ [b]			0.7	-0.2-0.18	0.04
$H_{min0,1}$ [c]			0.09	-0.0008-0.0097	0.06
$H_{max0,1}$ [d]			0.9	-0.060-0.0078	0.010
$R_{1,2}$ [e]			0.0002	0.002-0.007	0.004
Constant			0.3	-2.9-11.9	4.45
Model 2					
$T_{min2,3}$	0.57	0.43	0.06	-0.39-0.03	-0.19
$H_{min0,1}$			0.06	-0.005-0.94	0.06
$R_{1,2}$			<0.02	0.003-0.007	0.005
Constant			<0.02	2.0-9.9	5.89

C. SARIMA Analysis

In time series analysis, the lag of skin diseases cases confers the normal distribution i.e. ShapiroWalk Test with P-value 0.51 comparing with original skin diseases case with P-value <0.01 which has the lowest distribution. The plot betweenACF and PACF using collected data sets from 2000-2018 mention in figure.2 [A and B]. The ACF metrics exhibits the very strong seasonal hidden information of skin diseases that has confirmed to add S with seasonal to build SARIMA model (X,Y,Z) with periodic length S is 12 and other is non seasonal (x,y,z).Weanticipating or imagine as skin diseases occurrence has a different seasonal period.

PACFmetics recommended that the value of X between 1 and 2 with the period interval of 12 month lags, as PAC was almost Zero at all lags excluding lag3 and lag5. The ACF recommends a moving average value Y from 3 to 5; mention that autocorrelation is all zero expect 4 with the period time of 12 months (Fig 2). Next differencing value d = 1 on plot ACF shoes a significant cut off 1 month lag among 12 months. (Fig.2 C), a basic test indicates that there is significantstability in data using Dickey- fuller Test, P<0.0.1 which is compared with original data i.e. P>0.4.Nevertheless, from the ACF still shows the seasonal patterns at

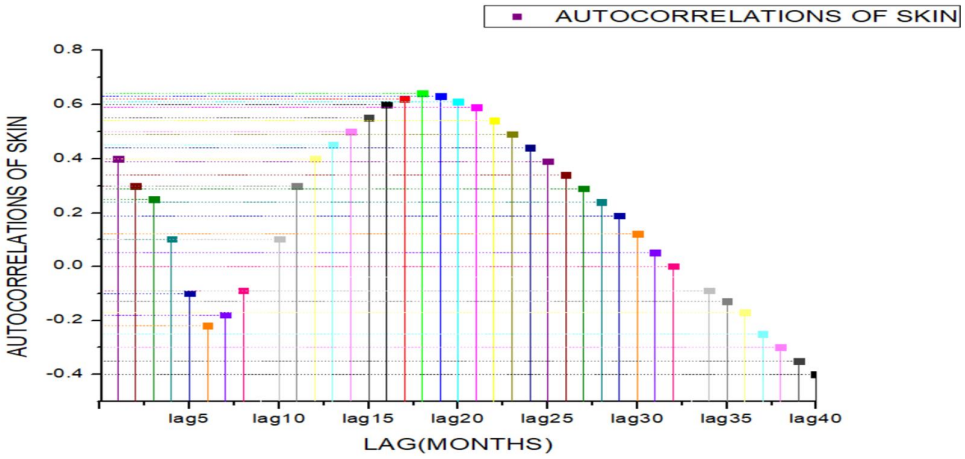

Fig.2. Autocorrelation functions calculate using log transformed skin disease cases from 2000 to 2018 in Hyderabad

In Fig.2 with 12 lags, clearly shows better to add seasonal differenceD = 1 month. Throughout 12 months autocorrelation shows positive significance, were SAR considers the value of x = 1.Table 3 exhibits the value of VIC and AIC for the SARIMA model. Selecting different x and y the model which has lowest BIC, AIC consider being best model as SARIMA (1, 1, and 1) (1, 1 and 0)$_{12}$ alter as average temp,rainfall and humidity (BIC 38,AIC 29) respectively.The investigation of residuals does not have any significant in ACF,shown in Fig.3A. The inverse graph shows a reasonable probability of residual in Fig.3B by Ljung- Box test establish residual value statistically not depended on P value greater than 0.04(Fig 3C).On the hand The SARIMA establishes the strong statistically significant result onmonthly temperature as $\beta = 0.19$ and $p = 0.01$, humidity value $\beta = 0.09$ and p is <0.01, but rainfall is not significant with value as $\beta = -0.007$ and $p = 0.2$.Then SARIMA model is train to predict skin disease cases at Hyderabad.

D. PoissonDistribution Analysis

The correlation between skin disease cases and climate factors confer a uniform sine wave oscillation at 6 monthsfor one rotation. 2-5 months are significant for min temp, humidity 2-3 months, 3-6 months interval for a max temp, 0-3 month for max rainfall and humidity. by removing the no significant attribute from the tested model, the final model shows all variable was; 2 auto regression value of skin 2-4 min humidity, lag 2-3of rainfall by adjusting Spline function of the population and time(table4).

TABLE II.RIDINGS OF BIC METRICS AND AIC METRICS BY DIFFERENT SARIMA MODEL COMBINATION VALUE (X, 1 AND Y) (1, 1 AND 0)$_{12}$

Time series Model	BIC	AIC
Simple SARIMA		
(1,1 and 1)(1,1 and 0)$_{12}$	150	138
(1,1 and 2)(1,1 and 0)$_{12}$	153	139
(1,1 and 3)(1,1 and 0)$_{12}$	154	137
Complex SARIMA		
(1,1 and 1)(1,1 and 0)$_{12}$	44	33
(1,1 and 2)(1,1 and 0)$_{12}$	49	36
(1,1 and 3)(1,1 and 0)$_{12}$	54	39

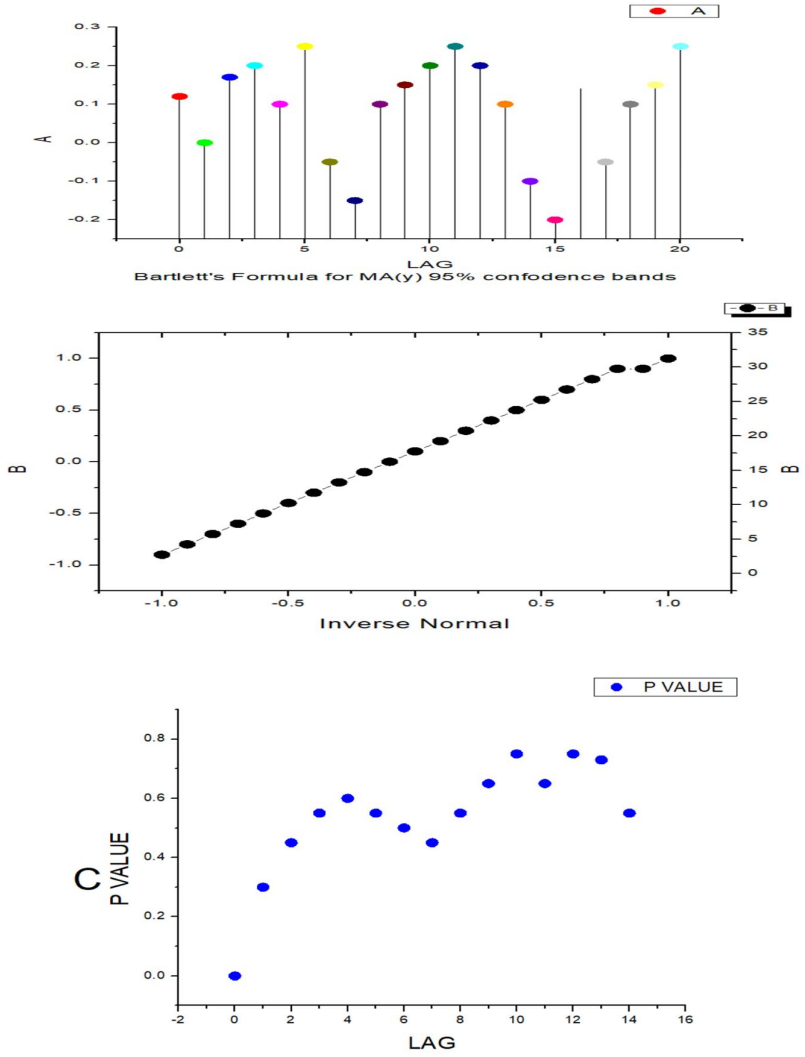

Fig.3.Graphical representation of SARIMA model: [A] and [B] plot of standardized residuals of Bartlett's formula and inverse, and [C] p value

TABLE IV. POISSON DISTRIBUTED LAG MODEL REGRESSION COEFFICIENTS OF SKIN DISEASES VS. MAXIMUM AND MINIMUM TEMPERATURE, RAINFALL, AND HUMIDITY

Variable	P-value	Coefficients	95% CI
Lag 1 Skin cases	<0.0.2	-0.001	-0.00027-(-0.0015)
Lag 2 Skin cases	<0.0.2	-0.002	-0.0036-(-0.0027)
Lag 1 Max Temp	<0.0.2	0.273	0.209-0.318
Lag 2 Max Temp	<0.0.2	0.220	0.168-0.29
Lag 1 Max Humidity	<0.0.2	0.046	0.034-0.058
Lag 2 Max Humidity	<0.0.2	0.061	0.047-0.074
Lag 3 Max Humidity	<0.0.2	0.025	0.009-0.0019
Lag 1 Rainfall	<0.0.2	0.002	0.00090-0.0019
Lag 2 Rainfall	<0.0.2	0.002	0.00097-0.0018
Lag 3 Rainfall	<0.0.2	0.008	0.0004-0.0013
Constant	<0.0.2	15.1	10.3-9.9

Maximum humidity and maximum temperature were statistically significant in the ML model. So that variable was removed from the building a final model. The R^2 (0.74) of out Ml model intimated in the previous skin disease cases; min humidity, min temp, rainfall trends and seasonality explained 74 of the variances of the monthly skin disease distribution.

E. Validation of 3 models

The model predictsinstancesby using PDLM, SMR and SARIMA algorithmmany observedinstancesare mention in Figure 4. By combining passion with distribute lag model give the best-fit prediction of skin disease instancesfor a period of 12 lag months with MAPE value = 0.07.Next SARIMA model with MAPE = 0.24 and lowest MAPE value = 0.64 found in standard multiple models. For prediction different time interval is consider for better prediction SARIMA model than PDLM for time period of 3 months with MAPE value = 0.02, but the PDLM model shows much better prediction for time period of 6 months with MAPE value = 0.31,9 month with MAPE value 0.31 vs. 0.09, and for 12 lag months with MAPE value = 0.24 vs. 0.07.

ROC metrics in Figure.5 shows that the last model PDLM is consider to be best fit model for diagnosticthe skin disease outbreak (>90thpercentile of skin disease instances) range of sensitivity and CI from 96 to 98% through outbreaksfrom 2000 to 2004, 2006 and 2009. It is estimated that ROC area for the time interval 2000 – 2009 shows that PDLM performed at 98%(95% CI,97-99%) sensitivity between non-outbreak and outbreak period (Fig.5A) other hand SARIMA algorithmrepresent at 90%(95% CI,75-97%) shown in Figure and SMR at 85 (95% CI,55-85%) sensitivity among non-outbreak and outbreak[Fig.5C].

TABLE V. MEAN ABSOLUTE PERCENTAGE ERROR (MAPE) AT DIFFERENT TIME INTERVALS OF PREDICTIONS

Machine learning Model	Lag Months	MAPE
SMR model	0 to 3 lag	.17
	0 to 6 lag	.31
	0 to 9 lag	.52
	0 to 12 lag	.70
SARIMA model	0 to 3 lag	.04
	0 to 6 lag	.35
	0 to 9 lag	.36
	0 to 12 lag	.29
PDLM model	0 to 3 lag	.23
	0 to 6 lag	.17
	0 to 9 lag	.14
	0 to 12 lag	.11

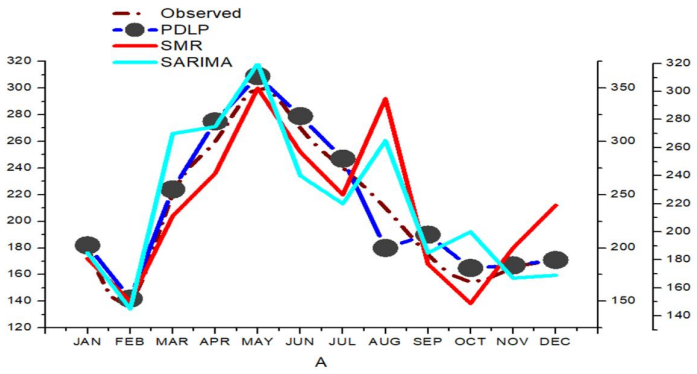

Fig.4. Skin diseases cases in Hyderabadregion for 2019.brown color line:actual values, Red color line SMR; cream color line: SARIMA model, blue color line: PDLM model

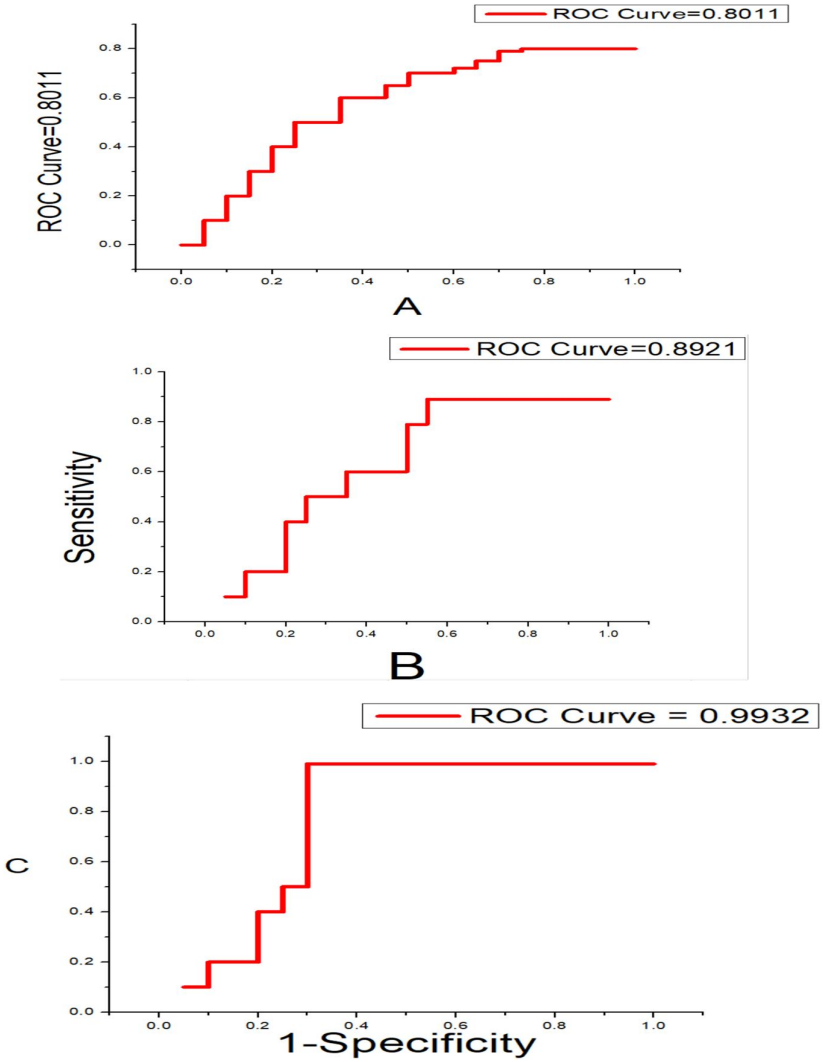

Fig.5. Model accuracy tested by Roc for prediction of skin diseases cases: [A] SMR model, [B] SARIMA model, [C] PDLM model

III. Discussion

Epidemiological records show that, therelationshipamong skin disease cases and climate factors was tested by different ML regression modes, and using the best fit model for skin disease prediction was validated by few validation techniques. The final result exhibits that relative humidity and temperature are significantly related to change in skin diseases occurrenceconfidentlythroughout the model, while rainfall shows association with skin diseases two of 3 models (PDLM and MLR). The Poisson modelexhibits better prediction of skin cases indicate for 6, 9 and 12 months time period and detection of the outbreak[1], [18], [19]. Nevertheless, SARIMA shows thebetter prediction of skin diseases cases for 3 months time interval. The SMR model exhibits a lower prediction rate among the other 2 models in a short time period[26], [27].

The associationbetween skin disease cases and climate factors. From the literature from the previous studies, we have to consider the climate factors Temp,Humidity,Rainfall that impact skin disease transmission. Ina few study rainfall not consider significant factors [17].Some many studies give strong evidence about the association between climate factors and other infectious diseases[28]. The plausible cases of skin disease temp association state as a higher temp increase rate of a skin-related system that leads to 6 types of skin diseases[1][22], [23], [29]. The same relative humidity also givesa significant association between that which skin diseases expose to outbreak to outside temperature and rainfall was no significant but few studies consider rainfall also.

Prediction model for infectious diseases like Dengue,Zika,Chikungunya etc has been developed and applied by many research groups by using mathematically and statistically which diseases with the problem of small to complex [30].Nevertheless, none of the retrospectivestudies has not attempted tocompare the dissimilarity machine learning modelsby experimenting with different datasets while theretrospective studies did it. Through our literaturesurvey, few machine learning algorithms like logistic regression and multiple algorithms notperformed better prediction and autocorrelation metrics fail to find the seasonal trendchanges that lead to week and wrong prediction rates [13], [31], [32]. When comparing with the SARIMA model outperform better among all machine learning algorithms. The present study exhibits that PDLM performs much good prediction of skin disease cases when compared to the SARIMA model for 5-12 months. This is because ofthe usage of autocorrelation 2 in the PDLM model vs. 1 in the SARIMA model. By using spline function among PDLM and SARIMA model, we have tried to control seasonal and trends and different lag time periods 3, 6, 9 and 12 months have used for validation. Future works should befocus on a better understanding of the dataset and applyingfew advance machine learning withfeaturing techniques[28], [30], [33], [34].

Some of the limitation of the studies is availability of medical record data for long time that make a time constraint and out study not tried to involve other factors like environmental,demographic and socioeconomic, etiological, education and humanbehavior have been associated with skin diseases incidence Global temperatures continue to rise[8], [35]–[37].Nevertheless, all the above factors can be considered for the long term not in the short term. Some other factors like population growth, air travel and unplanned urbanization should be considered in further studies. Previous studies found that only 70% of any infectious cases are registered near 30% of cases are not register and unreported[8].At some location infectious diseases like dengue,zika,chikungunya etc are treated by the local clinic which is not reported in thesestudies. Osmania hospital management establishesa prevention and control center that helps to trace the infectious diseases with 24 hours. Reported is consider in our study that helps to analyze the health issue in and around that monthly skin disease cases consistent throughout the study period. Irrespective of limitation,this study gives enough research gaps for applying machine leaning algorithms for prevention and control of any diseases as an early warning sign.In the Hyderabad city, this machine learning devolved method can apply in the preventive local center which can be considered as humidity, rainfall and temperature to predict skin disease cases outbreak and risk level of anyinfectious disease incidence [35], [36]. Using such a model can reduce susceptible individuals. Early preparedness for general hospital medical stores and needs, spreading prevention measures to the public in advance that control skin diseases can be efficient,adequate,controlled and prevented[8], [37], [38].

IV. Conclusion

Evidence from this study can inform public health interventions that high-level vulnerability of skin diseasescases to a variance of climatic attributes, like humidity, rainfall, temperature. Our studyfurther proposes that climate attributesdo have major connectionswith public health in Hyderabad city. The validation of algorithm methods used has suggested that either PDLM or SARIMA is fit for predicting skin diseases incidence in Hyderabad, SARIMA model shows better prediction rate for early 3 months and other PDLM model presents the better prediction in next time interval i.e.6 to 12 months. High precision in predicting skin disease outbreak

of the Distributed Lag Model will be efficientfor prevention or controlskin disease epidemics in Hyderabadcity. We suggest a further examination to validate the model and analyze the likehoodof incorporating weather based skin disease early warning to skin disease case surveillance method.Further, research can transfer the prediction method as a friendly operative tool for use inthe local area. This would enhance early warning methods for prevention of skin diseases in Hyderabad city future alternative socio-economic pathways.

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Analysis of Solar Energy Harvesting using Two different MPPT Method

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***Abstract*—Solar energy is the important source of energy. The demand for utilization of Solar energy is rapidly increasing . To optimize the solar energy is greatest challenge. Here MPPT method is used to extract the maximum power from the sun . In this paper, we have design a DC-DC Converter, as it provides the constant power flow for battery charging for wireless sensor node .The duty cycle of the converter controls charging based on the state of charge of the battery and direction of the current. Here its mainly emphasizes on the battery charging supplied by solar panel PV connected with DC-DC Converter controlled by maximum power point tracking technique . Solar energy system have been developed and simulation was performed in MATLAB/SIMULINK solar powered. DC-DC Converter with MPPT to achieve absolute result.**

***Index Terms*— PV cell, DC-DC Converter , MPPT, Incremental Conductance, Perturb and Observe and Wireless sensor node.**

I. INTRODUCTION

Wireless Sensor network are used in numerous applications like health care, monitoring and controlling system, detecting, industrial monitoring, security and surveillance etc. All of these applications has been developed with a portable battery. One main drawback with wireless sensor network is the battery life [1]. Due to which the lifetime of the wireless sensor node is reduced.

The solution to the problem is to harvest energy from the renewable energy sources. The widely used renewable energy is the solar energy, as it is abundantly available. To harness this energy PV (Photovoltaic) array system is used. There are two different ways to harvest solar energy one is sun tracking and second is Maximum Power Point Tracking [2].

In this proposed work Maximum power point Tracking is being used. As it is known that there are various maximum power point tracking technique ,but here Perturb & Observe and Incremental Conductance technique is used. Although many researches works has been done on [3-6] to increase the efficiency of PV modules. [7-10]Here the comparative study is done on Perturb & Observe and Incremental Conductance on harvesting solar energy for Wireless Sensor Node .

In this work simulation result shows the efficiency of the solar harvesting system and comparison of the two algorithm Section 1. Introduction of the paper, section 2. describe the working of the solar harvesting system section 3. major component used, section 4. Provides the difference between the two MPPT algorithm method. Section 5. gives us the results and finally section 6. is the conclusion.

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II. SOLAR ENERGY HARVESTING MODELLING

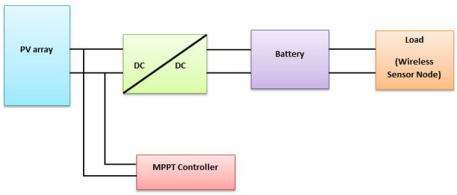

Fig 1. Block diagram of Solar Energy Harvesting

Solar energy produces electricity from the energy of the sun . The block diagram of the solar energy harvesting system for wireless sensor node is shown in the Figure 1. The solar energy consists of the tracking device (Photovoltaic cell) which convert the light energy into electrical energy. This energy is supplied to DC-DC Boost converter. Now the DC-DC Boost converter step up and regulates the harvested voltage. The power is supplied to the battery for charging. The MPPT controller track the maximum voltage and current ,accordingly adjust the duty cycle for IGBT of DC-DC Boost converter [11] . Hence the wireless sensor node is powered.

II. COMPONENT OF PROPOSED WORK

The component used in the solar energy harvesting is described below:

A. PV Cell

PV cell acts as very large area p-n junction diode when such a diode is forming a junction between the n-type and p-type region. As sun ray falls on the PV cell the incident energy is converted directly into the electrical energy. Transmitted light is absorbed within the semiconductor by using energy to excite free electron from the low energy status to an unoccupied higher level. The equivalent circuit of the PV cell is shown in the Fig 2.

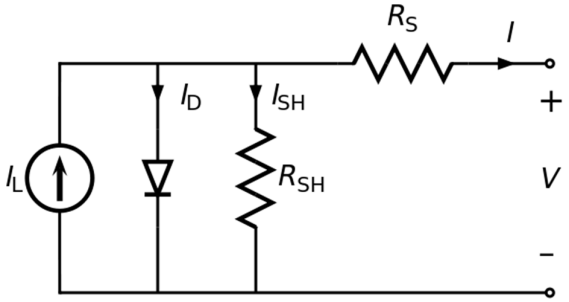

Fig 2. Equivalent circuit of PV cell

The PV and IV characteristics equations of the PV cell can be described from the equation circuit shown in Figure 2. [12]

$$I = Ipv - Io\left[\exp\left(\frac{q(V+IRs)}{KT}\right)-1\right]-\frac{V+IRs}{Rsh} \quad (1)$$

Here the PV cell output current I_{pv} is equal to I_{sc} , I_o is the reverse leakage current, R_s is series resistance, R_{sh} is the parallel resistance , is denoted by R_p, K is the Boltzmann's constant, T is the temperature, q is the charge.

For better performance of the solar cell it is assumed that , R_{sh} approaches to infinity , R_s approaches to zero and

$$\left[\exp\left(\frac{q(V+IRs)}{KT}\right)\right] \gg 1$$

The equation can be written as,

$$I = Isc - Io\left[\exp\left(\frac{qV}{KT}\right)\right] \quad (2)$$

For an open circuit V= $V_{oc,}$ and I=0 from eq.(2)

$$Io = Isc\left[\exp\left(\frac{-qVoc}{KT}\right)\right] \quad (3)$$

From (3) in (2) we get the characteristics of solar cell

$$I = Isc\left[1-\exp\left(\frac{q(V-Voc)}{KT}\right)\right] \quad (4)$$

We know P=VI, the P can be represented as

$$P = V\left[Isc - Isc\exp\left(\frac{q(V-Voc)}{KT}\right)\right] \quad (5)$$

where P is the output power and I is the current .

A. DC-DC Converter

The DC-DC Converter is the necessary part of the solar energy harvesting. It is used to obtain the regulated and DC voltage of the system. In this Boost converter is used, as it step up the voltage . Wireless sensor Node is for low power application.

B. Maximum Power Point Tracking

The energy harvested model is highly efficient with the help of MPPT techniques. A model design with MPPT tracker extract maximum power and delivers to the load and storage devices which is the rechargeable battery in this case. There are various technique use in the MPPT like fuzzy logic control , current sweep , stated based MPPT and neural network but in the proposed work Incremental Conductance [13] and Perturb and Observe [14] is used.

C. Load

The energy which is harvested are storage in the rechargeable battery used to operate the load, which is wireless sensor Node.

IV. MAXIMUM POWER TRACKING ALGORITHM

A. Purturb & Observe Techniue

Perturb and Observe which is also known as Hill Climbing Method, has grasp the attention due its simple and easy working. This algorithm is based on the output power of the PV module. The voltage is increased and decreased by the fixed step size in the direction of the maximum power point .[15] sometimes instead of operating at MPP ,it operate near at MPP because of error process, which exhibits oscillation in the power of PV module. The Fig 3. shows the Flowchart of Perturb & Observe algorithm.

Fig. 3 Flowchart of Perturb & Observe algorithm

B. Incremental Conductance

Incremental Conductance is also a very popular method, the only problem with Incremental Conductance is, its complexity. This method was introduced to overcome the weakness of the Perturb & Observe Method. The P& O method cannot compare any terminal voltage with Maximum power point operating voltage. Incremental conductance has certain advantageous like it has high tracking speed and good efficiency.

The incremental conductance algorithm detects the slope of the PV curve and the MPP is tracked by searching the peak of the PV curve. It uses the instantaneous conductance I/V for MPPT [16]. Depending on the equation,

$$\frac{dP}{dV} = 0 \qquad \text{at MPP} \qquad (6)$$

$$\frac{dP}{dV} > 0 \qquad \text{left of MPP} \qquad (7)$$

$$\frac{dP}{dV} < 0 \qquad \text{right of MPP} \qquad (8)$$

P-V curve,

$$\frac{dP}{dV} = \frac{IV}{dV} = I + \frac{VdI}{dV} I + \frac{V\Delta I}{\Delta V} \qquad (9)$$

Equations (9) can be written as:

$$\frac{\Delta I}{\Delta V} = \frac{-I}{V} \qquad \text{at MPP} \qquad (10)$$

$$\frac{\Delta I}{\Delta V} > \frac{-I}{V} \qquad \text{left at MPP} \qquad (11)$$

$$\frac{\Delta I}{\Delta V} < \frac{-I}{V} \qquad \text{right at MPP} \qquad (12)$$

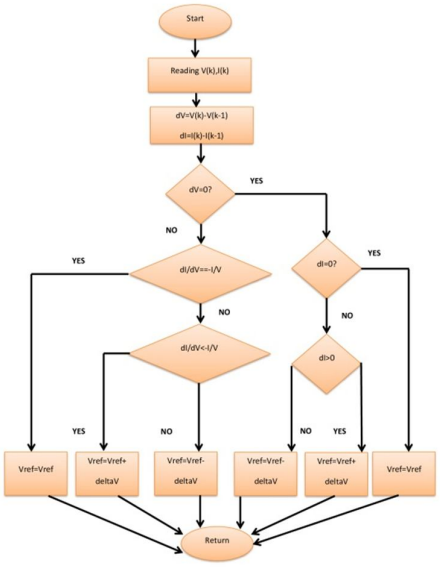

Fig 4. Flowchart of Incremental Conductance algorithm

V. STIMULATED RESULT

The TABLE I., TABLE II., TABLE III. show the design specification of PV solar system, photovoltaic array DC-DC Converter and Battery.

TABLE I. PARAMETER

Parameter	At Values	Parameter	Values
Irradiance(W/m^2)	1000 W/m^2	Input Voltage	250-350 V
Temperature(T)	25 degree Celsius	Voltage at Maximum Power Vmp (V)	29.0
Output Voltage(V_o)	500 V	IGBT Switching Frequency(f)	5KHz
Rated power	100 kW	STC Power Rating Pmp(W)	215
Voltage ripple(V)	1%	PTC/STC Power Rating Pmpp(W)	189.4
Current ripple(I)	5%	PTC/STC Power Ratio	88.1%
Max. Solar Panel output current(Im)	7.35	Open Circuit Voltage V_{oc} (V)	36.3
Short Circuit Current I_{sc} (A)	7.84	Current at Maximum Power Imp (A)	7.35

TABLE II. SHOWS THE DESIGN OF PV SOLAR CONVERTER (BOOST CONVERTER)

PARAMETER	VALUES
OUTPUT CURRENT(A)	200
CURRENT RIPPLE(ΔI)	20
VOLTAGE RIPPLE (ΔV)	5
INDUCTANCE	1.25MH
CAPACITOR	4000μF

TABLE III. SHOWS THE BATTERY VALUES

PARAMETERS	VALUES
BATTERY TYPE	LITHIUM ACID
BATTERY VOLTAGE	7.2
BATTERY CURRENT	5.4

The Fig.5 and Fig. 6 shows the simulink model of Incremental Conductance and Perturb & Observe .

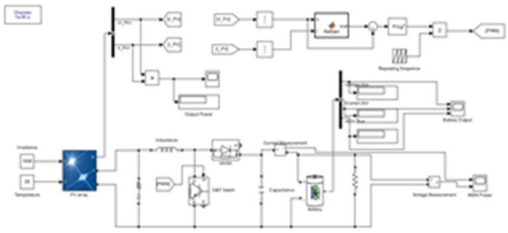

Fig 5. Simulink Model of Solar Harvesting for wireless sensor Node using Incremental Conductance algorithm

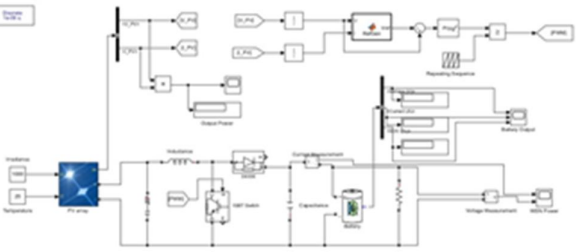

Fig 6. Simulink Model of Solar Harvesting for wireless sensor node using Perturb & observe Algorithm

The simulation results of the battery State of Charge (SOC), Battery Current(I_B) and Battery Voltage (V_B) as a function of time for different MPPT Controlled is shown in Fig 7. And Fig 8.

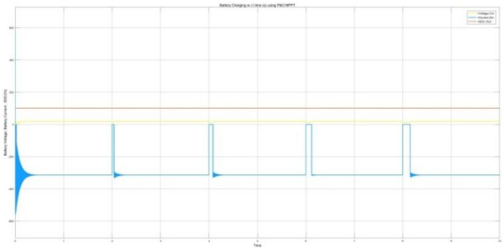

Fig 7. Shows the graph of battery charging InC Method

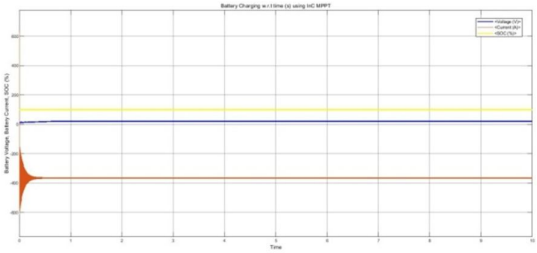

Fig 8. Shows the graph of battery charging P&O Method

VI. CONCLUSIONS

In this paper MATLAB /SIMULINK is performed for solar energy harvesting wireless sensor network , also a comparative study is done between Incremental Conductance and Perturb & Observe . From the result, it is clear that in Perturb & Observe technique oscillations is more as compare to Incremental Conductance. Incremental Conductance showed a better and stable performance.

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Challenges to IoT Security: Industry Perspective

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***Abstract*—The increasing adoption of Internet of Things (IoT) technologies and their related applications give rise to extensive challenges due to integration of varied categories of devices and technologies. Predominantly, this offers major challenges to the large number of industries to creates and run security policies that cover all functional areas. Currently, high-tech standards used for particular IoT security in the perspective of industry are simply the beginning of addressing by established IT security standards groups, associations, and vendor associations. It is also difficult for most government bodies and regulatory bodies to develop worldwide recognized security standards. Present work identifies the different challenges and opportunities concerning security issues in the IoT. An overview of effective IoT-related cases on major challenges accepted by the industry was presented. At the same time, the major opportunities that the industry can work with are also presented.**

***Index Terms*— Internet of Things (IoT), IoT Security, High-tech Standards, Challenges and Opportunities.**

I. INTRODUCTION

The emerging trend of technology is continuously changing people's lives. In addition to some of these emerging technologies, the IoT has been recognized as a machine-to-machine (M2M) technology where smart devices connect data, process information, organize and communicate information to the whole world, and perform actions dynamically or robotically [1]. The IoT is a new standard that relies on the interplay of smart devices with inter alia of physical or virtual resources via the Internet. IoT is a system connecting people and machines, gathering together services, environment, context and intellectualizing process [2]. IoT has developed not only through a wide variety of underlying technologies but also from side-to-side developments in different fields, each with vastly dissimilar purposes. In addition, IoT developments have been organized in different application areas that regularly use specific and exclusive standards [3]. Up-and-coming IoT applications can make many things in business as well as human life easier and lead to a smarter world. This is a sign of development that can bring intense changes in the world of business. During a technology-driven revolution that is changing business and the world, Artificial Intelligence (AI), automation as well as a digital invention are enabling devices to attach and absorb at an unexpected scale [3].

According to IDC (2022) predictions, 50% of innovative operational assets became self-sustain and $14.3 billion of services were consumed to make IoT resolutions in 2020 (https://www.idc.com/itexecutive/research/topics/iot). In 2022, industry environments identify 40% more development ratio of innovative digital and physical products and services carried to market in contrast to old-

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style revolution methods [4]. Furthermore, The IoT technology market is estimated to grow from USD 384.5 billion in 2021 to USD 566.4 billion by 2027 at a CAGR of 6.7% [5]. Even though the worldwide IoT market size grew by 22% in 2021, the worldwide enterprise IoT market grew by 22.4% to reach USD 157.9 billion in 2021 [6]. The market grew somewhat slower than expected by 24% last year because of quite a few issues, containing a slower-than-expected total economic recovery, costly or unavailability of chipsets, and interrupted supply chains. North America became a rapidly increasing zone in 2021 with +24.1%, and process manufacturing was the fastest increasing segment with +25%. Right now, IoT Analytics predicts that the IoT market size grow by 22.0% to $525 billion at a CAGR from 2022 to 2027. The five-year prediction has been reduced from the past year [6]. Quite a lot of headwinds to growth have had a much deeper impact than earlier expected, especially supply shortages and interruptions (mainly chip shortages estimated up to 2024 and perhaps further than) and lack of labour, particularly in exclusive software trades. Regardless of reduced growth forecasts, IoT rests on a very high-class technology, with lots of projects towards the inside deployment stage. The worldwide several connected IoT devices are estimated to reach 14.5 billion by the end of 2022 [6].
IoT is growing exponentially, but securing IoT projects and services remain a lot challenge from the industry perspective. One of the most essential security aspects of the IoT is to ensure that devices and services have trustworthy identities, and that can interrelate with secure environments. Some of the security-related aspects associated with IoT include the complexity of establishing safe and secure communication [7]. Regardless of this, IoT requires some security standards and use cases are very much vital for meeting the challenges at a worldwide level [3]. Some vulnerabilities can lead to system failure or a hacker attack, which can disturb people. For example, traffic lights can stop working and cause traffic accidents; or the household security system can be turned off via thieves. As some IoT devices are used for industry, automation, smart warehouse, healthcare or social protection, their security can be serious to people's lives [8].

II. Security Challenges

In 2021, there were 1.51 billion breaches of IoT devices, however, in 2020, Kaspersky stated 639 million breaches [9]. Underrating the significance of cyber security in the growth of IoT systems is improper [9]. IoT-aided devices pose more than a few security challenges for their consumers. Even though IoT has carried incredible connectivity on behalf of devices, the shared IoT security problems are not changed. In addition, there are also several dangerous threats of IoT, for example, insignificant computing power, sharing of network access, unpredictable security standards, lack of firmware updates, and more. To identify how to secure IoT systems, it is crucial to early examine the possible IoT cyber security challenges, for example, Software and firmware vulnerabilities, insurance communications, data leaks from IoT systems, malware risks, and cyberattacks [10,11]. There are some biggest security challenges concerning the field of IoT-connected devices.

A. Lack of proper testing and updates

One of the foremost difficulties tech industries have in creating these devices is being too careless when it comes to controlling the security risks associated with the devices. Many of these IoT devices as well as products do not receive sufficient updates, even though some do not receive critical security updates of any kind [11]. Its means the device that was once considered secure when clients first purchased it comes to be insecure and ultimately vulnerable to hackers and other security issues. Primary computer systems had a similar difficulty that was slightly resolved by automatic updates. Conversely, IoT makers are more excited to manufacture and offer the devices as quickly as they can devoid of worrying excessively about security. Inappropriately, best manufacturers only provide firmware updates for a slight time, merely to stop when they start functioning on the next interesting gadget. Even poorer, they procedure unproven older Linux kernels. Their trusted clients are thus unprotected from possible attacks due to obsolete hardware and software.

B. Brute enforcement and the problem of defaulting passwords

The Mirai botnet, applied in some of the major and utmost destructive DDoS attacks, may be one of the greatest examples of the issues derived from using shipping devices and using default passwords besides not stating users to alter them once they collect them. Approximately government indicators instructing creators not to sell IoT devices using poor security login details, for example, use of admin with username as well as password. This means that they are now nothing over the advice and there are no legitimate consequences to motivate creators to unrestraint this risky use. Weak passwords and credentials make almost entire IoT devices at risk of password hacking as well as especially brute force. The single intention of Mirai malware became so effective because it recognized at-risk IoT devices and usage of default passwords to log in to infect. Consequently, any industry that

has used defaulting login on the devices is putting their industry, resources as well as clients in addition to their important information vulnerable to being subjected to a brute force attack [12].

C. IoT malware and ransomware

As lots of IoT devices constantly grow in the coming stage of development, same will the several malware and ransomware utilized to exploit them. Whereas traditional ransomware depends on encryption to absolutely lock out consumers from diverse devices as well as platforms, there is continuing hybridization mutually of malware as well as ransomware that targets to join dissimilar attacks. Ransomware attacks may perhaps target to limit and/or deactivate device serviceability while stealing user data. Such as, the modest IP camera is perfect for capturing sensitive data in an inclusive variety of locations, including households, workplaces, or even native gas stations. Then webcam can be locked and directed to an infected web address, which may perhaps obtain sensitive data with a malware entrée point and request a ransom to unlock the device in addition to returning the data [13]. The forever developing IoT devices will create randomness in the future when it comes to illegal access or theft.

D. IoT botnets targeting cryptocurrencies

The intense mining competitiveness along with the cutting-edge growth in cryptocurrency estimations is evidencing too tempting for hackers looking to trade in on the crypto-craze. Even though furthermost consider blockchain to be hacker-proof, quite a lot of attacks in the blockchain area look to be on the rise. The foremost weakness is not the blockchain itself, but somewhat the growth of the blockchain application that runs on it. Social engineering is before now utilized to obtain usernames, passwords as well as private keys, in addition, it will be utilized more frequently to hack blockchain-based applications in the future. The open-source cryptocurrency Monero is the only of the several digital currencies presently being mined using IoT devices [14]. Quite a few hackers have even redesigned IPs as well as video cameras for cryptocurrency mining. IoT botnet miners, Blockchain breaches, as well as data reliability manipulation mien an enormous threat to flood the open crypto market as well as disturb the previously unstable value and configuration of cryptocurrencies.

E. Data privacy and security across phone, web, and cloud

Data protection and security remain to be one of the biggest challenges in nowadays' connected globe. Data is continually being used, pass on, warehoused and deal with the huge industries via varied IoT devices, for example, smart televisions, smart lighting systems, attached smart printers, smart HVAC systems, smart sensors and thermostats. Usually, entirely the customer data is distributed or even retailed to several industries, which violates the civil liberties to privacy and data protection and increases personal doubt. Insufficient data protection is also a risky IoT security concern. This problem can happen due to unsafe data storage and uncertain communication. One substantial vulnerability in IoT security is becoming the negotiated device that can be utilized to access confidential data [15]. The significance of protected data storage as well as web-based network isolation has never been clearer.

F. AI and Automation

As IoT devices continuously attack daily life, industries will ultimately have to manage quite a lots of IoT devices. This quantity of consumer data can be problematic to deal with in terms of data assembly and networking. AI and automation techniques are now being utilized to filter huge quantities of data and can support IoT managers as well as network security professionals to apply data particular procedures and identify irregular data and traffic configurations. Though autonomous systems create autonomous decisions that interrupt the number of roles across huge infrastructures, for example, energy, healthcare, and shipping can be more dangerous, specifically when you realize that a single code error or incorrect algorithm can cause the crash whole infrastructure.

G. Security issues in managing device updates

Software and firmware be able to one of the biggest causes that can interrupt software security. But, the creator can provide modern product updates using devices it retails. These updates may likely cause security breaches.
These are some of the utmost persistent IoT security challenges that became essential to consider while manufacturing IoT-based applications in the coming years. Most of them rotate around two things, securing IoT in contrast to attacks and securing user data contrary to theft.

III. Cases on Major Challenges

In the world of users and enterprises, IoT has continued growth and enhanced inventions, however, IoT security breaches are also on growth. Connected smart devices are all over the place and have taken root in our individual and proficient networks. From automatic security systems to sensors that can be set from portable devices, and from voice-activated peripherals that enable the less able to live independently, to pioneering inventions, for example, self-driving cars. Though, with over 26.66 billion active IoT devices in 2020 and estimated to develop to 75 billion by 2025, the IoT is not devoid of risks [16]. Sensitive data, cloud technologies, also vast numbers of smart devices are attached through the Internet, offering cyber criminals a huge attack superficial. 84% of measured industries described IoT security breaches [16]. Inappropriately, several IoT devices are not prepared to be secure by default while they ship from creators, also because of their frequently embedded nature, they are not often patched as well as protected once in manufacture. Any network weaknesses can simply exploit by hackers as well as under attack through malware. Enterprises must therefore make sure that they have strong security with compliance management prepared for all IoT touchpoints. There are some actual examples of IoT security breach cases that have happened in the IoT in the past.

A. Apple listened to conversations without any consent

Before this year, Apple's so-called 'Facepalm' bug hit the headings. It happened in Arizona when a 14-year-old boy was joining his friend in a group conversation [17]. Even though the friend never attended to the phone, the boy was able to hear in on the conversations arranged on the friend's iPhone, as per ZDNet. Despite the boy's limitless efforts to inform the case to Apple, Apple did not take action until a week after the incident happened. Consequently, Apple decided on a security flaw extremely and announced the software update that would later fix the bug [16].

B. WiFi router unprotected to malicious code

Also happened before this year, the utmost standard WiFi chipsets (Marvel Avastar 88W8897 firmware) on the marketplace were unprotected to the weakness that could be activated devoid of any user interface, as per ZDNet [17]. It is installed on devices with PlayStation 4, Xbox One, MS Surface Laptops, Samsung Chromebooks and smartphones. Conversely, it was determined to be solely an issue with the app's firmware, and fixes were issued after the occurrence [16].

C. IoT device infected with this malware

In 2017 as per Larry Cashdollar, one of Akamai's scholars, encouraged via the old BrickerBot strain, Silex Malware functioned by destroying IoT device storage, invalidating firewall procedures, eliminating the configuration of the network, as well as stopping devices. The malware rapidly spread among IoT devices, causing 1,650 attacking devices [17]. Intending to improve, vendors had to automatically reinstall the firmware of all devices. Amazingly, this malware was spread through the 14-year-old teenager with the pseudonym Light Leafeon [16].

D. ID can leak or chances of ID leaked

Before this year, a bug in the Bluetooth communication protocol affected users of up-to-date devices to be tracked and their ID leaked, as per ZDNet in 2019 [17]. It may be applied to spy on customers regardless of the instinctive securities the operating system (OS) had and could affect the devices of Windows 10, iOS and macOS. Though, as stated by Boston University's search, this algorithm does not include message decryption, nor does it compromise Bluetooth security at all [16]. Microsoft (MS) also publically declared that the problem was fixed in the May 2019 update.

E. Alexa and Google Home devices are eavesdropping on users over again

In addition to many outcomes in 2018, hackers once again misused Alexa and Google Home smart aides to eavesdrop on users devoid of their information, or worse, trick consumers into giving over sensitive data, as per ZDNet [17]. No problem that how Amazon and Google have installed updates consistently, innovative ways to abuse the device seem to keep popping up.

F. Hackable Cardiac devices

In 2017, CNN defined, The FDA showed that St. Jude Scientific's embeddable cardiac devices have weaknesses that can permit a hacker to get entry to a device. the FDA stated that just once, they may expend the battery or administer improper pacing or tremors. While pacemaker devices and defibrillator devices became utilized to

monitor and manipulate patients' coronary heart functions and prevent heart assaults [18]. The item persisted to describe the vulnerability happened within the transmitter that delivers the devices' information and remotely shares it with physicians. The FDA stated that hackers can control a device by using getting access to its transmitter.

G. Mirai Botnet (DDoS attack)

In October of 2016, the biggest DDoS attack constantly released on service supplier Dyn the usage of IoT botnet [18]. This causes massive portions of the internet to take place, consisting of Twitter, the Guardian, Netflix, Reddit, and CNN. This IoT botnet was prepared by malware named Mirai. When crumbling or transmissible through Mirai, computer systems always seek the internet on behalf of weak and at-risk IoT devices after which use regarded default usernames and passwords to credential as well log in, spoiling them through malware. these gadgets were equipment similar to digital cameras and DVR players.

H. The Jeep Hack

The IBM protection Intelligence website informed us about the Jeep hack. In July 2015, a group of scholars became capable of takings the total operation of a Jeep SUV with the use of the automobile CAN bus [18]. As a result of developing a firmware replacement vulnerability, they hijacked the automobile over the sprint cellular network and found they may make it go faster, secure down, or even veer off the path. Its impervious conception on behalf of the increasing IoT hacks: while industries frequently overlook the protection of peripheral devices or networks, the significance may be tragic.

With IoT devices as well as technologies, evolving so rapidly risks and attacks become a flawless, and existent vulnerabilities to users and enterprises around the globe. Consequently, users must identify how to secure their information and devices from this misuse. Users should take this enormously and understand that disappointments can have tragic consequences. Paying attention to personal information will also permit creators and industries to emphasize more the prime goals of IoT that developing the industries, quality of life cycle as well as user capability. Furthermore, there is essential to develop the greatest security standards, protocols and approaches if the IoT uprising is to sustain to distribute importance to human beings devoid of giving up protection.

IV. OPPORTUNITIES

The IoT is at the peak of development through wireless and sensing connectivity, in addition to aid specified via processing, control and power management devices in existing years [19]. The phase is now established on behalf of the IoT to initiate sighted by standard deployment together with users and industry domains. There are subsequently described the challenging situations and opportunities of IoT from the perspective of the industry. Extremely unified solutions to support take hold of the enormous business-related opportunities [20,21].

A. Industry specialist firm market and markets approximations by 2022 the wide-reaching IIoT enterprise may be real assets about $195 billion yearly. Estimates about the several attached IoT devices to be in process differ quite substantially. Furthermost determined that there might be 50 billion in 2020, whereas others claim 20 to 30 billion is more sensible. Progressively, there will be tens of billions of things connected to the internet in support of coming years, in addition about 50% of these might be on behalf of industrial utility (https://www.arrow.com/en/research-and-events/articles/challenges-and-opportunities-of-industrial-iot-technology).

B. Industrial IoT can allow better automation and for this reason, increase productiveness. It can additionally help organizations to increase the collection of services they may provide, enhance security, keep away from interruption, recover and control the resources as well as turn out to be greater environmentally liable.

C. There is the majority of various associated technologies provided with a purpose to aid industrial IoT. Approximately few of these are now established, whilst others are quite the procedure of rising. They encompass conventional business wireline protocols (for example CAN bus, Fieldbus, Hart, KNX, Ethernet, MBUS and PLC), in addition to Wi-Fi protocols. The Wi-Fi wireless connectivity alternatives may be classified as both mobile-based ones that keep the extensive area network (such as LTE−M, and 5G) or quick-range, energy-efficient ones (such as Wi-Fi®, LoRa, ZigBee®, Z-Wave® and BLE) on behalf of the continuing implementation.

D. IoT provides an opportunity to manage distinctive devices remotely through cloud-based automation setups, such as stimulating lighting, using vehicles, beginning/ending actions, and many others. Li-Fi communication is allowing the capability to know about formerly traditional standalone actuators. Similarly, dissimilar sensor

technology can be engaged in an industrial IoT environment, including the temperature at which the commercial manner is being carried out, energy consumption as well as capacity load throughout the utensils process, the ambient light as well as dampness tiers in a huge business greenhouse, or nitrogen-oxide contented material in the air leaving the use flu of business container.

E. On behalf of sensor-related networks, the energy consumption of the things is in all likelihood to be considerably less than may be the case for related actuators; as a result, battery-powered things will constitute the sizeable substance of deployments. this is probable to demonstrate energy to IoT propagation, as several apps will depend on sensors that have been organized in remote locations. The energy consumption and linking range of the radio interface will possibly constitute a good-sized effect on the duration of the battery (thus BLE and ultra-low power RF protocols are most effective).

F. Along with the constraints engaged on industrial-based IoT hardware because of battery-powered procedure, the microchip technology located at each node is probably to have other restrictions. The wide range of devices deployed ought to mean that small bill-of-substances prices want to be observed too. moreover, to be had space will also be constrained.

G. The cloud can be the consideration upon which IoT information processing and storage actions are dependent. Industrial IoT-based records need to be controlled below very strict deployment procedures as well as authorization of the holder of these facts. To moderate the possible hazard of industrial undercover activities, hacking or even deeds of violence, a completely protected supplier provides requirements to be hired.

H. ON Semiconductor standard renowned in advance that somewhat becomes had to be carried out about the disjointed form that occurs in the middle of the hardware and software components of IoT improvement. In the end outcome of this enterprise turned into the ON Semiconductor IoT development kit (IDK). This affords engineers using a solitary platform that recognized an extraordinary elasticity, upon which the needs of both hardware and software programs are embarked. Depending on the industry's vastly fashionable NCS36510 system-on-chip (SoC) through 32-bit ARM® Cortex® M3 processor core, it contains the important hardware sources behalf of making surprisingly powerful, distinguished industrial IoT devices, at the side of a wide-ranging software context appear to interface using the cloud [22].

I. with the aid of assigning daughter cards to the IDK baseboard, a means of conferring (WI-FI, SIGFOX, Ethernet, 802.15.4 MAC-based radios permitting ZigBee and Thread protocols, and so on.), and sensor (motion, ambient light, proximity, heart rate, and so on.) and actuator (using stepper and brushless motor using, plus the capacity to force LED strings) possibilities may be brought to the machine [23].

J. The Eclipse-based connected development environment (IDE) attends the hardware including a C++ code editor, compiler, and debugger with the group of software-associated libraries. It permits them to organize the IDK in the manner that pleasant suits with software, while concurrently quite advancing commencing effective security functions and actual-time diagnostics/analytics. The IDK gives an extraordinary platform to assist engineers to reap their gadget layout desires at the same time as accelerating development timeframes, thus deploying systems earlier using price efficiency.

V. Conclusion

Industries can attain massive benefits from developing IoT-based devices and applications, but their security is one of the main issues. This paper covered all about IoT security and how to overcome it. Governments despite the business or increasing size can create IoT resolutions as a part of their industry to develop user satisfaction and efficiency. This paper also provides an overview of the opportunities afforded by the huge technology, concerning machine to machine, users to their surroundings and enables exploration of the globe on the innovative aspect. While opportunities become substantial and go together with the risks for the company and its setup. This paper covered some crucial points related to challenges and opportunities concerning the security issues in IoT perspective of the industry.

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Construction of Delaunay Triangles for Face Recognition in Images

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***Abstract*—A Delaunay graph method is a proposed solution to the matching issue in facial recognition. The techniques for feature matching and feature detection are scale-invariant feature transform (SIFT) and speeded-up robust features (SURF). In the existing method, the major drawback is that each algorithm only extracts particular features, leading to many mismatches in matched features. To avoid those mismatches, this paper concatenates the SIFTSURFLBPCNN together. Input images are pre-processed and key points are detected using sift algorithm. For each Detected key point, textural, and geometrical uutilizing, characteristics are extracted scale-invariant feature transform(SIFT), speeded-up robust features (SURF), local binary pattern(LBP), Convolution neural network(CNN) and concatenated to form a feature vector. Using the lows method, the key points between the input images are filtered out. Then the Delaunay triangles are constructed for the input images from their respective filtered key points using the Delaunay triangulation method. Testing is done and each algorithm's performance is evaluated.**

***Index Terms*—. Convolution neural network, Local binary patterns, Delaunay triangles.**

I. INTRODUCTION

The face matching algorithm is a Process to detect the comparison of a face in an image with another face (or faces) to see if there is a match. Feature extraction methods are applied to raw images to extract features. The features are then used as input data for the matching algorithms. There are many algorithms are in existence for feature extraction methods. SIFT, SURF, and LBP are one of those. This algorithm [3] uses only particular features for matching, they are not produce accurate matching results because all features are not taken into consideration and most times mismatches will occur, these are the major drawback of feature matching. The accurate matching results can be obtained only if all features are considered. In this paper, we use SIFTSURFLBPCNN for feature extraction.

Each algorithm posse's unique advantages over one another. Scale-invariant feature transform (SIFT) extracts the local features of images, Speeded-up robust features (SURF) identifies the neighbors' Intensity [6], and Local binary patterns it extracts the textural information of a feature. Finally Applying PCA [5], the dimension is reduced to 128 using VGG-16 trained on the Image net. Using Lower matching technique, unique critical points are eliminated. Images from the Labelled Face in the Wild face dataset are utilized images are produced in an unrestricted environment with significant changes in scale, rotation, and illumination.

To increase matching accuracy graph matching algorithms can be used. To perform the graph matching

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algorithms Delaunay triangles are constructed. The advantage of using Delaunay triangles are creating a triangular mesh by connecting a group of points. In Delaunay triangulations, narrow triangles are typically avoided.

II. Related Work

A. Comparison of SIFT, PCA_SIFT, SURF

Luo juan &Oubang (2009) describes a comparison of sift, PCA-sift, surf [8]. The Performance of the robust features is compared with the scale changes, rotation blur and illumination changes. K-nearest neighbors (KNN), Random sample consensus (RANSAC) [7] are the methods used for SIFT, SURF, PCA-SIFT algorithms in order to finding the matching recognition between the images. This paper evaluates that while sift is invariant to rotation, scale changes, and affine transformations, it is sluggish and not good at changing illumination. Surf has the same performance as the same sift and is faster than sift. But pca sift is the best choice and giving best improvements in the results.

B. Linear programming formulation

All geometric restrictions should be able to be precisely or roughly reformulated into a linear form once a model has been established and the matching problem is solved [1]. This poses a significant challenge for this particular matching method. Unlike previous linear programming-based solutions, the technique developed in this work, popularly called new local produce remote keyless entry constraint, can be exactly normalised and requires far fewer auxiliary variables. Its basic premise is that each position in the configuration point sequence can be accurately depicted by an interpolation blending of its successive points, the weights of which can be easily calculated using least squares [11].

C. Comparison of sift surf approaches

SIFT [10] is the most well-known key point descriptor in the literature because it offers a high level of resilience and individuality. Ke and Sukthankar [9] devised PCASIFT to decrease the dimension of the descriptor from 128 to 36 in order to increase the effectiveness of SIFT. In [2] the authors describe a comparison of sift and surf approaches in different set of Noisy images, Blur images, rotation of images 90 degrees &180 degrees. This paper proposes a SIFT and SURF algorithm comparison. Scale space extreme detection, key point localization, and key point description techniques in the SIFT algorithm are used and in surf algorithm interest point detection, interest point description methods are used for feature detection.

In feature extraction every set of images is compared with SIFT and SURF algorithm and the performance is evaluated. In some images the sift algorithms provides the good results and in some images the surf algorithms provide the better results. Tested the different types of images like blur, noisy, wrap transform images, rotation with 90 degrees of images. As a result, SURF is three times better than SIFT because of using integral images and box filter. SURF is providing good results in matching features in blur, noisy images. SIFT provides good results in different scale of images.

D. Robust point set matching for partial face recognition

In [4] the strong point set matching between the photos is described. The scale invariant feature transform (SIFT) feature detector is used to detect key points in each image. Each key point has geometric characteristics that record its posture in the current frame and texture analysis that serve as its feature descriptor. A scale-invariant binarization pattern is used to acquire more relevant information of facial expression textures while also accommodating scaling. The test in made on AR datasets. The dataset consists of partial images and holistic images which varies from scale, illumination changes.

These features are concatenated as the single descriptor is coined as SIFTSURFLBP. From the detected key points to facilitate the matching process, we choose a subset of the key points. Lastly, the suggested SIFTSURFLBPCNN algorithm for matching all the features between the images and construct the Delaunay triangles in the matched features. By taking input as holistic image and partial images, Only the sift detects the key points in the images and all other algorithms like SURF, LBP, CNN produces the descriptions for the detected keypoints. The dataset used for the test was labelled face in the wild (LFW). The images are produced in an unrestricted environment with significant scale, rotation, illumination, and occlusion variation.

III. PROPOSED MODEL

In this section, we model the Delaunay triangles as a task of matching geometric graphs. After key point extraction, we apply Delaunay triangulation to build a graph for each image in order to take into account the structural information. Extraction of features and key point selection. To build the graph, we first extract key points and associated descriptions from facial photos. We then use coarse matching to filter the candidate key points. First, we utilize Scale-Invariant Feature Transform (SIFT), a popular method for key point extraction, to find key points. After that, we mix the CNN descriptor with the "SiftSurfSILBP" to create the "SiftSurfSILBPCNN" for key point description. To increase the resilience to changes in illumination, we particularly combine the SIFT descriptor with the Speeded Up Robust Features (SURF) [9] and then apply the Scale {P, R}: {8,1}, {8,2}, {16,2} and {16,3}. Finally, we use VGG-16 trained on ImageNet to reduce dimensionality to 128 with PCA. The proposed "SiftSurfSILBPCNN" combines the capabilities of SIFT, SURF, SILBP, and CNN, demonstrating reliability to spinning, scale, and illumination, all of which are essential for key point characterization. SIFT can detect 100s of key points in a typical 128 128 face recognition system, which would incur considerable computational price if we applied graph matching to all key points directly. As a result, we first use Lower matching strategy to filter out apparent anomalies before applying our graph-matching methodologies to the candidate key points.

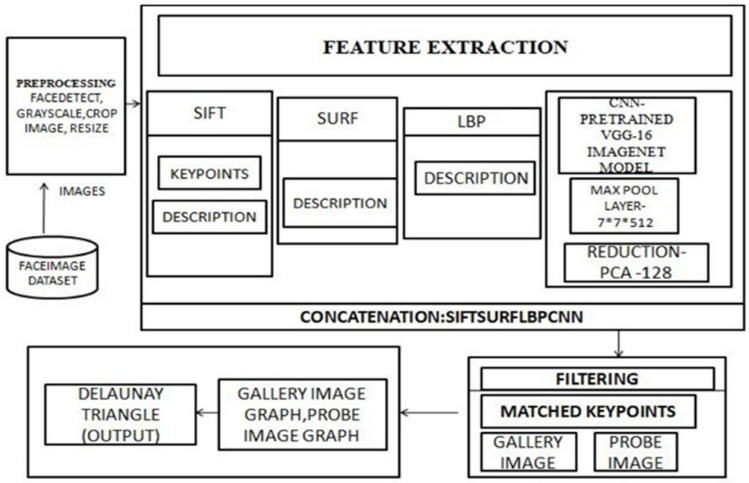


Figure 1. Flow Diagram

The flow diagram in Figure 1 shows the overall architecture of constructing a Delaunay triangle for graph matching for face recognition.

A. Algorithm: Sift Surf Lbp

```
//detect keypoints
For all pixels p in image
{
If (is key point(p)) Keypoint_list.add (p);
}
For all pixels kp in keypoint_list
{
Sift and surf Extract features(kp)
}
//extract local binary patterns
 For all keypoint in keypoints(list)
{
Consider 8*8 region
Lbp extract features () region, p=8, r=1)
Lbp extract features () region, p=8, r=2)
Lbp extract features () region, p=16, r=2)
```

Lbp extract features () region, p=16, r=3)
}
//extract VGG 16
For all key point in key points(list)
{
Consider 8*8 region
Extract CNN features (in max pool layer)
Reduce dimension using PCA (128)
Concatenate siftsurflbpcnn

}

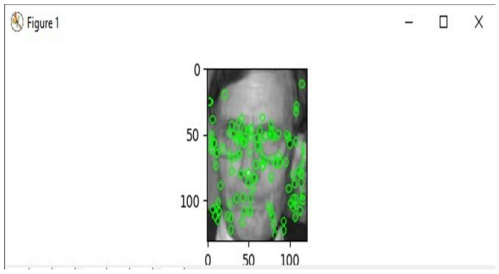


Fig 2. The SIFT detected keypoints in full image

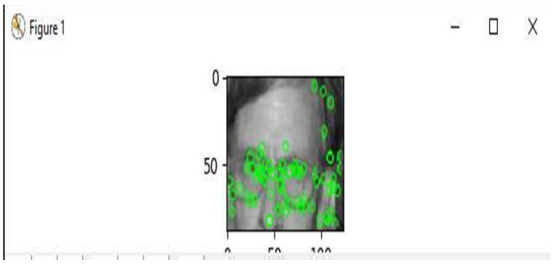
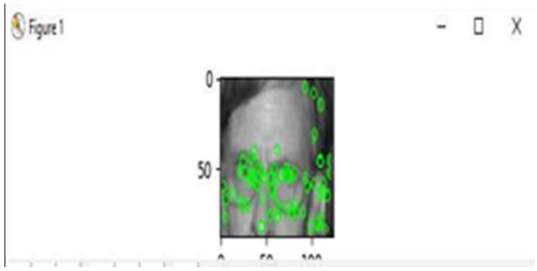


Fig 3. The SIFT detected keypoints in partial image



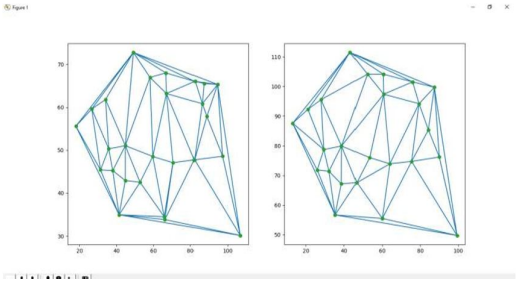


Fig4 Results of Delaunay triangles from the LFW dataset

Figure 2, 3 and 4 shows the SIFT detected keypoints in full image, partial image and Delaunary triangles from the LFW dataset respectively.

IV. Experimental Evaluation

To evaluate the performance of the system. Each algorithm is separately evaluated Overall results shows that siftsurflbpcnn gives the best performance.

A. Comparison of siftsurflbp cnn (matching features) in gaussian median filters

TABLE 1. COMPARISON OF SIFTSURFLBPCNN (MATCHING FEATURES) IN GAUSSIAN MEDIAN FILTERS

ALGORITHM	SIFT	SURF	LBP	CNN	SSLC
GASSUSIAN	1	4	1	4	13
MEDIAN	1	9	2	18	11

B. Comparison of SIFTSURFLBPCNN (timecost) in gaussian median filters

TABLE II. COMPARISON OF SIFTSURFLBPCNN (TIMECOST) IN GAUSSIAN MEDIAN FILTERS

ALGORITHM	SIFT	SURF	LBP	CNN	SSLC
GASSUSIAN	0.03	0.4	0.09	17.1	13.2SEC
MEDIAN	11	0.2	0.4	0.09	31SEC

C. Performance of rotating images 90/180 degres matching features and timecost

TABLE II. PERFORMANCE OF ROTATING IMAGES

ALGORITHM	SIFT	SURF	LBP	CNN	SSLC
90DEGREE	19	13	1	14	19
180DEGREE	34	18	3	13	33
ALGORITHM	SIFT	SURF	LBP	CNN	SSLC
90DEGREE-TIMECOST	0.4	0.4	1	50	51
180DEGREE-TIMECOST	0.6	0.4	0.2	109	106

D. Comparison of sift, surf, lbp, cnn, siftsurflbpcnn / blurimage gaussian filters

Fig 5 the results of SIFT, SURF, LPB, CNN, SIFTSURFLBPCNN

V. CONCLUSION

SIFT, SURF, LBP, CNN all these algorithms are robust methods to find the feature detection. The major drawback is each algorithm uses only particular features for matching the holistic face image and partial image, it results in many features being unmatched. To get accurate matching results since we use the combination of SIFT SURF LBP CNN Algorithms. Thus gaining advantages of the features matching is obtained. Direct matching of all the key points suffers from high computational cost, so by using the Lowes matching method the Candidate key points are filtered out. Delaunay triangles are constructed. For further extending the application of proposed techniques more accurate matching results can be produced by comparing the Delaunay structures.

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Role of NLP for Corpus Development of Endangered Languages

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***Abstract*—Language plays a crucial role in preserving culture in our society and acts as a repository of traditional knowledge, memories, values, practices and unique worldviews that have been used, transformed and practiced in the form of language since millennia. It is estimated that there are more than 6000 spoken languages today that are in danger. UNESCO regularly publishes a list of endangered languages, based on a 5-scale classification system such as: vulnerable, definitely endangered, severely endangered, critically endangered & extinct. It is worrying to know that most of Odisha's indigenous languages are coming under these above factors. Safeguarding and reinvigorating these languages has become crucial for maintaining and preserving the cultural diversity of the society. On account of this, the present paper discusses how Natural Language Processing (NLP), in collaboration with linguistics, can help to revive endangered languages by developing a methodology to build a corpus for the lesser-known endangered indigenous languages of Odisha, some of which have no existing script. The purpose of this paper is to serve researchers/professionals working on low resource languages with a complete guideline for classifying languages and collecting corpus considering language diversity, style and achievable issues.**

***Index Terms*— endangered languages, language classification, corpus collection, natural language processing.**

I. INTRODUCTION

Language is the vehicle of our culture, yet 43 percent of the global languages are endangered. Language plays a crucial role in preserving culture in our society and acts as a repository of traditional knowledge, memories, values, practices and unique worldviews that have been used, transformed and practised in the form of language since millennia. It is estimated that there are more than 6000 spoken languages today that are in danger. To make matters worse, there is no conclusive count that has any status as a scientific discovery of living languages [1]. The reasons are not that some isolated part has not been studied linguistically nor explored properly but rather the notion of enumerating languages is not that simple, it's a lot more complex affair than it appears.
UNESCO offers a classification system to show how languages are 'in trouble'. It has categorised 5-scale classification system such as: vulnerable, definitely endangered, severely endangered, critically endangered &

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extinct. According to UNESCO, when a child no longer learns the language as mother tongue at home then the language becomes “definitely endangered”. Similarly, when a language is present at the spoken level in the grandparent generation and understanding level at the parental generation but the parents are not speaking the language to the children, then the language become “severely endangered”. When the youngest speakers are grandparents who have little or infrequent use of that language it defines the language as being in “critically endangered” state. And when there are no speakers left, the language becomes “extinct”.

History says, languages have shifted naturally and declined in dormancy. But, the present situation of language loss is beyond its "natural" pace. Austin & Salabank, renowned linguists predicted that 50% to 90% of languages will be severely/critically endangered by the end of this period 2011[2].

This precipitation of language endangerment be indebted mostly to cultural, political, and economic marginalization and the rise of global expansionism/colonialism/imperialism. Across the world, indigenous peoples have suffered from the colonization and have abandoned their mother tongue in favour of another language. In order to attain a higher social status, indigenous/tribal peoples have had to accept the linguistic norms of the colonists. As per Laderfoged [3] we cannot/should not blame indigenous/tribal people for abandoning their languages in order to secure a better life under intense socio-economic pressures. Rather as a scientist it is our prime duty or responsibility to develop certain mechanism which can be helpful for this power imbalance nature of the society and create a space for the indigenous languages. Besides, a loss of language means loss of identity, culture, knowledge and memory [4].

Study shows, little known/endangered languages are even less signified in the Natural Language Processing (NLP) literature. Sometimes it also merged with many dominant languages. Take an instance of Indian languages, as we all know, India is known for its multicultural, multi-ethnic and multi-lingual mosaic. A place often called by the linguistic experts as the heaven for pluralism. However, it is important to mention here that India both in pre and post independent era has no or partial record on language details based on two formal Linguistic Survey. Sir Abraham Grierson’s project ‘Linguistic Survey of India’, for instance, was conducted for 30 years from 1898 to 1927 and published the data in 11 different volumes. Similarly, in 2010 ‘People’s Linguistic Survey’ was lunched to update the existing knowledge about the spoken languages of India. This survey was led by noted linguistic Ganesh N. Devy and the data was published in December 2012 in 50 different volumes.

Apart from this, 2011 census has also revealed that 123 languages are present in India grouped in 2 categories [5]. The first category is schedule languages and the second category is non-schedule languages, which has 22 and 100 languages respectively. A staggering 96.71% of the speakers are from the Schedule language category, whereas 3.29% speakers are from the non-schedule language category. It is important to note here that, these 3.29% speak a whole lot of 100 types of languages with numerous varieties of dialects given in Fig 1.

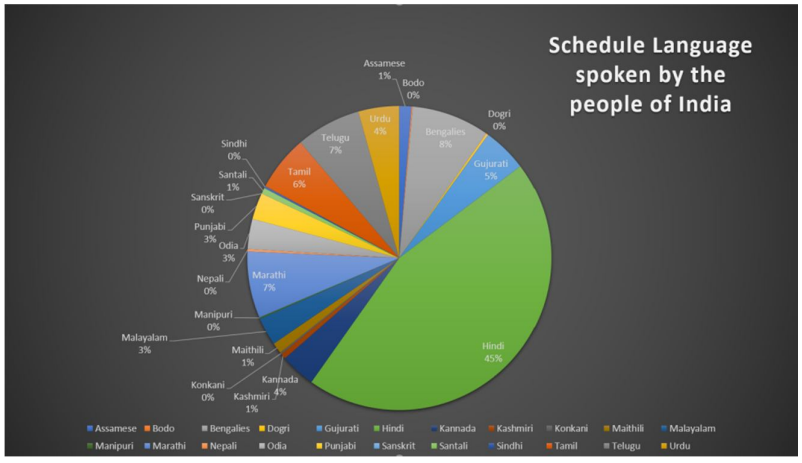

Fig 1: Shows the percentage of people speaks schedule language in India

II. Related Works

According to a theoretical linguist Prof. Ayesha Kidwai, Hindi has emerged as the dominant language spoken by the greatest number of people (4,363 out of every 10,000)[8]. She added that the truths uttered by the Census data are a massive fiction. Hindi is a major spoken language only because the census classification groups 56

other languages plus a category of 'others' under Hindi. It includes many dialects/mother tongue such as; Awadhi, Bagheli/Baghelkhandi, Bagri Rajasthani, Banjari, Bhadrawahi, Bharmauri/Gaddi, Bhojpuri, Brajbhasha, Bundeli/Bundelkhandi, Chambeali, Chhattisgarhi, Churahi, Dhundhari, Garhwali, Gojri, Harauti, Haryanvi, Hindi, Jaunsari, Khairari, Khari Boli, Khortha/Khotta, Kulvi, Kumauni, Kurmali Thar, Labani, Lamani/Lambadi, Laria, Lodhi, Magahi/Magadhi, Malvi, Mandeali, Marwari, Mewari, Mewati, Nagpuria, Nimadi, Pahari, Panchpargania, Pangwali, Pawari/Powari, Rajasthani, Sadan/Sadri, Sirmauri, Sondwari, Sugali, Surgujia, Surjapuri; and many others.

Likewise, many indigenous languages are clubbed under major dominant language as the example given above. According to Joshi more than 88% of the world languages are neglected which is spoken by around 1.2 billion people, that mean the language technology aspect is overlooked or ignored these speakers [6]. Therefore, it is high time to develop linguistic NLP tasks for example morphology analysis which is more inclusive than machine translation NLP tasks as explained by Blasi [7]. Today, as we all are witnessing, is the age of Digital Word. The traditional ways of communication or communicating ideas with each other are becoming out-dated and digital culture mostly the NLP techniques has taken over on it. People are using it widely on the internet. Research says, most of the internet content that we are exposed to every day is processed or generated by NLP techniques. However, when we discuss about the low source language / little known language / endangered language the digital interface has failed to address these languages as a result the enraged languages are facing sever challenges for its survival. On the other hand, most of the NLP researches are biased towards dominant/high sourced languages and neglected the diverse forms of dialectical variations and often depends upon the availability of large scale data.

III. Our Approach

Therefore, the present work is trying to address these above said gaps by developing a model where we are adopting a 6 layered data gathering process with a complete guideline for classifying languages and collecting corpus considering language diversity, style and achievable issues given in Fig 2.

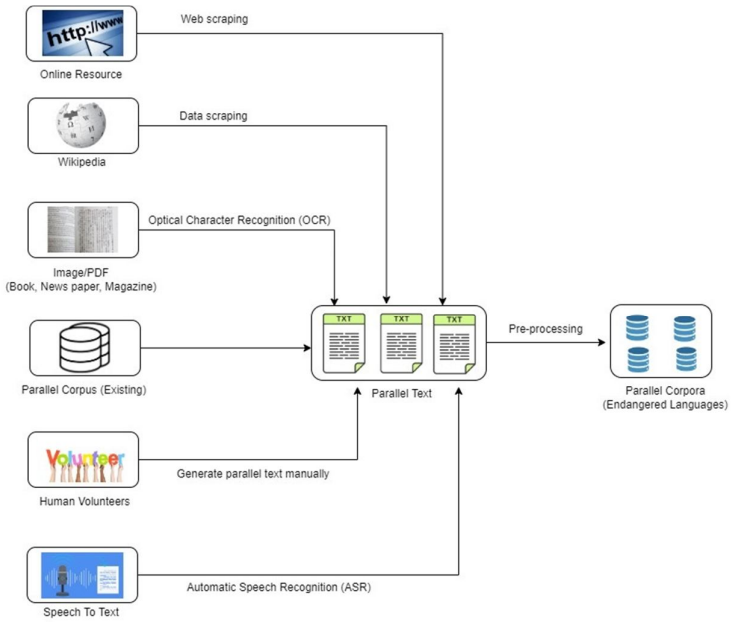

Fig 2: Proposed model to prepare the parallel corpora

A. Web Scraping from Online Resources

Web scraping would be essential for collecting large amounts of data from the online resources and this data could be unstructured and in HTML format. The data from web scraping would be converted into spreadsheet data for using them in several other applications. Web scraping could be performed with several different ways and data can be directly be obtained from websites or web applications. Online services such as APIs can be used for collecting data from web resources [20]. API should be best way to scrape data from web resources;

moreover, Python is most compatible with web scraping as it can handle most processes itself. Python offers Scrapy as popular open-source web crawling framework and it is ideal for data extraction with help of APIs. Beautiful Soup is another python library for web scraping applications; it can create a parse tree so that data can be extracted from HTML [5]. In this model, web scraping would be used as a technique to collect language resource from online web applications or websites. The web scraping data would be structured into parallel text which would be stored as parallel corpora.

B. Data Scraping from Wikipedia

Data Scraping from Wikipedia would be another source for creating text dataset for low-resource and endangered languages. The Wikipedia is considered as online encyclopedia where people keep record of several different items throughout open collaboration and online volunteers. Some researchers could consider Wikipedia as vague source of data considering several people could bring bias into the information or lack of depth could exist. However, Wikipedia is supported with sources or citations that can provide benefit of trust over information. Data scraping for low-resource and endangered language from Wikipedia is useful as community who speaks in those languages can store text data in Wikipedia.

C. Optical Character Recognition

Optical Character Recognition is to be used in this context for collecting data from images. The images of textbook, storybook, magazine, newspaper, article, blogs, and other printed sources would be fed into OCR for extracting data from those images [22]. Use of OCR is highly beneficial in this model as collecting massive data from millions of books and printed sources would be easier. Scanning images would be effortless, automated with easier access to convert the printed sources into machine-readable text data. This technique would be useful for storing data into parallel text dataset.

D. Parallel Corpus

Parallel corpus in this context is existing dataset or corpora available for the low-resource language. Existing parallel corpora is not detailed with low-resources and specific knowledge domain is not available online hence, parallel corpora should be considered as a basic source. Mostly, data should be collected from existing printed resources and from people's inputs.

E. Human Volunteers

Human Volunteers or community should be taken into the data collection phase as they can input text data on their own. Their input would be collected manually from their own inputs. The collected data would be directly added to the parallel text dataset in a suitable format. Human volunteers' input should be validated with experts as mistakes during inputting should be avoided. Manual entry can take more time than machine-generated data inputs therefore; this volunteer-driven data entry should be initiated before web scraping and use of OCR.

F. Automatic Speech Recognition

Automatic Speech Recognition (ASR) should be considered as a technology that can allow users to speak and it would conduct the data-entry to the machine in that specific language. In recent decades, researchers are more interested into automatic speech recognition (ASR) as it is a specific method for communication between people [9]. ASR can be defined as process of collecting data as speech data and converting it into text data. Current studies have shown that there are problems such as background noises, large vocabularies, speech pronunciations, and dialects. Research works are considering audio-visual techniques for making the approach more robust [11]. In medical and educational sectors, ASR is used for conducting research work.

Major challenges in ASR lies in performance of ASR as there exists background noises covering the speech. Many algorithms are used to deal with noisy environments where, these algorithms failed due to presence of noise only. In noisy environment, acoustical features would be degraded in short-frame detection [10]. Noise cancellation or noise reduction methods are developed however; these methods cannot work when noise sources are not known. Diverse noise sources can interrupt the text data collection using ASR.

Overlapping speech or conversation would be another challenge for using ASR; this problem can occur when data is being collected from a group of speakers [12] [8]. ASR faces this difficulty in detecting the target speech. This problem is considered as much critical as others.

Performance of speech capture could influence ASR performance; speech data collection through poor quality microphone can reduce the performance of ASR systems. Poor quality microphone would introduce noises into the speech that would complicate the speech detection and recognition process [13] [18]. Hence, number of microphones should be higher than number of speakers.

Commonly spoken or low-resource languages have dialect influence. Dialect is a huge dilemma for Natural Language Processing as a diverse issue. Diversity of dialect makes the ASR challenging for specifically low-resource languages [15] [17]. Audio-visual models are facing the issue of dialect; as well, it cannot differentiate the continuous speech from dialects.

Performance issues of ASR systems are noticeable when speech content becomes less predictable [16]. Pronunciation difference can exist due to speakers' health condition as well such as stuttering in pronunciation, voice and children's limited speech ability.

Currently, there is limited datasets for ASR research, which is a significant limitation in speech-to-text research domain [19]. Therefore, this model would be considering ASR as suitable source of text data for the dataset. Moreover, the limitations can be avoided with massive collection for preparing parallel corpora of low-resource and endangered languages.

IV. Conclusion

This proposed model can conclude that all primary low-resource language sources are considered for making this parallel corpus. The collection of speech data and convert it into text dataset would be a bigger challenge in this research context. Web scraping, OCR-based text data extraction from online and printed sources respectively would be effortless and automated. These techniques could be faster compared to ASR-based text data collection. Human volunteers can contribute to the parallel corpora in suitable way and their manual data entry would take longer duration. However, the noise reduction in ASR would be primary concern in the implementation. It should be recommended to collect speech data from speakers when they are in confined space so that noise can be avoided. Individual speaker should be considered for collecting their speech to avoid overlapping issue and high-quality microphone should be used to reduce noise as well.

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Cyber Security and Artificial Intelligence

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***Abstract*—Cyber security plays an important role in the field of information technology. Privacy and security of the data will always be the top security measures that any organization takes care of with the digitalization of India. The Internet has reached every corner of the country whether it is in urban and rural areas. Social media, online shopping, money transfer everything is only a click away Cyber threats are also increasing with the rising number of Internet users. The main reason rural people get victimized by cyber attacks is lack of awareness about these issues. The concept of username and password have been fundamental way of protecting our information.The OTP feature prevents some forms of identity theft by making sure that a captured password cannot be used a second time. Encryption is the process of encoding messages and information in such a way that eavesdroppers or hackers cannot read it. In encryption schemes, the personal and confidential information such as transactions, emails, bank account details etc. are encrypted using an encryption algorithm turning it into an unreadable ciphertext.**

Cyber security is a vast topic that is becoming more important because the world is becoming highly interconnected, with networks being used to carry out critical transactions. There is no perfect solution for cyber crimes but we should try our level best to minimize them. This paper mainly focuses on challenges faced by cyber security in rural areas. It also focuses on cyber security techniques, cyber crime and social media.

***Index Terms*— Cyber security, Artificial Intelligence, Rural Development, Wireless Network,Cyber threats.**

I. INTRODUCTION

This research is about the awareness of cyber security in the rural community. The present days, the application of the internet suddenly increased, which is the cause of network trafficking[1].That increases risk of cyber crime for the local authority, employees ,since they are supposed to use their devices to access their accounts[2]. This research is conducted with the objective to raise awareness and educate the rural community about the importance of cyber security[3]. The rural communities have been ignored in being given an education about cybersecurity.In another research we come to know that the rural community norway has any awareness in cybersecurity. The role of local authority is important to provide awareness in cybersecurity. Cybercrime targeted rural communities where most are individual in nature and rarely hear about these cases in the national media[4]. The material for teaching rural communities should be easy to understand so the local authority can be

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understood.
In research we take a person “MIC” in consideration who starts doing online shopping[5]. He got a “Gift voucher” message from the fake account of shopping.com ,he filled all the bank account details with the thought that it's a formality. Because of this mistake all of his bank details got corrupt. There a question a rais “ can he prevent this attack? The answer is yes he could prevent these attacks if he had the knowledge about cyber crime and cyber security[6].

A. Types of cyber attack[7-10]

1)Malware attack:-due suspicious messages which are downloaded from online,spy etc.
2)Phishing attack:-by fragel emails which look like from a legitimate source.
3)Man-in-middle attack:-here the hacker gain the access to the information path between mic device and the website server hacker takes over mic ip address by doing so the communication line between our device and the network secretly interrupted ,this commonly happen with unsecure wifi network and also through malware
4)Password attack:-it's a one of the easy ways to hack the system here the mic password could be cracked by the common password or try all alphabetic possible passwords.

B. How to prevent feature cyber attack[11-13]

We can implement some cyber security practices
1)Firewalls :-its a virtual wall that filters the incoming and outgoing traffic from your device to guard the network.
2)Honeypot:-just like flowers attract bees,damey computers called honeypots are used to attract hackers. This system is made to look vulnerable to decisive attackers and this in turn protects the real system. In addition to this we can also use a unique alphanumeric password and antivirus software which avoid the mails from unknown devices[14-20].

II. System Model

The basic system model as shown in the figure deploys the technical aspects of a Secured network connections proposed

- However, now-a-days wifi router most widely used device in a day to day life.
- Wifi router is mostly targeted by the cybercriminals to steal the user's any private and sensitive Information.
- To secure wireless networks like wifi router and any there access at homes and any of Companies,We a normal person doesn't need any type of Cybersecurity experts,or we don't have pay a lot of Money to secure our Devices,to secure our Private Data.
- We, people can also Secure our Devices with taking some measures or by doing or using some Techniques.
- To Implement simple Techniques, We can Enhanced Security in Internet Home Devices.

III. Results

The research conducted by the authors confirms that this lack of awareness, combined with the deep-rooted dangers posed by the internet, expose local communities to cyber threats. Enhancement of security and Privacy Policy connected to wireless networks is done.

Online Google Forms was designed to identify user impacts due to wireless network related attacks in the remote areas and in particular to Village. The targets were both technical and non-technical based users which consists of a random 56 sample.The survey uses a quantitative technique using online questionnaires. We asked our target users if they faced any kind of cyber attack during the pandemic (quarantine time), and what kind of attack/threat they experienced and how they dealt with it. We provided options of common wireless related attacks to choose from such:

1. Your password was not working, but you are very sure it was correct
2. You were not able to access to the website that you need; it was always down
3. You were purchasing something online and suddenly your current page redirected to another page
4. Someone came from TeleCom/STC offering you to increase your Wifi band for free
5. Someone called telling you win 1000$ and share your banking details
6. You were buying something online, and website asked you to provide sensitive information; social ID, username & password

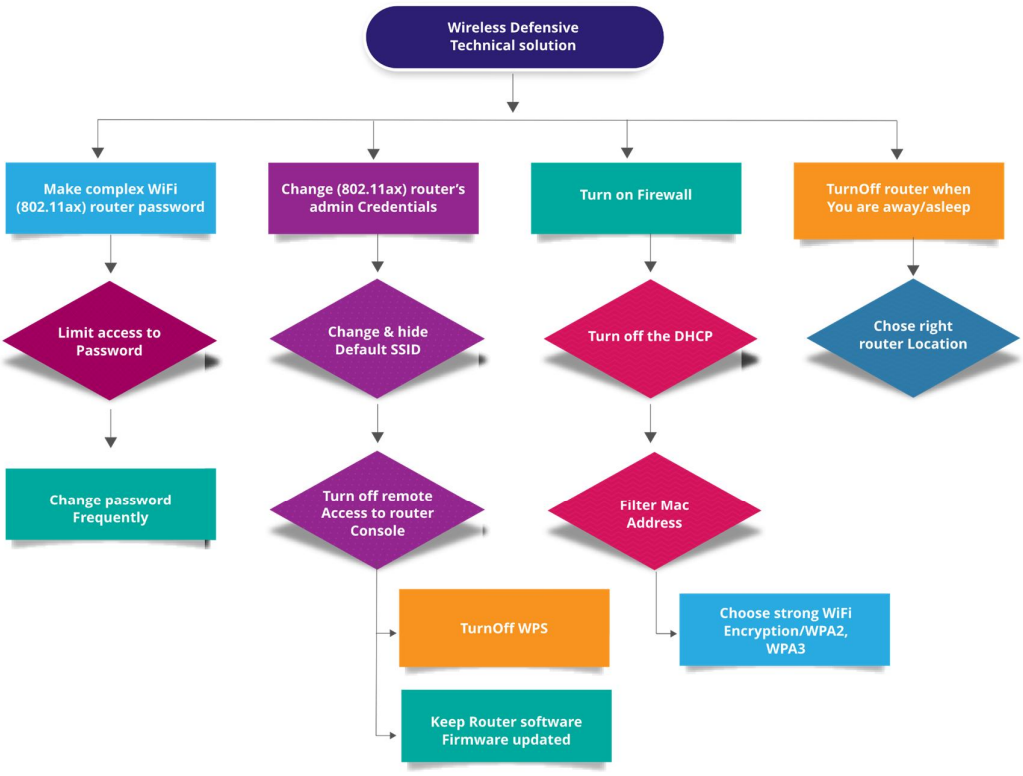

Fig 1. Wireless Network Security Enhancement figure(i)

You saw someone in your neighborhood in the car using a laptop with some weird antennas Survey results as follows; most people (66.7%) faced phishing attacks because 'Someone called telling you win 1000$ and share your banking details', (42.9%) of people experienced DoS attack, 'You were not able to access to the website that you need; it is always down', (33.3%) of people experienced social engineering attack 'You were buying something online, and website asked you to provide sensitive information; social ID, username & password'. We also asked questions to identify how people mitigate or dealt with attacks that they were experienced, where most of people (62.5%) 'Did nothing' when they actually were attacked, because people cannot easily differentiate phishing/fake emails, malware websites, social engineering masquerading tricks. Thus, users should be aware and take simple precautions to stay protected as well as enhance their security and privacy issues while using wireless networks.

IV. Conclusions

These themes are developed in such a way to cover a wide range of topics, including practical advice on phishing attack avoidance and more advanced topics such as preventing social engineering attacks. This paper will introduce the development of the cyber security awareness program, and bring the importance for including these specific themes at the hand of international cyber security incidents.

This research paper focuses on promoting cyber security awareness towards the newly released broadband capability and knowledge transfer within rural communities by means of an optional community based training program. This program can be adapted in any environment other than rural areas, but the current focus has been in the rural areas.

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Artificial Intelligence in Data Science

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***Abstract*—This paper introduces Current Wireless Systems which works on Automatic gain control (AGC), Adaptive Modulation and Coding Schemes and channel Quality Indicators (CQI). AI-Enabled Wireless CQI Monitoring and Diagnosis System for 6G Cellular Network. The Proposed AI in Data science provides a collaborative process to a systematic process that is adopted in wireless systems that leverages the network performance.**

I. INTRODUCTION

With each passing day cellular network technology progressively emerge to 3G, 4G(LTE), 5G, the sophistication of wireless networks is expanding speedily[1].Thus,Network Structures of MNOs-Mobile network operators turned into further hard and standardized administration of the parallel wireless Channel Quality Indicator(CQI) is likewise [2] demanding responsibility from a profitable network opinion[3-4].Alternatively this is approximately impractical for a lot of administrators to guide and maintain wireless CQI for individual cell unit mutually in real-time for entire 6G mobile base stations displayed publicly[5].

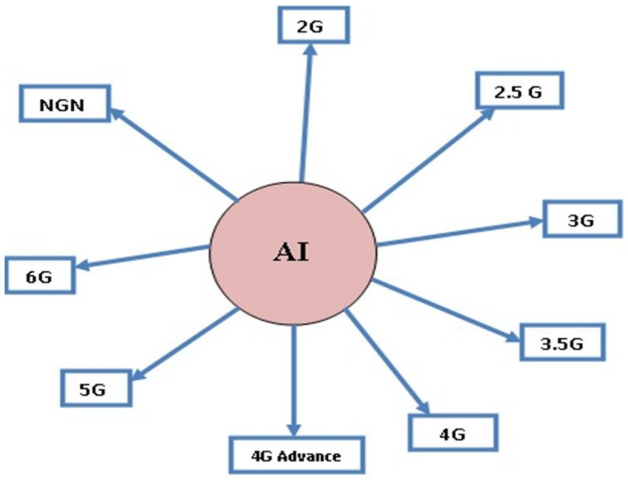

Fig 1. AI Connectivity

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To Conquer this obstacle, Artificial Intelligence occupying technique have been suggested in this paper specifically by adopting fair Machine Learning(ML) and Deep Learning(DL) Methods to the THz/6G wireless CQI management for economic purpose.There are lot of relevant works[2]-[4] implementing familiar AI methods to network management fields.In this relation,the major characteristic in this paper is that we centered on wireless CQI administration for present economical 6G cellular networks and for this we introduce a novel AI framework that facilitate present rational CQI analytical procedures,that is being accomplished mutually in individual provincial administration site,further to be automated,creative and precised.In this concern,well-known Machine Learning and deep learning methods with the help of open sources[5-9] are accordingly implemented to our real-time CQI monitoring system and Root Cause Analysis(RCA) respectively.
The below 6G Network structure is considered in this paper to enhance the system, where the part from RU to gNB-CU is about a typical system block of a 6G NR Base station. The element manage system(EMS) as a network entity described the network management system(NMS) is a higher level entity connected to multiple EMS's and carry out integrated management nationwide[7]. In this paper, the Artificial Intelligence system basically deals directly with EMS from which more diverse raw data for CQI performance is enables more easily[8-10].

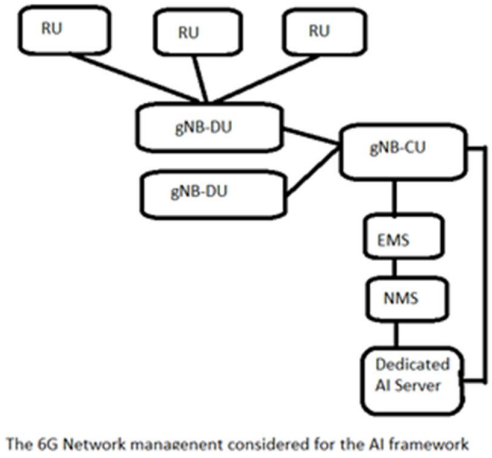


Fig 2. 6G and AI frame work

It collects Cell Level (RU-level) configuration information, wireless performance statistics, fault history and so on for Network management. Here In this paper the following section II deals with the Artificial Intelligence enabled CQI monitoring and alarm system followed by some of the informative concepts inter-related to the AI framework.

II. The CQI Monitoring and Alarm System

CQI is a channel Quality Indicator, this indicator describes the data/information on which it specifies the quality of the communication channel a system Model as shown in figure(i) and Figure(ii).

- This CQI is used to monitor the advancement of the HSDPA communication system, it is a cellular Telecommunication.
- => The Media Independent Handover Function (MIHF) provides various information to the channel quality source. This source uses some existing MIH services such as Link_Up, Link_Down, Link_Going_Down and Link_Get_Parameters in order to determine the link status and QoS parameters of different links.

Link_Up and Link_Down events are generated by Lower Layers (layer 1 or layer 2), and these events are notified to MIHF. Access to network specific information like network identifiers is provided by the information elements(IE) of the MIH Information Services (MIIS). Uplink multi-antenna techniques, For uplink transmissions a device with multiple antenna elements can use beamformed MIMO methods to improve the channel quality.
Acquisition CSI is one of the most important aspects of multiantenna techniques since the quality of the CSI is often the limiting factor on the performance of multiantenna techniques. CSI indicates the behavior of the

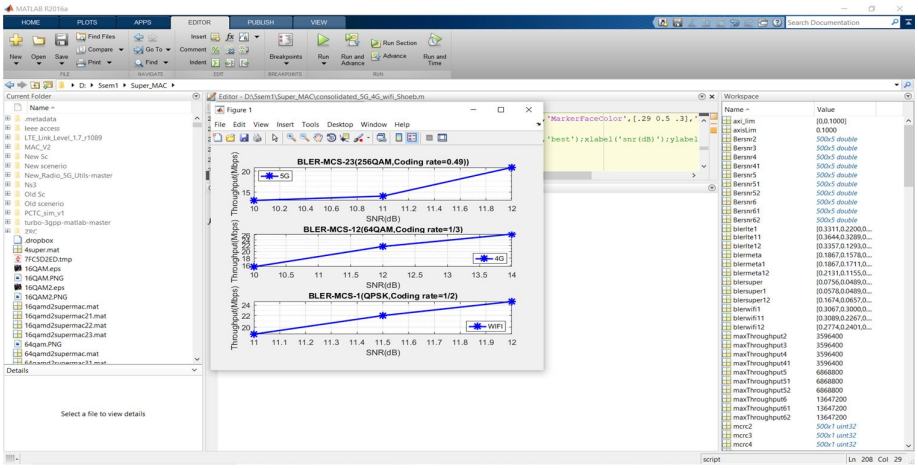
channel at a specific time. Depending on the situation and configuration from the network, UE performs different combinations of parameters of the channel.
CSI is a kind of collective name of several different types of indicators (UE report) as given here…Channel quality indicator (CQI), precoding matrix indicator(PMI), precoding type indicator(PTI), rank indication (RI).
Most important purpose of CSI on the UE side is to estimate the channel quality and recommend a proper precoding matrix to the network. So the last part of CSI estimation and report is highly related to various precoding matrices. There are several different sets of precoding matrices and different precoding matrix sets are used for different transmission conditions . Therefore in order to understand the overall mechanism of CSI estimation, the main step would be to get familiar with all of these precoding matrices from the selected set.

III. Simulations and Results

A Matlab simulations of the proposed setup compare the standalone and AI supported 4G, 5G systems with the specifications listed below:

TABLE I. SIMULATION PARAMETERS

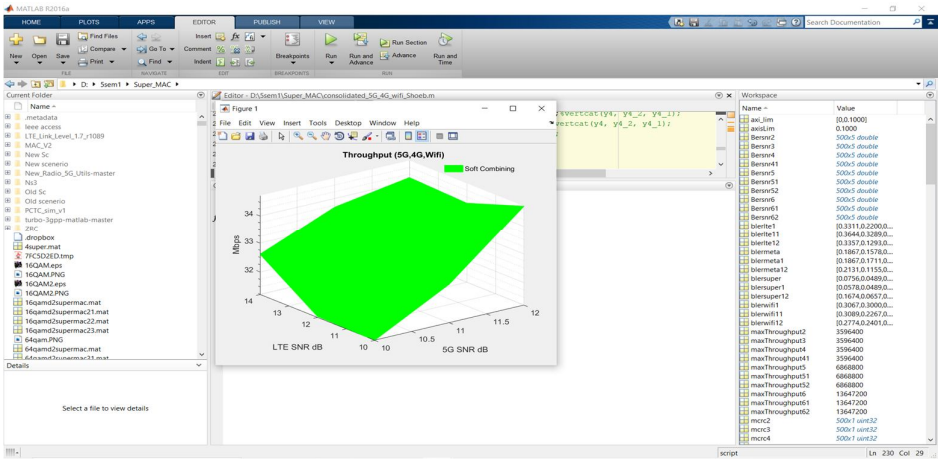
MAC parameters			4G/5G/6G		Wifi	
Access Mode			FDD		CSMA/CA	
Transmission			Downlink		Downlink	
Fading Model			Rayleigh		Rayleigh	
Number of frames			50		500 (packets)	
TTI			1 ms		1 ms	
Frame duration			10 ms		1 ms	
Bandwidth			20 MHz		20 MHz	
Physical parameters	Scenario 1		Scenario 2		Scenario 3	
	6G	5G	LTE	5G	LTE	WLAN
MCS	3	0	8	1	12	2
Peak data rate (Mbps)	7.1	6.5	17.5	14.4	28.42	21.7
Buffer size (Mb)	8.5	8.5	15	15	30	30
SNR (dB)	5, 6, 6.5	7.8, 7.9, 8.0	10, 10.5, 11	11.3, 11.4, 11.5	20, 22.5, 23.5	16.8, 17, 17.2
Transport block size (bits)	7992	7992	15264	15264	28336	28336
Simulation time (ms)	1500		1500		1500	



IV. Proof of Concepts

A. Advantages

- As maximum of the mobile service is arising indoors, Further cellular networks were never been directed to purpsoe indoor audience proficiently. 6G conquer these threat adopting femtocells or distributed antenna systems (DASs).
- 6G implements THz(Terahertz) frequencies/density which has many gains as followed .THz waves can effortlessly consume in the air. Thus it is fruitful for high-speed brief wireless transmission .



- 5G will transform the health care category which exclude space and time blockade . Through remote surgery and it will secure health care work flow increment.
- 4G wireless benefits evident lights which powers additional benefit of LED's such as radiance and fast speed data communication.Electromagnetic radiation is not produced by VLC
- NGN hits very huge data rate and very flat latency. This many applications can implement 6G wireless network.

B. Disadvantages

Further advancements may cause a minimum delay, but it is acceptable with respect to Round trip transmission time RTT delay.

V. Conclusion

In this paper,we recommended a novel AI framework for general wireless CQI monitoring and it's diagnosis in LTE/6G mobile networks. Definite methodologies of ML-establish CQI monitoring and DL-establish problem diagnosis were also determined to help reader's perspective.From our first POC- proof of concept data for the AI framework.It has been indicate that our AI framework was being strongly operate with profitable 6G apparatus in real time.In the future,we will further upgrade the framework for KT 6G WACS and the definite conclusion to expand this AI key generally.

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Development of Autonomous Underwater Vehicle (AUV) for Crack Detection in Canals

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***Abstract*—The cracks in the canals or dams caused by waterborne particles or some external disturbances lead to canal deterioration and water wastage. For determining the repair of such cracks, periodic inspections of canals are required. For detection of these cracks imaging techniques are popularly used. In this technique there is a need for an Autonomous Underwater Vehicle (AUV). The AUV carries a camera for image capturing. This paper aims at developing a PVC material fabricated cost-effective underwater vehicle for reliable crack detection. The system would detect the cracks in the canal up to a depth of 3-5 meters. The integrated system will obtain the image of the concrete surface of canals in the desired position from the camera mounted on the vehicle. The proposed AUV is equipped with 2 thrusters in order to achieve easy maneuverability along with the modular electronics consisting of the controller and the battery module. AUV control is achieved through Radio control where throttle input is given to the receiver from the 6-channel radio transmitter. Neutral stability is achieved with the partial submerged AUV model. In a nutshell, the developed AUV is low weight and economical due to the materials used and radio control makes the model user friendly.**

***Index Terms*— Dams, Cracks, Seepage, Inspection, AUV, Image capturing.**

I. INTRODUCTION

Civil infrastructure systems represent a significant fraction of global assets, and due to many factors, cracks will appear on the surface of these structures. These cracks not only affect the visual appearance of the structures but also lead to steel corrosion, which accelerates concrete aging affecting the normal use of these structures and leading to underuse of the infrastructure and a shorter life span.

Canals are an integral part of the dam water distribution system. Canals are built for a variety of uses including irrigation, urban water supply, hydroelectric power generation etc. Waterproof linings keep a canal's water from seeping into the ground. The Canals are built using a mixture of sand, clay, and water that dried to a waterproof state and Modern materials and additives that are more durable include concrete, fly ash. Since the flow of water through this open channel is huge, the pressure of water on the walls is high. Also, the canal walls are subjected to erosion.

Due to these cracks are developed in canal walls. Due to these cracks, there is a water seepage, and thus the canal walls get deteriorated. Underwater environments are complex, cracks are quite random and diverse in nature. Marine life in the water bodies, atmospheric temperature, heavy rainfall, and local bodies can contribute

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to the canal strength deterioration. Over the period the developed cracks widened. Cracks are always used to indicate the degree of risk in the field of canal damage. These cracks if not monitored regularly can cause accidents. In the year 2018, Pune witnessed unexpected flooding when a wall of the Mula-Mutha canal saw a breach. Several vehicles were damaged in the sudden floods, causing panic in several areas.

An autonomous underwater vehicle (AUV) is a robot that travels underwater without requiring input from an operator. They are considered autonomous because they have no physical connection to their operator, who may be onshore or aboard a ship. They are self-guiding and self-powered vehicles. The oil and gas industry uses AUVs to make detailed maps of the seafloor before they start building subsea infrastructure; pipelines and subsea completions can be installed in the most cost-effective manner with minimum disruption to the environment. The AUV allows survey companies to conduct precise surveys of areas where traditional bathymetric surveys would be less effective or too costly. Also, post-lay pipe surveys are now possible, which include pipeline inspection. The use of AUVs for pipeline inspection and inspection of underwater man-made structures is becoming more common. The proposed system aims at early detection of such cracks in the canal walls to avoid such instances in future. The system aims at developing a crack detection system which is cost effective using the latest technology for reliable crack detection.

II. Literature Review

This paper [1] discusses the operating scope for the Autonomous Vehicle Research Platform (AVRP). It mainly focuses on types of sensors for understanding the surrounding environment, and their optimal mounting locations, and hardware for positioning and navigating within that environment. It also covers the power estimation for the hardware and systems, computing benchmarks from other autonomous research platforms, and a communication structure for the AVRP. The author of the [2] has employed a prototype of the Autonomous vehicle system (car) using the Internet of Things. They have used a Raspberry Pi, a Picamera, a Web interface and Internet modem. It is based on Computer vision algorithm. Using this module we can transfer the digital parameters to cloud storage through the internet. The saved data so obtain find a use for monitoring purpose and analysing the information. This paper [3] aims to design and develop an AUV as a test bed platform for a variety of research in underwater technologies especially involving small-scale and low-cost underwater robots. It also can be used for testing and learning conventional and advanced control algorithms and techniques to other underwater systems. With a limited budget a small autonomous underwater vehicle has been developed.

The stated paper [4] introduces Maribot LoLo and presents the underlying design philosophy which focuses on versatility and endurance. The vehicle is designed to be operated at moderate water depths and on long-range missions. This leads to challenges in the design of the variable buoyancy system (VBS) which also is presented. The achievable range of the AUV is evaluated with a simple hydrodynamics model based on frictional drag. The concerned research [5] describes the electromechanical design of a compact, light-weight Autonomous Underwater Vehicle (AUV) for archaeological applications; the vehicle is named Zeno (Zeno Environment Nautical Operator), protector of freshwater and flood victims, and was developed in the framework of the European project ARCHEOSUb; the AUV specifications, its navigation devices and payload are given. The main characteristics of the vehicle are described with particular attention to its system architecture, propulsion system and structural design.

Author of [6] had introduced a model-driven control realization, which was based on the systems engineering concepts of the model-driven architecture (MDA) or model-based systems engineering (MBSE) approach combined with the real-time UML or SysML, extended/ unscented Kalman filter algorithms, and hybrid automata, in order to conveniently deploy controllers of autonomous underwater vehicles. The model also created a real-time communication pattern, which could permit the designed components to be customizable and reusable in new application developments of different AUV types. It had stepwise adapted the AUV dynamics for the control that are then combined with the specialization of MDA or MBSE features. Mentioned research in [7] had a new, low cost and modular AUV design and was built to replace Odyssey IV, the primary research vehicle. The new AUV was a shallow cruising vehicle with a depth rating of 100 meters. With a weight of less than 50 kg, the AUV could easily be launched and recovered by hand from Sea Grant's 25 ft vessel. Although specifically designed to support Didemnum research, the AUV incorporated a flexible and modular design that allowed the vehicle to be reconfigured for existing Didemnum missions or upgraded with additional sensors and payload. Incorporating a separate, interchangeable Li-Polymer Battery pack allowed the vehicle to achieve both a high mission duty cycle and extended bottom time.

III. System Overview

Our AUV system is combination of the Electronics and the Mechanical assembly and it is discussed below.

A. Electronics System

For powering up the AUV, we had designed the electronics module which consists of BLDC Motors, propellers, ESC, ESC Calibration throttle hub, radio transmitter, receiver, battery, power distribution module as shown in the Figure 1. Further, image processing will be done by either a transmitter and receiver pair as shown in the Figure 1 or it will be carried out via WiFi

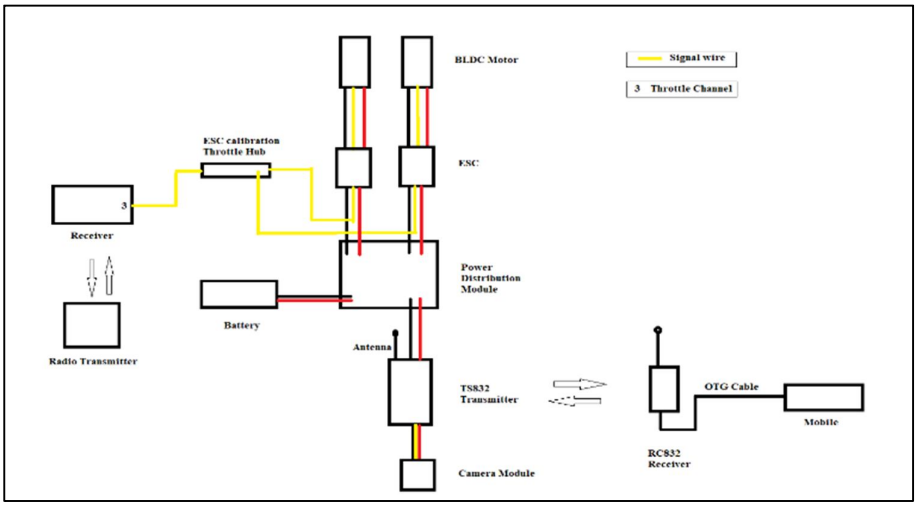

Figure 1. Block diagram of AUV

The complete electronics architecture overview has described below:

BLDC Motor:

As the BLDC motor has high power density, high efficiency, and lower rotor inertia, it could give better torque characteristics than other motor types. We compared BLDC motors of different makes. Considering our thrust requirements, we decided to go with the BLDC motor of 935 kV which provides us with the required thrust and weight constraints. In our AUV design, we have used 2 BLDC motors for the forward and backward motion.

ESC:

Ampere rating of ESC should be 20-30 % more than the maximum current requirement of the motor. This will allow the motor to work at a lower temperature. The 935kV BLDC motor draws a current of 18 Amp. So, for safety purposes, we are using ESC of 40 Amp, which is also recommended by the manufacturer.

Propeller:

We had selected three bladed propellers of 6x4.2, where 6 signifies six inches of diameter and 4.2 signifies 4.2 inches. of propeller pitch. Both the propellers are of clockwise rotation.

Battery:

LiPo battery was chosen because of its convenience, reliability, affordability, and its renewability. The maximum draw from the 935kV BLDC motor is 18A. The battery should be able to deliver more current than this. We had chosen a 2200 mAh 30 C 3S LiPo battery for our mission.

The effective battery capacity = Battery Capacity x Battery Efficiency = 2.2Ah x 80% = 1.76Ah

Maximum Current delivered by battery = Effective Battery Capacity x C Rating = 1.76Ah x 30C = 52.8A

Radio:

The AUV control was done by a transmitter and receiver pair with 2.4GHz of range.

Underwater Camera:

We are using a waterproof action camera with 4k resolution for best capture of the underwater environment. It comes with Wi-Fi connectivity which is capable up to 50-60 meters range. This camera is perfect for our application.

Underwater Flashlight:

To explore the underwater scenario in the dark, underwater flashlight was chosen with the specification of 12V and 12 W power.

Power Distribution Board:
As we were using two BLDC motors with two ESCs, there was a requirement of handling two motors with the single throttle of the radio transmitter. Power distribution board of 6 ESC tabs was selected for this purpose with regulated 5V and 12V outputs.
ESC Calibration Throttle Hub:
8 in 1 throttle calibration hub distributes throttle signal up to 8 ESCs where we used only 2 hubs out of 8.
B. MECHANICAL SYSTEM:
The primary goal of ours was to design our AUV in 2D model before directly hopping onto the manufacturing. We modelled it in *AutoCAD* as shown in the Figure 2.

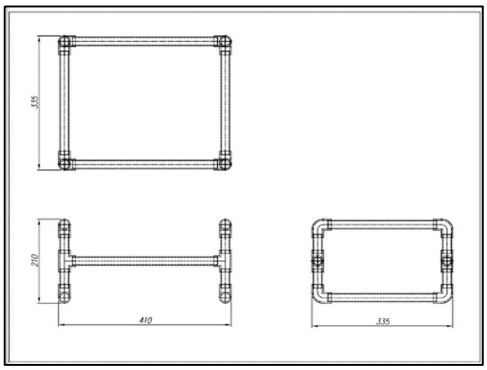

Figure 2. 2D CAD design

Later, we proceeded with the 3D model of the vehicle according to our specifications in the *TinkerCAD* as shown in the Figure 3 and 4. 3D modelling made us go with further fabrication of the vehicle.

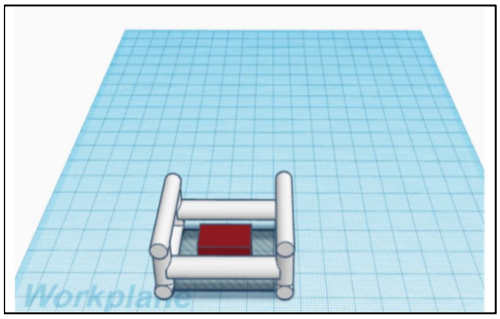

Figure 4. Side view of 3D CAD model

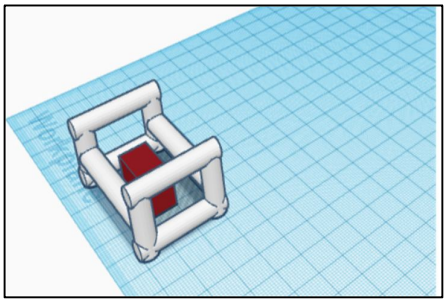

Figure 3. Front view of 3D CAD model

AUV was manufactured with the PVC pipes for cost effective solution and weight reduction. The detailed specifications are listed below:
Materials Required:

- PVC pipe
- 2 Pool Noodles
- Tie Wraps - Motor Mount
- 2 Film Canister
- 2 Propellers
- Electronics (refer to section III.A.)
- Underwater Camera
- Underwater Flashlight

PVC Pipes:

- Two Pipes - 16.5” long
- Four Pipes - 13.5” long
- Four T Connectors
- Eight Round Connectors

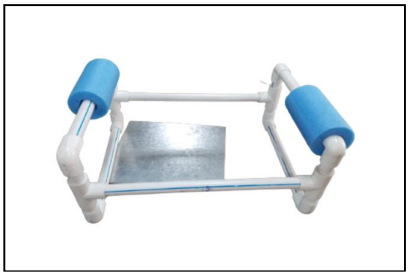

Figure 5. Vehicle Architecture

Before locking this configuration of vehicle structure, we had tested various PVC frames but the CG was not balancing and we were not getting desired results so we decided to go for a symmetrical structure. The results were desirable for the above vehicle frame. This Vehicle consists of PVC structure as shown in the Figure 5. We are using pool noodles for the ease of floating. This vehicle assembly has been tested and found stable in the water. Its CG is balanced along with the BLDC motors, propellers, underwater camera, and underwater flashlights onboard.

IV. EXPERIMENTS

In this section, discussion is done on the various tests performed for the evaluation to meet the desired outcomes. Following tests were conducted-

A. Stability Test
B. Electronics Test
C. Vehicle Test

A. Stability Test

In this test, we checked the stability of our vehicle. At first it seemed that the PVC structure was tilting a little on one side. To see what was going wrong, we removed the 16.5" PVC pipe from the structure and it was still tilting on the same side. We figured out that it was because of the uncentered heave control motor mount PVC pipe. To make the structure more stable underwater, we decided to mount more structure on the opposite side edge of the 16.5" PVC pipe. Refer to Figure 6.

Figure 6. First Iteration

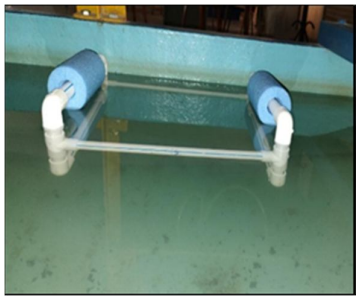

Figure 7. Second Iteration

After our third iteration we decided to go for a symmetric PVC structure for achieving the best stability. It was observed that the vehicle frame was stable. Refer to Figure 7.

B. Electronics Test

We tested our sealed electronics in a bucket full of water. In this test we sealed one BLDC motor with the silicon sealant and tested it in a bucket full of water to check whether the sealing was properly made or notc

C. Vehicle Test

After the conclusion of the above tests, we assembled the vehicle frame with the electronics shown in Figure 9. Then this assembled vehicle was tested in the tank with a depth of 5-6 feet.

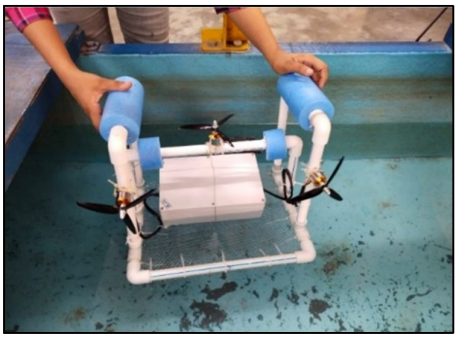

Figure 9. Vehicle Testing

V. RESULTS

Based on various experiments done, we have summed up the results as shown in the Table I and enhancement was carried out later.
After the proposed enhancement, amperage of ESC was increased to 40A, power distribution module was included and vehicle was furthe made stable.

VI. CONCLUSIONS

The AUV has an easy construction. The model constructed uses a transmitter - receiver pair which has reduced complexity caused due to the use of cables. It has wireless communication. In addition, it does not require a bulky and complex component for support. Using AUV to conduct Underwater Canal Inspection is far safer than using a human diver. Thus, the proposed system design will significantly contribute to efficient canal inspection and reduction in the water seepage through the cracks. This design is advantageous for cost effective solution and weight reduction of the vehicle. In addition to this, for future scope, we are aiming for image processing which will consists of a camera, a flashlight, WiFi Communication and image processing platform (MATLAB). This will enhance the crack detection system.

TABLE I. RESULTS OF VARIOUS TESTS CONDUCTED

	Execution	Results	Enhancement
Test 1. Stability Test	Vehicle Stability Check: First iteration included the unstable AUV structure Second iteration was concluded with the stable structure	Vehicle was unstable Structure was tilting at one side due to assymetry	Make the vehicle architecture more like a symmetrical to get the stable model
Test 2. Electronics Test	Electronics check : All the electronics were sealed inside the ABS container BLDC motors were sealed with the silicon Sealant	ESC had lesser amperage BLDC motors stopped working after a while due to sealant blocking	Increase the ESC amperage Remove the sealant in the BLDC motors and instead keep them inside the canister
Test 3. Vehicle Test	AUV maneuvering and communication check: AUV structure was asembled with the electronics It was then controlled by setting the communication by radio	Vehicle structure was floating on its own In the first iteration, due to absence of power distribution board and ESC calibration hub, only single thruster could run	Remove the pool noodle as we want our vehicle to partially submerge Connect 2 BLDC motors with ESCs and then futher with the power distribution board to which battery will be connected

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Estimating Bangalore Housing Prices using Textual Attributes and Image Data

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***Abstract*—The majority of current automated algorithms for estimating house prices only take into account textual information like the home's neighbourhood and the number of rooms. A human representative makes a physical inspection of the home and makes an estimate of the actual cost. In this work, we suggest merging written information about the property with visual elements extracted from images of the house. The combined features are fed into a Convolution Neural Network (NN), which produces a single output that is an estimate of the price of the home. For the purpose of developing and evaluating our network, we have gathered a housing dataset that includes both visual and textual features. The dataset consists of the price and other features of 500 homes from Bangalore along with images of those homes.**

***Index Terms*— Housing Price, Bangalore, CNN, SVR, textual data, and image data.**

I. INTRODUCTION

The housing market is a key factor in how the economy is shaped. By raising the pace of home sales, employment, spending, housing rehabilitation and construction stimulates the economy. It also influences the demand for goods from other important businesses, such those that provide building
materials and durable goods for the home (Li et al., 2011). Recent studies demonstrate that the profitability of financial institutions is impacted by the housing market, which in turn has an impact on the surrounding financial system.

Additionally, the housing industry serves as a crucial indication of the real sector of the economy as well as asset values that aid in forecasting inflation and production (Li et al., 2011). The arduous conventional price prediction technique is based on the cost and sales price comparison, which are inaccurate and do not have an established standard or certification procedure (Khamis and Kamarudin, 2014).

In order to better establish policies, prevent inflation, and aid individuals in making good investment decisions, it is necessary to have an accurate automated prediction of housing price (Li et al., 2011). Predicting home values is a very difficult task due to the illiquidity and heterogeneity in both the physical and geographical views of the housing market.

Additionally, a delicate interplay between the home price and a few other macroeconomic variables makes the forecast technique extremely difficult. Previous research was done to identify the most crucial elements influencing housing prices. All of the earlier studies focused on the homes' linguistic characteristics (Khamis and Kamarudin, 2014; Ng and Deisenroth, 2015; Park and Bae, 2015). So, in order to leverage both visual and verbal qualities in the price assessment process, we decided to integrate them. According to (Limsombunc et al., 2004), the neighborhood, size, and number of bedrooms and bathrooms all have an impact on a home's pricing. The cost of a home increases with the number of bedrooms and bathrooms.

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II. Related Work

Some effort has been done to automate the real estate price appraisal process during the past ten years. Successes included highlighting the property's features, including its location, quality, environment, and site. When comparing various techniques, we discovered that they may be divided into two major categories: data aggregation-based models and data disaggregation-based models. Similar to the Hedonic Price Theory, the data disaggregation based models attempt to forecast the house's price based solely on each feature. To predict the price of a house, data aggregation techniques like regression and neural networks must take into account all of the property's characteristics.

The Hedonic Price is a prime example of a Data Disaggregation Model. Theory in which the characteristics of real estate determine its price. A collection of implicit pricing is defined by the real estate's related qualities. The marginal implicit values of the qualities are created by differentiating the hedonic pricing function with respect to each characteristic (Limsombunc et al., 2004). The issue with this approach is that it ignores the variations across properties within the same geographic region. It is therefore seen as being unrealistic. By contrasting the outcomes of data aggregation and disaggregation, Flitcher et al. attempted to determine the optimal method for estimating the property price in (Fletcher et al., 2000).

They discovered that the outcomes of agglomeration are more precise. They also discovered that some coefficients' hedonic prices are not constant since they vary with location, age and property type. They thus came to the realization that while analyzing these changes, hedonic analysis can be useful, it cannot be used to estimate the price based solely on a characteristic. They also learned that the property's location has a significant impact on its pricing. Neural Networks are the most popular model for the Data Aggregation model.

In (Khamis and Kamarudin, 2014), Bin Khamis examined the effectiveness of the Neural Network and Multiple-Linear Regression (MLR). NN outperformed MLR in terms of MSE and R2, respectively. The neural network model surpasses the Hedonic model when results from the two models are compared because it achieves a better R2 value by 40.769% and a lower MSE by 45.4314%. The Hedonic model's information deficit might be what's behind its subpar performance. The Neural Network Model does have some limits, though, as the predicted price is not the exact price but rather a near approximation.

This is as a result of the challenge in getting accurate market data. Additionally, the temporal impact, which neural networks cannot automatically manage, is crucial to the estimating process. This suggests that several more economic factors that are challenging to account for in the estimation process also have an impact on the price of real estate. In this article, we'll look into how the estimation process is affected when visual characteristics and textual attributes are combined. The SVR and the NN are the two estimating models that will be explored.

III. Dataset Description

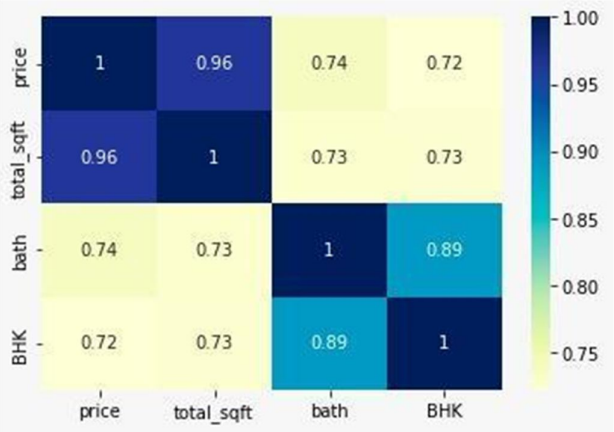

Figure 1. Correlation between Variables

The dataset was created by scraping data from the website housing.com using Beautiful soup. There are two forms of data, textual and image data. Textual data consists of features that describe house-property in Bengaluru. The features can be explained as follows:

1. Price- Value of the property in lakhs.

2. BHK - Number of bedrooms
3. bath - Number of bathrooms.
4. total_sqft - The area of the house in square feet.

TABLE I. DATASET SUMMARY

	area	bath	BHK	price
mean	1689.489	2.620	2.622	110.671
std dev	925.921	0.943069	0.9431	71.878
count	500	500	500	500

In table 1, the mean and standard deviation of all the data points, for features like area, bath, BHK and price are computed.
The image data is a grid of four images: The bedroom, the bathroom, the kitchen and the apartment complex.Fig 2 shows a sample image. From fig 1, the correlation between the different variables in the dataset can be seen. It can be seen that the housing price has a strong positive correlation with the bath (number of bathrooms in the house), BHK(number of bedrooms in the house) and total_sqft(area of the house). Thus, these features were given greater weightage while predicting the house price using the textual data.

Figure 2. Sample Image from Dataset

IV. EVALUATION METRICS

The evaluation metrics which we have used to calculate the accuracy of the models are:

A. R-squared error

In a regression model, the R-squared statistic quantifies the percentage of variance in the dependent variable that can be accounted for by the independent variable(Fig-3). The range of the r-squared model value is 0 to 1, with a greater value indicating better data fit by the model. R-squared measures how well the variation of one variable accounts for the variance of the second, as opposed to correlation, which describes the strength of the relationship between independent and dependent variables.

$$R^2 = 1 - \frac{\sum_{i=1}^{n} (y_{predicted} - y_{observed})^2}{\sum_{i=1}^{n} (y_{predicted} - \bar{y}_{observed})^2}$$

Figure 3. Formula for R-Squared error

B. MSE

The mean squared error of an estimator calculates the average of the squares of the errors, or the average squared difference between the estimated values and the actual value. (or a process for estimating an unobserved

variable). A measure of an estimator's quality is the MSE. It is always a positive number that gets smaller as the error gets closer to zero since it is derived from the square of the Euclidean distance.

V. Proposed Baseline System

A. Support Vector Regression (SVR)

Support vector machines are used for estimating and regressing multidimensional functions. SVMs are based on the idea of the best possible class separation and are derived from statistical learning theory. SVMs use a high dimensional feature space to train and produce prediction functions that are extended on a subset of support vectors.

B. Convolutional Neural Networks (CNN)

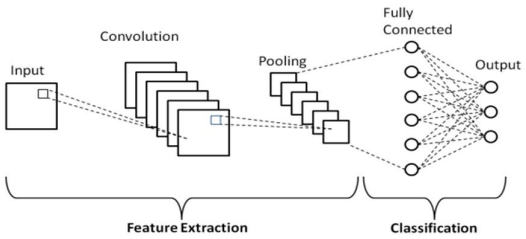

Figure 4. Convolutional Neural Networks

A network or circuit of biological neurons is referred to as a neural network. Therefore, a neural network can either be a biological neural network made up of biological neurons or it can be an artificial neural network created to address problems with artificial intelligence (AI). Artificial neural networks use weights between nodes to resemble biological neuron connections. A positive weight denotes an excitatory connection, whereas a negative weight denotes an inhibitory one. Prior to combining, each input is given a weight. This action is referred to as a linear combination. Finally, the output's amplitude is controlled by an activation function.
As shown in figure 4, a Convolutional Neural Network (ConvNet/CNN) is a Deep Learning method that can take in an input picture, give various elements and objects in the image importance (learnable weights and biases), and be able to distinguish between them. Comparatively speaking, a ConvNet requires substantially less pre-processing than other classification techniques. ConvNets have the capacity to learn these filters and properties, whereas in basic techniques filters are hand-engineered.

VI. Experiments and Results

Our study's primary objective is to determine the influence of integrating aesthetic characteristics of homes in estimates of their pricing. Hence we utilized Support Vector Regression and Neural Networks Models to investigate the link between the quantity of visual features and the quality of the estimation. SVR uses only textual attributes whereas CNN uses both textual and image data.

A. SVR Experiments

In the SVR model, 428 homes—or 80% of the dataset—were used for training, and 107 homes—or 20% of the dataset—were utilized for testing. The MSE and R values were calculated on the training dataset and testing dataset.

B. Convolution Neural Network Experiments

By experimenting with various counts of neurons in the hidden layer, it was found that having 4 neurons is the ideal architecture. Theneural network uses textual data as well as image data to make its predictions. To balance the number of input and output nodes, the number of hidden nodes was set at four. So the effective architecture is 8(4 textual + 4 images)-4-1 as input-hidden-output neurons respectively. Our neurons had sigmoid activation function and trained using the error-back propagation approach in the Levenberg Marquardt variation. During our tests, this design delivered the greatest outcomes. Our dataset was separated into three sections: training (70%), validation (15%), and testing (15%).The validation and training error start to stabilise around 7 epochs, a measurement of how many times all of the training vectors are used once to update the weights, therefore we terminated the training to prevent over-fitting.

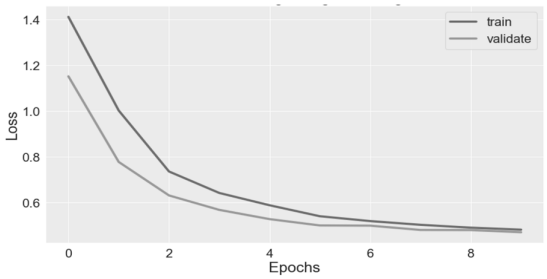

Figure 5. MSE vs Epochs

Figure 5 displays the Network's performance while emphasising the training and validation's MSE loss as well as the time (around 8 epochs) when the training process was halted to prevent over-fitting.

C. Results

TABLE II. EXPERIMENTAL RESULTS

	Training MSE	Training R value	Testing MSE	Testing R value
SVR	1.4 E9	0.903	2.43 E9	0.813
Neural Network	1.2 E9	0.96	1.56 E9	0.956

According to the findings listed in table 2, our model succeeds on the testing set with an MSE of 1.56E9 and an R-Value of 0.956. This means textual attributes along with image data provide better results in predicting house prices.

VII. CONCLUSION

This research uses a dataset for house price prediction with both visual and textual information. It was demonstrated that visual and textual data produced greater estimation accuracy. The relationship between the image features are presently being researched by us.

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Ethereum Smart Contract Threats, Attacks and Solutions: A Survey

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***Abstract*—The importance and popularity of Ethereum smart contract has been continuously growing despite the availability of alternatives such as polkadot, Hyperledger Fabric and Stellar. Smart contracts are program that can be run on decentralized blockchain network with its most important property immutability. Due to this property, smart contract once deployed on the blockchain network, it cannot be modified or updated even for security enhancement purpose also. Hence it is necessary to develop strong secure contract program before deploying it on blockchain network and avoid potential exploitation and delay. Smart contracts are vulnerable to different typed of threats and attacks. To develop secure smart contracts is one of the most important challenges. In this paper we have analyzed different types of vulnerabilities on ethereum smart contract. We also review some available tools that detect these vulnerabilities. The main objective of this paper is to identify the research gap after carrying out literature survey of smart contract security and propose a model to improve security of smart contract.**

***Index Terms*— Blockchain, Ethereum, Smart Contract, Vulnerability.**

I. INTRODUCTION

Ethereum is a decentralized blockchain platform establishes a peer-to-peer network that securely executes smart contracts. Ether is the transactional token that facilitates to perform operations on Ethereum network. Ether is the natal cryptocurrency of the ethereum platform. Ether is the second largest cryptocurrency amongst different cryptocurrencies. Now-a-days an ethereum smart contracts have boomed, it has become an integral part of the blockchain ecosystem. Actually the concept of smart contract is introduced by Nick Szabo in 1997 [1]. Smart contracts are programs that are hosted on decentralized blockchain network. The smart contract allows two or more parties to form an agreement and initiate transaction between these parties without an involvement of intermediary [2]. Ethereum is a blockchain platform which provides tools for developer to build decentralized application using Ethereum Virtual Machine (EVM). It enables involving parties to make an agreement in a transparent and secure way. However there exists some security vulnerabilities within these smart contracts and hence it causes huge financial loss. Vulnerability in smart contract cannot be fixed, due to the immutable property of blockchain. Hence smart contracts are targeted by different kinds of attacks. Most of the attacks on smart contract are exploited due to the poor smart contract code [3]. In fact, ethereum smart contract already faced several overwhelming attacks including Decentralized Autonomous Organization (DAO) attack, Parity

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Multisig wallet attack. The DAO attack in 2016 [4] and the parity multisig wallet attack in 2017 [5], which together causing a loss of over $400 million due to bugs in the smart contract code.
Various tools have been proposed so far for detecting the vulnerabilities before deploying the contracts, but still it lacks complete solution [6, 7, 8]. So it is needed to identify possible vulnerabilities and filtering it out before deploying it on blockchain. This paper is organized as motivation which is followed by literature review, followed by research gap identified which is followed by the proposed model, followed by conclusion and future work.

II. MOTIVATION

Ethereum smart contracts were introduced in 2015, since that there have been several attacks exploited on smart contract [9]. The motivations behind this study are some observations on ethereum smart contract attacks are as follows:

- The first attack was in 2016, when an attacker launched a reentrance attack against the Decentralized Autonomous Organization (DAO) smart contract, which resulted in a loss of more than 36,00,000 million ethers worth more than US$60 million[10].
- Parity wallet, a digital storage service for cryptocurrency such as ethereum was hacked in 2017, with approximately $34 million stolen. It is estimated that hackers have stolen a total of $2 billion since 2017[11].
- In 2018, an adversary stole more than 165 ethers worth of almost US$40,000 from spankchain due to reentrancy attack in the smart contract [10].
- In 2019, about 34,200 ethereum smart contracts worth $4.4 million ether are vulnerable to hacking due to poor coding and containing bugs [12].
- In 2020, there were 47 successful attacks aimed at ETH DApps, which cost victims around $436.36 million or $ 9.28 million per hack [13].

The above statistics shows that, ethereum smart contract threats and attacks are increasing day by day. It has become important to propose tools to detect threats on ethereum smart contract.

III. LITERATURE REVIEW

1. Ethereum smart contract threats and attacks increasing day-by-day. Ethereum smart contracts are susceptible to different kinds of attack. Following are some major attacks on ethereum smart contract.
   The DAO Attack – The contract DAO is a financial application running on top of Ethereum. In June 2016, the DAO hack occurred when the attacker managed to steal more than 3.6 million ethers [6]. The DAO attack caused by reentrancy vulnerability [17].
   The reentrancy vulnerability exploitation in the DAO attack was accomplished in four steps.[17]
   Step 1. The Attacker or Hacker initiates a transaction by calling withdraw function of victim.
   Step 2. The victim transfers the money and calls the fallback function of the attacker.
   Step 3. The fallback function recursively calls the withdraw function again i.e. reentrancy.
   Step 4. Within an iteration, extra ether will be transferred multiple times to the attacker.
2. *Parity multisig wallet attack* – The parity multisig wallets are smart contract programs which are used to manage digital assets by the wallet users [38]. In ethereum, a multisig wallet requires multiple private keys to unlock a wallet. The parity multisig wallet attack was compromised twice in 2017. The first attack exploited the delegate call injection vulnerability and erroneous visibility vulnerability. The second attack exploited the unprotected suicide vulnerability and frozen ether vulnerability. This attack is the second largest attack on the ethereum network in terms of amount of stolen ether [39].
3. *King of Ether Throne Attack* – The king of the ether throne contract (KotET contract) exploit case of out-of-gas exception vulnerability. KotET contract is a game, where player complete to become the king by paying some ether to the current king, plus a small fee to the contract owner [40]. After the contract declares a new king of the ether throne, the new claim price for the throne goes up by 50%.
4. *Rubixi* – The Rubixi contract is a Ponzi scheme containing erroneous constructer name vulnerability. Rubixi is a contract which is a fraudulent high yield investment program where participant gain money from the investments made by new comers. Further, the contract owner can collect some fee paid to the contract upon investments [41].

5. *Governmental* – Governmental scheme attack exploit case of mishandled exceptions vulnerability. In this attack, a contract that implements a flawed Ponzi scheme [3]. This scheme requires a participant to send a certain amount of ether the scheme contract. If no one joins the scheme for 12 hours, the owner of the contract keeps his fee and transfers the remaining ether to the last participant.
6. *Reentrancy Honeypot* – Reentrancy honeypot caused due to Typecast Vulnerability. Honeypot contracts are deployed on the ethereum main network to capture ethereum hackers who try to exploit the contract. A small scale attack using the typecasts vulnerability was launched on a honeypot developed to capture hackers trying to exploit the reentrancy vulnerabilities in smart contract.
7. *Proof of Weak Hand Coin (PoWHC)* –Proof of Weak Hand coin (PoWHC) attack caused due to integer underflow/overflow vulnerability. An integer overflow / underflow occur when an arithmetic operation is performed that requires a fixed size variable to store data that falls outside the range of the variable [42]. The integer type unit 256 in solidity has a limited size up to 256 bits. If the value of integer variable reaches its maximum value as 2256 – 1, then it will automatically reset to zero when an additional integer 1 is added to the variable. Hackers target these variables in smart contract to make vulnerable by increase or decrease the value of integers until they reach to the maximum or minimum value [43].
8. *HYIP* – The contract HYIP was another Ponzi scheme, which pays existing investors from funds contributed by new investor at the end of each day. The contract HYIP exploitation case of DoS by external call vulnerability.

The researchers have proposed different tools that identify different vulnerabilities in smart contract.
Table 1, shows review of the important contributions or solutions which have been proposed so far to stop different threats and attacks.

TABLE 1. IMPORTANT CONTRIBUTION

Authors	Dataset used	Techniques/ methodology	Contribution
Chen, W.et al. (2020) [14]	Total 857 addresses from HONEYBADGER Project	Machine learning model to detect honeypot contract based on N-gram features and LightGBM.	The authors have analyzed honeypot contracts on ethereum and build a LightGBM model to detect the honeypot contract.
W. Chen et al. (2018) [15]	-	The machine learning model is proposed	The authors have proposed a machine learning framework to detect smart Ponzi scheme, a classic scam under the veil of smart contract on ethereum.
Tann, W. J. W. et al. (2018) [16]	Experimental study on 620,000 smart contracts	The technique of machine learning long-short term memory (LSTM) is used to detect new attack trends.	The authors have proposed the approach of sequential learning of smart contract weaknesses using machine learning long-short term memory (LSTM) - that allows detecting new attack trends quickly. Accuracy reported 99.57% and F1 score 86.04%
Ivica Nikolic et al. (2018) [12]	Total 34200 contracts flagged	Static symbolic analyzer used to propose MAIAN tool	MAIAN tool for detecting Greedy, prodigal and Suicidal contracts. Results of these three contracts over given dataset are prodigal 97%, suicidal 99% and greedy 69% true positive.
Luu L et al. (2016) [17]	Total 19,366 existing contracts are tested. It takes two inputs Ethereum smart contract bytecode and ethereum global state.	Oyente is a symbolic execution tool aims to find potential security bugs.	The proposed oyente tool enhances the operational semantics of ethereum to make contracts less vulnerable. The proposed tool finds potential security bugs. It is a static analysis tool which detects the security vulnerability.
Kolluri A et al. (2019)	-	The authors have developed an efficient analysis technique for	ETHRACER is an automatic analysis tool which runs directly on ethereum bytecode and requires

[18]		ethereum smart contracts under multiple events. They investigate a family of bugs in smart contract called Event-Ordering (EO) bugs.	no hints from users in order to detect event ordering bugs in blockchain smart contract.
Jiang B et al. (2018) [19]	Flagged fuzzing of 6991 smart contracts.	Presented novel fuzzer to test the vulnerabilities in ethereum smart contract	The author proposed ContractFuzzer tool which is novel fuzzer to test Ethereum smart contracts for security vulnerabilities. ContractFuzzer generates fuzzing inputs based on the ABI specifications of smart contracts, defines test oracles to detect security vulnerabilities, instruments the EVM to log smart contract run-time behaviors, and analyzes these logs to report security vulnerabilities.
Bragagnolo S et al. (2018) [20]	-	Decomposition technique and mirror based reflection used to analyse contract state	SmartInspect is a solidity smart contract inspector that aims at analyzing contract states using decompilation techniques driven by the contract structure definition. It also allows contract developers to better visualize and understand the contract stored state without needing to redeploy, nor develop any ad-hoc code
S. Kalra et al. (2018) [21]	-	Total six different types of vulnerabilities in smart contract were detected. Static analysis technique is used.	ZEUS verifies the correctness of smart contract and validates their fairness. The tool ZEUS detects six security vulnerabilities in smart contract.
T. Chen et al. (2017) [22]	Uses smart contract bytecode	Static analysis tool is used to propose GASPER tool	The author proposed GASPER tool to detect the smart contracts with inefficient gas consumption. Seven solidity code patterns were identified which are used by GASPER for detection purpose.
L. Brent et al. (2018) [23]	-	Analysis pipeline is used to convert EVM bytecode to the semantic logic relations.	The author proposed tool Vandal is a security analysis framework for identifying the vulnerabilities in ethereum smart contract. Vandal identifies security vulnerabilities such as unchecked send, re-entrancy, unsecured balance, destroyable contracts and use of origin problem.
E. Albert et al.(2018) [24]	Uses ethereum smart contract bytecode and ethereum global state	Rule based representation produced by OYENTE is used to propose Ethir tool.	The proposed tool analyses ethereum smart contract bytecode based on the rule based representations of the Control Flow Graph (CFG) produced by the OYENTE tool
P. Tsankov et al.(2018) [25]	The tool was evaluated on two datasets- the EVM dataset and solidity dataset.	Used two components- dependency graph and critical code structure.	The author proposed fully automated and scalable security analyzer for ethereum smart contract
Albert, E. et al.(2018) [26]	-	Uses five tools to generate closed form gas bands.	The platform developed to calculate the upper bond for the required amount of gas for ethereum smart contract to avoid the out of gas vulnerability.
Jiachi Chen et al.(2021) [27]	Applied on Open source Dataset. Tested on total 1,65,621 Smart contract	Proposed symbolic execution-based approach and tool to detect eight contract defects.	Author proposed DEFECTCHECKER is a symbolic execution based model for smart contract defect detection. These proposed models obtain high F-score on an open source dataset i.e. 88.8%.
Yu Feng et al.(2019) [28]	Evaluated on entire data set from etherscan with > 25K	Proposed a summary based symbolic evaluation technique	Proposed tool SMARTCOPY is an attack synthesizer which incorporates a novel combination of search space partitioning, parallel

	smart contracts	which reduces program size.	symbolic execution and early pruning based on the abstract semantic of candidate program. This proposed model obtains the FN and FP rates as 7% and 10% for timestamp vulnerability and 14% and 5% for Reentrancy vulnerability.
Sergei Tikhomirou et al.(2018) [29]	The proposed tool is evaluated on big dataset of real world contracts from etherscan.	Proposed an extensible static analysis tool to detect vulnerabilities in Smart contract.	Proposed SMARTCHECK model helps to remove the simple bugs quickly from smart contract. This tool showed better False Discovery Rate (FDR) and False Negative Rate (FNR) compared to its closest competitor Remix, Oyente and Securify. This tool showed overall FDR of 69% and Overall FNR 47%.
Torres, C. F et al. (2018) [30]	Evaluated on large experimental dataset containing more than 1.2 million smart contracts	The proposed model employs a strategy based upon taint analysis and symbolic execution.	Author introduced OSIRIS, a symbolic execution tool that automatically detects integer bugs in EVM bytecode. This tool reports less false positive rate as compared to other tool ZEUS. Overall evaluation on 1.2 million ethereum smart contracts indicates that about 4% of them might be vulnerable to at least one bug from arithmetic Bug, Truncation bug or Signedness bug.
Neville Grech et al. (2018) [31]	Validate 6.3 million contracts deployed on blockchain.	The proposed model is a static program analysis technique used to detect gas focused vulnerability in smart contract. This approach combines a control-flow-analysis based decompiler and declarative program structure queries.	Proposed model MadMax uses static program analysis directly on the EVM bytecode. This model identifies out-of gas vulnerabilities. The analysis on given dataset reports vulnerabilities for contracts holding a total value of over $2.8B.
Everett Hildenbrandt et al. (2017) [32]	-	The proposed model is a semantic analysis tool based upon SE. Framework of this model integrates a semantic debugger and a program verifier.	Proposed KEVM model which is fully formally rigorous ethereum interpreter that does not rely on a built-in hard coded implementation of the EVM.
Anastasia Mavridou et al.(2018) [33]	-	Proposed model to help developers to create more secure smart contracts. A presented framework rooted in rigorous semantic for designing contracts as Finite State Machine(FSM)	Author presented a tool FSolidM for creating Finite State Machine easy interface auto generating ethereum contract. In this tool author introduce set of design patterns, as plugins that developers can easily add to enhance security and functionality of their contract.
Mavridou, A. et al. (2019) [34]	-	Proposed approach used formal verification tool	Author presented the VeriSolid framework, which introduces formal verification capabilities providing an approach for correct-by-design development of smart contract. Author design and implement developer friendly natural language for specifying safety and liveness properties. It prevents reentrancy as well as Denial of Service vulnerabilities.
Johannes krupp et al. (2018) [35]	-	Methodology used to find vulnerability is symbolic execution tool.	Author develops a tool TEETHER that provides end to end exploits generation from a contracts bytecode only. They provide a large scale vulnerability analysis of 38,757 unique contracts extracted from the ethereum blockchain and found exploits for 815(2.10%) of those completely automated.
Grishchenko,I. et al.(2018) [36]	Tested on real world contracts from the ethereum blockchain	Proposed static reachability analysis technique for EVM bytecode, that handles the complexity of EVM bytecode	Proposed tool EtherTrust, a static analyzer that analyzes large contracts in a few seconds. It is a tool provides security guarantee for EVM bytecode.

Liu, C. et al.(2018) [37]	-	The proposed model is based of fuzzing-based analyzer	Proposed tool ReGuard, a fuzzing-based analyzer that detects reentrancy bug in ethereum smart contract

IV. Research Gap Identified

1) **To identify importance of Ethereum in Block chain**.
   The importance of execution of Ethereum would be studied with the context of Block-chain. The role and importance of Ethereum would be investigated in the working of Blockchain.
2) **To investigate the execution of Smart Contracts and susceptibility of Smart Contracts to different types of Attacks.**
   The Study of execution of Smart Contracts would be carried out. During this study main focus would be on the susceptibility of Smart Contracts to different types of attacks. The detail study of these attacks would be carried out.
3) **To understand the working of Greedy contract Threat and it's impact on the working of Smart Contract.**
   One of the major attack Smart contract is suffering from is Greedy contract Threat. The study of Greedy contract Threat would be carried out along with the different dimensions including the way of attack, different methods used in executing this attack. Impact analysis of Greedy contract Threat on Smart Contract would be carried out.
4. **To develop new technique or improve existing technique/es for detecting Greedy contract Threat.**
   After studying existing techniques or methods to deal with Greedy contract Threat existing technique/es would be improved or new technique/es would be proposed.
   All these techniques are evaluated using evaluation metrics such as Accuracy, Precision, Recall and F-Score

V. Implementation Detail

Smart Contract testing is relatively complicated, as smart contracts often interact with each other, and any integration with a third-party system can lead to making the system vulnerable. Therefore, testing is often extended to other smart contracts that interact with the smart contract under test. The testing process includes static analysis, dynamic analysis and interaction analysis with other Smart Contracts, using advanced testing tools and manual reviewers. Methods used for vulnerability detection in smart contract include symbolic execution, formal verification, fuzzy testing, program analysis, taint analysis, ML-based methods RNN, LSTM, ABCNN. In order to implement the model for detecting vulnerability in ethereum smart contract advanced security scanning tools required to scan for vulnerabilities in smart contract. Following are steps to implement advanced security scanning tools for vulnerabilities detection in smart contract,

Step I To find the scope and content of work for the smart contract.
Step II Test the component in the smart contract, using advanced security scanning tools to detect common vulnerabilities.
Step III Simulate interactions with smart contract on the blockchain using a combination of automated testing tool to determine if any vulnerabilities exists.
Step IV Aggregate the result and check for accuracy, Precision, Recall and F-Score

After finding out the research gap from the literature survey an architecture has been proposed this is shown in Fig. 1,to classify greedy contract threat.

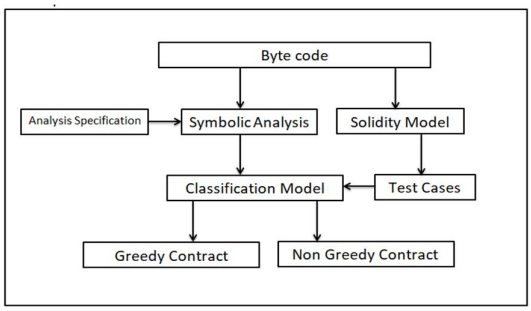

Fig.1 Architecture for greedy contract classification

VI. Conclusion

This proposed research addresses to the detection of vulnerabilities in smart contract and susceptibility of smart contract to different types of threats and attack. The primary objective of this paper is to find out research gap after carrying out literature survey of tools and techniques to find vulnerabilities in smart contract and identify greedy contract threat. The research gap identified then can be used to propose new technique for detecting vulnerabilities in ethereum smart contract which would be efficient and effective. Smart contract advanced security scanning tools would be developed to scan for vulnerabilities in smart contract.

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Curved Text Detection Methods for Scenic Images : A Review

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***Abstract*—The objective of this paper is to present a comprehensive exploration of deep learning based curved text detection methods. The main goal of text detection is to determine the position of text from input natural scenic image The position of the text area in the image is obtained using text detection and localization techniques. In this current era of deep learning, computer vision applications have evolved and taken new routes, such as smartphone translation technologies, supportive ways for the visually impaired, and so on. This paper is aimed at summarizing and analyzing the major changes and significant progresses of curved scene text detection and recognition in the deep learning era. This paper tends to highlight the Challenges arises in capturing and recognizing curved text from natural images. To identify publicly released scene image data sets as well as appropriate standard evaluation methods for scenic images.**

***Index Terms*— Deep learning, Scenic Images, Challenges, Curved text Detection methods, public curved text Dataset.**

I. INTRODUCTION

Text in natural settings can be found in almost every stage of life. From the facade of the buildings in our neighbourhood to the cover of a library book. Writing is undoubtedly one of mankind's most creative and powerful creations. In view of a variety of patterns, cluttered backgrounds, and text orientations, text detection in images collected in an unconstrained environment is significant but challenging computer vision task. This is a problem that both machine learning and deep learning techniques face. It has been found that Language difficulties, bounding box sizes, and text recognition in multidirectional and curved text images are major challenges which need to be addressed. Based on different research strategies and different existing deep learning approaches in specific ways, its performance when identifying curved characters (e.g., horizontal bounding boxes, rotated rectangles, or squares) decreases drastically. Therefore, the detection of curved text, which is quite common in natural situations, is of enormous importance. Deep learning based methods are sorted into two categories region proposal based methods and segmentation based methods [1] .

A. Region Proposal Based Methods

A region proposal for scene text identification is a convolution-based text detection approach that works from end to end. The proposal-based technique is primarily motivated by object detection frameworks in general. This

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approach targets the full-text region first, then applies horizontal/quadrilateral boxes, and then performs bounding box regression to provide correct coordinate offsets of anticipated text boxes. It can enable us to focus the component and then use CNN to detect and label items.

Advantages

1. For scene text detection in clutters, region proposal techniques are particularly efficient.
2. Multi-scale rectangular windows are concatenated over text appearances for more accurate text detection, and all of the windows are regressive with a high overlap fraction with text areas.
3 This approach is most commonly used in the wild with horizontal and multi-oriented aligned texts.
4. Some of the examples are RCNN, Faster -RCNN, SSD and YOLO.

Disadvantages

1. The proposal-based methods are mostly limited to simple texts with linear shapes.
2. It fails to detect curved texts accurately in most cases.

B. Segmentation Based Methods

Segment-based regression focuses on a portion of the texts, and for final identification, a merging approach is non-suppression. This approach targets the full-text region first, then applies horizontal/quadrilateral boxes, and then performs bounding box regression to provide correct coordinate offsets of anticipated text boxes.
subsequently, a non-suppression merging technique is applied for final detection

Advantages

1.In comparison to proposal-based strategies for irregular text identification, these methods are more flexible.
2. They can recognize text sections in a complicated environment with ease.
3. This approach aims to locate a tiny portion of text occurrences, which necessitates a limited receptive field of CNN baselines.
4. Some of the examples are YOLO, EAST, and Single shot multi box detector.

These methods are more flexible compared to proposal-based
techniques for irregular text detection. They can effectively detect text regions in complex
environment. These methods attempt to localize small part of text instances that requires
small receptive field of CNN baselines.
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small receptive field of CNN baselines.

Disadvantages

1. In the domain of text form, the linkage technique leads to more complicated algorithms and is more adaptable.
2. This strategy focuses on curved and multi-oriented texts in natural images.

II. Various Curved Text Detection Methods

In this section various models by different authors are covered for curved text detection methods Most of the scene text detectors are applicable for horizontal or multi-oriented text detection. It has been observed that performances of conventional approaches drop significantly in detecting curved texts in the wild Different models have different methodologies, bounding boxes with their performances. Some of the models and work done by the various researchers in this area are discussed from 2018-2022. Few of them are based on proposal-based methods and latter is based on segmentation-based methods

A. Proposal-Based Methods

Liao et al. (2018a) [2] implemented an end-to-end trainable fast scene text detector, named TextBoxes++, which detects arbitrary-oriented scene text with both high accuracy and efficiency in a single network forward pass. No post-processing other than efficient non-maximum suppression is involved. To overcomes the shortcoming of TextBoxes by introducing quadrilateral boxes instead of horizontally aligned boxes to detect linearly aligned scene.

Zhu et al. (2019) [3] have implemented a novel text detection algorithm for curved texts using bounding box regression method. In which candidate text proposals are generated using RPN and bounding box regression of text proposals are performed gradually in a two-stage manner, which produces more accurate text bounding boxes. The shortcoming of this method is that it can't achieve real-time detection compared with one-stage detector.

Liu et al. (2019 a) [4] designed a novel polygon-based curved text detector (CTD) for curve text detection. It represented a one-of-a-kind curved text detector based on polygons (CTD). It comprises of the regression module, the backbone, and the region proposal network (RPN) are the three parts. This approach is designed as a universal method, meaning it can be trained using rectangular angular or quadrilateral bounding boxes, requiring no extra effort. The curved text in this dataset is tightly labeled using polygons, which does not require significant manpower. Additionally, we proposed a novel CTD approach that may be the first attempt to directly detect curved text. An shortcoming of CTD is that it is slightly slower than a rigid rectangle-based detector.

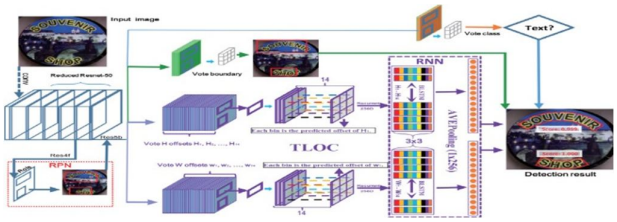

Figure 1: Overall structure of our Curve Text Detector (CTD) [1]

Xue et al. (2019)[5] proposed A multi-scale shape regression-based framework is designed by where central point of each candidate text proposal is identified using a triangulation method within polygon region. Then, distances from nearest boundary pixel to central pixel in both x and y direction are computed to produce a dense boundary of arbitrary shaped text instances. This method is claimed to be superior to general quadrilateral box regression methods that generally include additional background region. This method predicts dense text boundary points instead of sparse quadrilateral vertices that are prone to produce large regression errors while dealing with long text lines.

Chuang Yang et al.2021[6] proposed a Bidirectional Perspective strategy-based Network (BiP-Net) a new text representation strategy is proposed to represent text contours from a top-down perspective, which can fit highly curved text contours effectively. Moreover, a contour connecting (CC) algorithm is proposed to avoid the information loss of text contours by rebuilding interval contours from a bottom-up perspective. BiP-Net network mainly depends on the image scales, which means this method can run faster for smaller size images only.

Zobeir Raisi, et al.2022[7] end-to-end trainable architecture based on Detection using Transformers (DETR), this proposed method leverages a bounding box loss function that accurately measures the arbitrary detected text regions' changes in scale and aspect ratio. This is possible due to a hybrid shape representation made from Bezier curves, that are further split into piece-wise polygons. The proposed loss function is then a combination of a generalized-split-intersection-over union loss defined over the piece-wise polygons, and regularized by a Smooth-ln regression over the Bezier curve's control points.

B. Segmentation Based Methods

Xiqi Wang et.al. (2020) [8] proposed a novel method called Rotational You Only Look Once (R-(YOLO), a robust real-time convolutional neural network (CNN) model to detect arbitrarily-oriented texts in natural image scenes. It is a rotated anchor box with angle information is used as the text bounding box over various orientations. Then features of various scales are extracted from the input image to determine the probability, confidence, and inclined bounding boxes of the text. Finally, Rotational Distance Intersection over Union Non-Maximum Suppression is used to eliminate redundancy and acquire detection results with the highest accuracy.

Richardson et al. (2019)[9] have designed a segmentation-based model that approximately locate the text instances without processing all the pixels in the image, resulting in a robust and tighter text detection.

Xu et al. (2019a)[11] have proposed a novel text detection method where a VGG-16 based network learns a directional feld map consisting of 2-D vector (magnitude and direction) generated from an input image and finally using this directional information curved texts are obtained accurately from scene images.

Tang et al. (2019) [12] implement a seglink++ an arbitrary oriented text detection method is proposed using instance-aware text component grouping technique. In this multi-level features are extracted to predict text

components and estimate links between text components and then a grouping algorithm is applied based on estimated links to generate the final result.

Baek et al. (2019)[13] proposed a unique framework that localizes individual characters within text instances and subsequently group them based on affinity scores between adjacent characters to detect the entire text instance. Model is trained with character level ground truths generated from synthetic and real images. This model is more robust to text scales, as model localizes individual characters rather than whole text instance.

Li et al. (2018)[14] implemented a progressive scale expansion network (PSENet) as a segmentation-based shape arbitrary text detector, where text instances are initially shrunk to different scales and then progressively expands the kernels to enclose the entire text instance.

Long et al. (2018a)[15] proposed a novel text detection method for multi-oriented and curved texts using geometric feature estimation technique is reported in Here text instances are predicted using geometric properties of text regions.

Tang and Wu (2018) [16] proposed a lightweight segmentation framework consisting of two modules namely feature pyramid enhancement module (FPEM) and feature fusion module (FFM), where FPEM generates scale-wise feature maps from input image and FFM aggregates those multi-scale feature maps to generate final feature map. Then, a pixel aggregation method is applied to predict text instances on final feature map, where true pixels of text instances are aggregated with appropriate text kernels nearest to corresponding text instances. This method yields high accuracy and efficiency due to its low-cost segmentation process.

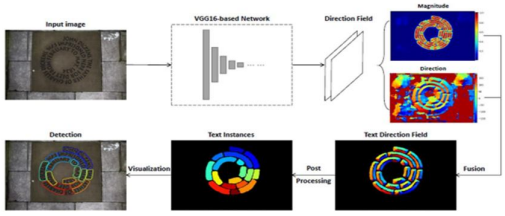

Figure 2 Pipeline and working principle of text detection model for curved text [16]

III. Related Challenges

There are various types of challenges that arise in both machine learning and deep learning techniques. Language challenges, text detection in curved and multi-directional text images, and the size of the bounding box are among these issues. Since the previous decade, the research community has nearly pushed itself into a deep learning environment, as the reliability of DNN models and has improved significantly. However, significant challenges must be addressed in addition to making deep learning models more resilient and efficient which will benefit both the academic community and our society.

Scene texts provide more challenges than document image analysis because of complex backdrop, uneven illumination and noise, and the existence of multiple scripts. These combined issues are the most significant obstacle to researchers creating a full scene text detection algorithm. In complicated scene scenarios, rigid picture capture, along with a diverse set of scene texts, presents a number of obstacles for reliable scene text localization. [24]. These challenges are discussed below.

Text heterogeneous in nature In terms of design, arrangement, orientation, and other characteristics, text in scene photos has more variety and unpredictability. Furthermore, natural scene photographs include text from many scripts, making text identification more difficult owing to the uneven pattern.

Backgrounds with an abundance of images The backgrounds of scene photographs are frequently quite complex in nature, making it difficult to locate the inscriptions in the images. For suitable text localization, scene texts that emerged as miscellaneous items in unconstrained contexts may necessitate complex and costly segmentation approaches. Also, items that appear to be letters and occlusion owing to noise, as well as uneven lighting effects, might cause confusion and incorrect detection.

Improper image acquisition Due to uncontrolled circumstances, picture acquisition in the outdoors cannot be flexible, and consequently scene photography and text instances may not be of high quality. Improper image capture, lens distance from the subject, and shooting angle might result in a lower and fuzzy text occurrences in the obtained image.

(4) **Algorithms customized to text** Over the last few years, scene text identification algorithms have gotten more object specific in terms of text alignment and style. Several published datasets are specifically designed for specific types of texts, such as multi-directional, blurred, and curved text, prompting researchers to construct text-specific algorithms instead of general text detectors.

IV. STANDARD CURVED DATASETS FOR TEXT DETECTION

Text with a curved is one of the most prominent observations in real-world scenarios. Despite its performance in multi-directional texts, scene text detection has yet to be completely explored in curved texts.

Total-Text [17] It allows us to create curved text along with horizontal and multi-oriented text. The dataset contains 1255 training images and 300 testing images. At the word level, a polygon with 2N vertices (N 2, 15) is implemented to annotate the images.

CTW-1500[18] It is a 1500-image collection (1000 train and 500 test). At the text line stage, each text detection annotation is a 14-vertex polygon that represents the text area. In text examples, both angled and horizontal texts are presented. Images are mostly captured using camera phones in both indoor and outdoor locations, as well as through the internet, digital image collections, containing English and Chinese languages.

CUTE80 [**19**] he first scene text dataset with a curve orientation is now available. There are a total of 80 curved text line photos, each with a unique backdrop, viewpoint deformation appearance, and small impact (in S, Z shaped text lines and circle). Images are captured with digital camera phones in both indoor and outdoor settings. With altering font size, color, perspective distortion, and so on, the backdrop of a text is complicated. On a line-by-line and word-by-word basis, this dataset has been annotated. It can handle curved character.

ICDAR'19-ArT dataset [89] is currently the largest

ICDAR'19-ArT[20] It's now the most extensive collection of scene text that may be changed in any way. Total-text and SCUT-CTW1500 are merged and expanded in a single package. Each of the new images has at least one arbitrary-shaped sentence. When it comes to text orientations, there is a lot of room for creativity. The ArT dataset is divided into two sections: a training set of 5,603 images and a testing set of 4,563 images. All English and Chinese text occurrences have been placed with tight polygons.

SCUT-CTW1500[21]. It is a difficult dataset to recognize curved text on natural images. It contains 1,000 training and 500 test images, with the majority of the text instances being in English and Chinese.

ICDAR 2019-ReCTS [22] The images in this dataset were captured from a street view Chinese signboard, the letters were largely set against a complex background with varied font styles and orientations. Cell phone cameras capture images in an unrestricted area. Because of its aesthetic approach, the layout of Chinese letters adds greater intricacy to the signboard.

MSRA TD 500[23] The MSRA Text Detection 500 Database (MSRA-TD500) is a collection of 500 natural images captured using a pocket camera in both indoor and outdoor (street) settings. Outside images typically consist of guide boards as well as billboards with a complicated backdrop, while indoor images mostly consist of signs, doorplates, and caution plates. The image sizes range from 1296x864 to 1920x1280 pixels.

KAIST [24] comprises of photographs taken in a variety of settings (Lee et al. 2010). The majority of the photographs are of indoor/outdoor scenes with uneven lighting effects. Multilingual text pictures are included in the collection. This dataset's GT is created at the pixel level.

DAST1500 [25] is a text detection dataset that aggregates commodities images from the Internet in a dense and arbitrary-shaped format, along with extensive descriptions of the goods on tiny wrinkled packet. There are 1,038 images for training and 500 images for testing. Polygons contain annotations only at text-line level.

The dataset is described using the various parameters. The following parameters are described in detail:

Various parameters used to represent the dataset are mentioned below:

a) Train is a tool that shows how many training pictures are in a dataset.

b) Test collection of test images for a given dataset is represented by test.

c) The text type in the dataset describes the type of text to be examine. These styles of text might be horizontal, multi-directional or curved text.

d) Script defines the form of script used in the dataset.

e) Train Instances is the amount of text instances examine for training the model.

f) Test Instances is the amount of text instances examine for testing the model.

g) The region from where the images are collected is known to as the source such as natural scenes, websites and image libraries (Google Open Image).

h) Environment Considered The characteristics considered while taking pictures from the surroundings are referred to as environmental circumstances.

TABLE I. COMMON CURVED DATASETS FOR NATURAL SCENIC TEXT DETECTION

Datasets	Number of Training set	Images Testing set	Text type	Script
Total text	1255	300	Horizontal and multi-directional text	English
CTW-1500	1000	500	Inclined texts and horizontal texts	English and Chinese texts.
SCUT-CTW1500	1000	500	Horizontal as well as multi-directional text.	English
CUTE 80	80	80	Multi-oriented	English
ICDAR'19-ArT	5,603	4,563	Arbitrary-shaped text.	Chinese and Latin scripts
ICDAR 2019-ReCTS	20,000	5,000	Chinese character test images	Chinese script
MSRA TD 500	300	200	Arbitrary orientations.	Chinese, English or mixture of both
KAIST	3000	-NA-	Multi-oriented	Multi-lingual
DAST1500	1038	500	Arbitrary-shaped text	English

V. PERFORMANCE EVALUATION

To show the validity of computer vision-based approaches, they must be verified on the technique. Every new approach is compared and assessed on the basis of a set of standard parameters known as performance matrices. Various criteria including as F-Measure, Precision and Recall are utilized to assess the text detection demonstration.

Precision (P) It is refers as the model's capacity to predict the text region with accuracy.

Recall (R) Recall (R) refers to the model's capacity to identify all true positive and recognized text items between all ground truth.

Intersection over Union (IoU) The approach may be used to measure accuracy and recall by directly employing between the truth and detection frames.

The mathematical expression to these Equation (1) and Equation (2) are used to calculate accuracy and recall:

$$P(D, G) = \frac{\sum_i IF(\max(I_O U Mat_{i,j}) > t)}{|D|} \quad (1)$$

$$R(G, D) = \frac{\sum_j IF(\max(I_O U Mat_{i,j}) > t)}{|G|} \quad (2)$$

Where G stands for truth boxes, D for detection boxes, t for threshold value, which is usually 0.5, and IF for logic function. Equation (3) is used to compute the IoU matrix for both the truth and detection frames

$$\text{IoU Mat } i, j = \frac{\sum i\ IF\ (area(intersection(Gi, Gj))}{\text{Area (union } (G_i, G_j))} \quad (3)$$

The cumulative average of precision P and recall R is provided by: Overall assessment metric (F).

$$F = (2 * P * R)/(P + R)$$

VI. CONCLUSIONS

Curved scene text detection is a challenging research area in computer vision and pattern detection that has both practical and theoretical applications. This paper examines current deep learning-based algorithms, as well as their performance measures and benchmarked curved datasets and issues in scenic images recognition. As the

study of computer vision and deep learning increases, natural scene text detection technology will begin to expand and research for even improved technical advances.

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Frequent Itemset Generation using Clustering

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***Abstract*—Data mining examines pre-existing large databases to generate new information. For large databases, research is needed to improve mining performance and accuracy, therefore, much of the current focus on association rule mining lies in new mining theories, algorithms, and mining algorithms. improve old methods. Association rules mining is a function of the data mining research domain and arouses many researchers' interest to design a highly efficient algorithm to mine association rules from transaction databases. With the increasing size of the database, we have a large amount of data, but unfortunately we cannot use raw data in our daily decisions/inferences. We desperately need specific information. This information is in most cases in the gathered data, but the extraction of it is a very time and resources consuming operation. In the single machine environment, the problems of Apriori and FP-Growth algorithm in large-scale data association rules mining are high memory consumption, low computing performance, poor scalability and reliability, choosing appropriate minimum support and so on. The purpose of this project is to introduce an improved FP-growth algorithm that will help to resolve the bottleneck problems of the traditional algorithm and has more efficiency than the original one. Therefore, we put forward a new implementation method which depends on a cluster based approach for mining frequent item sets to generate association rules and is verified by using real datasets. Experimental results show that the proposed algorithm was able to reduce the size of constructed trees and the execution time was significantly less than that of the conventional FP-Growth algorithm.**

***Index Terms*— Association Rule Mining, Clustering, Data Mining, FP-growth, Frequent Itemset Mining.**

I. INTRODUCTION

Digitization of all trades and markets has been achieved because the perfect documentation is available to every individual. Digital transformation and the resulting business model innovation has fundamentally changed consumer expectations and behaviour, putting enormous pressure on traditional businesses and disrupting many markets. So AI and machine learning (ML) became mainstream terms outside of the high-tech field, developers were encoding human knowledge into computer systems as rules that get stored in a knowledge base These rules define all aspects of a task, usually in the form of an "If" statement ("if A, then do B, else if X, then do Y"). While the number of rules that need to be written depends on how many actions you want the system to handle (e.g. 20 actions means writing and coding at least 20 manually), systems based on rules usually require less effort, more profit and less risk because the rules will not change or update on their own. While a rule-based system can be thought of as having "fixed" intelligence, a machine learning system on the other hand is adaptive and tries to emulate human intelligence. There is still a basic layer of rules, but instead of a human writing a

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fixed set of rules, the machine is capable of learning new rules on its own and discarding those that no longer work. In fact, a machine can learn in many ways, but supervised training - when the machine is fed data to train - is often the first step in a machine learning program. Eventually, machines will be able to interpret, classify, and perform other tasks on their own with unlabeled data or unknown information.
Rules based machine learning algorithms are helpful when simple rules don't apply - when there is no easily definable way to solve a task using simple rules; speed of change - when situations, scenarios, and data are changing faster than the ability to continually write new rules and Natural language processing - tasks that call for an understanding of language, or natural language processing.

II. Literature Review

Association rule mining [1] is an important data analysis method and data mining technology. Although the author proposed the Apriori algorithm, the algorithm uses an iterative process for the data subset and uses the candidate itemsets produced earlier to generate frequent itemsets later, which results in low efficiency of the algorithm and being difficult to be used in the mining of massive data.
The algorithm Pascal[2] which introduces a novel optimization of the well-known algorithm Apriori. Given a certain threshold of minsup, Pascal detects all the common patterns by performing as few counts as possible. To get support for larger models without accessing the database whenever possible, we use the knowledge of the support of some of their submodules,, the so-called key patterns. This method was implemented in the Pascal algorithm that is an optimization of the simple and efficient Apriori algorithm. Pascal's comparative test with the Apriori, Close and MaxMiner algorithms, each representative of the frequent pattern discovery strategy, shows that Pascal improves the efficiency of extracting frequent patterns from correlated and non-correlated data incur additional running time when data is weakly correlated.
This paper [3] discusses the approach of defining a new notion of cluster centroid, that represents the common properties of cluster elements. Thus, similarity within a cluster is measured using cluster representation, which also becomes a natural tool for finding an explanation of the cluster's population.
Their definition of cluster centroid is based on a data representation model which simplifies the one used in document clustering. In fact, we use compact representation of boolean vectors that states only presence and absence of items, while document clustering requires storing the frequencies of items (words). In this paper they show that using our concept of cluster centroid associated with jaccard distance we obtain results having a quality comparable with other approaches used in this task, but we have better performances in terms of execution time. In addition, cluster representatives provide an advanced explanation of cluster characteristics. A particular remark is due to the performance of our approach, which is relevant in case of real-time applications, e.g., clustering of search engine query results or web access sessions for personalization.
In these cases, response time is a fundamental requirement of clustering algorithms, and performances of traditional methods are unacceptable. An alternative to hierarchical methods is to exploit partitioning methods, such as KMeans and its variants, which are linearly scalable to the size of the dataset. However, these methods do not provide an exhaustive form for variable-sized datasets containing categorical data. Constrained frequent pattern mining algorithms on Hadoop platform based on the in-depth analysis of constrained frequent pattern mining algorithms is introduced[4]. First, three pairs of Map and Reduce functions are used to perform the entire process, including mapping transactions to frequent elements that aid in counting, building a constrained regularity tree, and so on. forced (CFPTree), mining frequent patterns, and aggregating frequent patterns results. A parallel mining algorithm of the constrained frequent pattern, called PACFP, is proposed using the MapReduce programming model. We are proposing a load balancing strategy based on frequent item support. The experiments confirm the usability of the algorithm and the load balancing strategy using the celestial spectral dataset. Frequent Pattern Mining (FPM) is emerging as a significant approach to discover fascinating knowledge concealed in the data[5]. With the advancement of big data, growth of the dataset size has increased tremendously. For this reason, traditional algorithms cannot scale to achieve better performance. To achieve better scalability, MapReduce framework is introduced. Execution time for FPM is another major shortcoming in big data mining. To solve this problem, Hadoop with Map Reduce Model is used.
This paper [6] envisages that digitization of data or documents were a revolutionary change which brought out major advancements in almost all sectors. In today's world, digital documents or data have replaced traditional book keeping and data collection methods. The Internet is one of the major areas where a lot of unstructured high dimensional digital documents/data are found. The rate of growth of digital data has made it tough for us to classify or to cluster documents. Document clustering refers to dividing data into similar groups, each of which has similar objects. The clustering is done in such a way that documents present inside a cluster will have higher

degree of similarity and for the documents that are present in different clusters will have lower degree of similarity.

Knowledge discovery in databases (KDD) which is defined as the non-trivial extraction of valid, implicit, potentially useful and ultimately understandable information in large databases [7][12]. In this paper, the problem of the efficiency of the main phase of most data mining applications is addressed: The frequent pattern extraction. This problem is mainly related to the number of operations required to count support models in the database and we propose a new method, called model counting inference, that allows them to perform as few support counts as possible. Using this method, the support of a pattern is determined without accessing the database whenever possible, using the support of some of its sub-patterns called key patterns.

FP-growth algorithm as the representative of non-pruning algorithms is widely used in mining transaction datasets [8]. But it is sensitive to the calculation and the scale of datasets. When building an FP-tree, the search operation as the major time-consuming operation has a higher complexity. And when the horizontal or vertical dimension of the data set is larger, the mining efficiency will be reduced or even failed. Mining association rule is one of the recent data mining research [9] [10][11][13][14]. Association rules are commonly used in marketing, advertising, and inventory control. The association rules detect the current usage of the elements. This problem is fueled by applications known as market basket analysis to find relationships between items purchased by customers, i.e. what types of products tend to be purchased together. This paper presents an efficient partitioning algorithm to extract frequent item set (PAFI) using clustering technique. This algorithm finds frequent itemsets by partitioning the database transactions into clusters. Clusters are formed based on measures of similarity between transactions. Then it finds the frequent itemsets with the transactions in the clusters directly using the improved Apriori algorithm which further reduces the number of scans in the database and hence improves the efficiency.

III. Existing System Models

Association rule mining finds interesting associations and relationships between large sets of data elements. This rule indicates how often a set of items occurs in a transaction. A good example is market-based analysis. Market-based analysis is one of the main techniques used by major relationships to show associations between products. It allows retailers to identify relationships between items that people often buy together. Given a set of transactions, we can find rules that will predict the occurrence of an item based on the occurrence of other items in the transaction. A supermarket will show that if a customer buys onions and potatoes together, they are likely to also buy a hamburger. This information may be used as the basis for decisions regarding marketing activities, such as promotional pricing or the creation of combined offers or product placement. Also, learning association rules often doesn't take into account the order of elements in a transaction or from one transaction to another.

Following the original definition by Rakesh Agrawal, Tomasz Imieliński and Arun Swami the problem of association rule mining is defined as: Let $I = \{ i_1 , i_2 , \dots , i_n \}$ be a set of n binary attributes called items; Let $D = \{ t_1 , t_2 , \dots , t_m \}$ be a set of transactions called the database. Each transaction in D has a unique transaction ID and contains a subset of the entries in I. A rule is defined as an implication of the form : $X \Rightarrow Y$, where $X , Y \subseteq I$ and a rule is defined only between a set and a single item, $X \Rightarrow i_j$ for $i_j \in I$.

Few real-world use cases for association rules:

- Retail - Retailers can collect data about purchasing patterns, recording purchase data as item barcodes are scanned by point-of-sale systems. Machine learning models can look for co-occurrence in these data to determine which products are most likely to be purchased together. The retailer can then adjust its marketing and sales strategy to take advantage of this information.
- User experience (UX) design - Developers can collect data on how consumers use a website they create. They can then use the links in the data to optimize the user interface of the site by analyzing where users tend to click and what maximizes their chances that they engage with a call to action.
- Entertainment - Services like Netflix and Spotify can use association rules to fuel their content recommendation engines. Machine learning models analyze past user behavioral data to find frequent patterns, develop association rules, and use those rules to recommend content that users are likely to interact with or organize content in a way that is likely to put the most interesting content for a given user first. Regular pattern mining algorithms have been applied in many fields. Studying their systems model can help to better understand these.

Figure 2.1 shows the process of the system model. Users can get the necessary knowledge to get through the data mining process through the data mining platform. The data mining platform includes a data definition, a data mining designer, and a model filter. Through data definition, we can perform data pre-processing and make

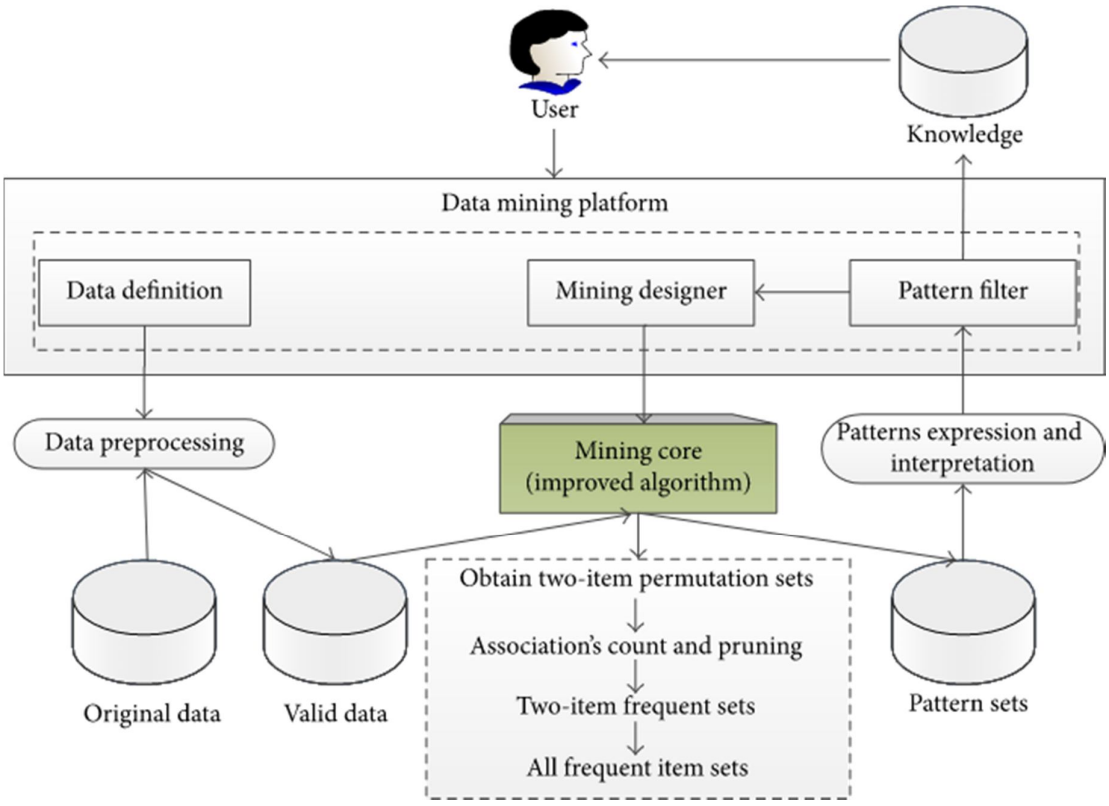

Figure 2.1. System Model

incomplete data usable; thanks to the data mining designer, we can use improved algorithms to dig into the data and get useful patterns (this is a set of frequent items); through the pattern filter we can choose interesting patterns among the obtained samples.

IV. PROPOSED SYSTEM

In this research paper, an efficient Partition Algorithm for Mining Frequent Itemsets (PAFI) using clustering is proposed. This algorithm finds the frequent itemsets by partitioning the database transactions into clusters. Clusters are formed based on the similarity measures between the transactions. Then it finds the frequent item sets with the transactions in the clusters directly using an improved Apriori algorithm which further reduces the number of scans in the database and hence improves the efficiency. By further experiments the efficiency can be increased to a significant level.

Figure 4.1 shows the various preprocessing steps applied on the dataset and then the data is pruned based on the clustering method that will be explained. Thus the size of the dataset is reduced. The final step of this algorithm is applying frequent pattern growth on this newly obtained pruned dataset as shown.

Clustering is a data mining technique used to place data items into related groups without prior knowledge of the clustering definition. Clustering can be considered as the most important unsupervised learning problem; so, like any other problem of its kind, the problem is finding structure in unlabeled data sets. Thus, a cluster is a collection of objects that are "similar" to each other and "dissimilar" to objects belonging to other clusters. We used clustering as a processing technique to truncate the data. The various steps in the implementation part are :

- One hot encoding on the dataset:

One hot encoding is a process by which categorical values can be converted into binary values so that it can be applied to machine learning algorithms.

In our case the input dataset which consists of several transactions each containing different itemsets is converted into binary values. This is done for ease of implementation and for the fact that many machine learning algorithms cannot run on categorical values.

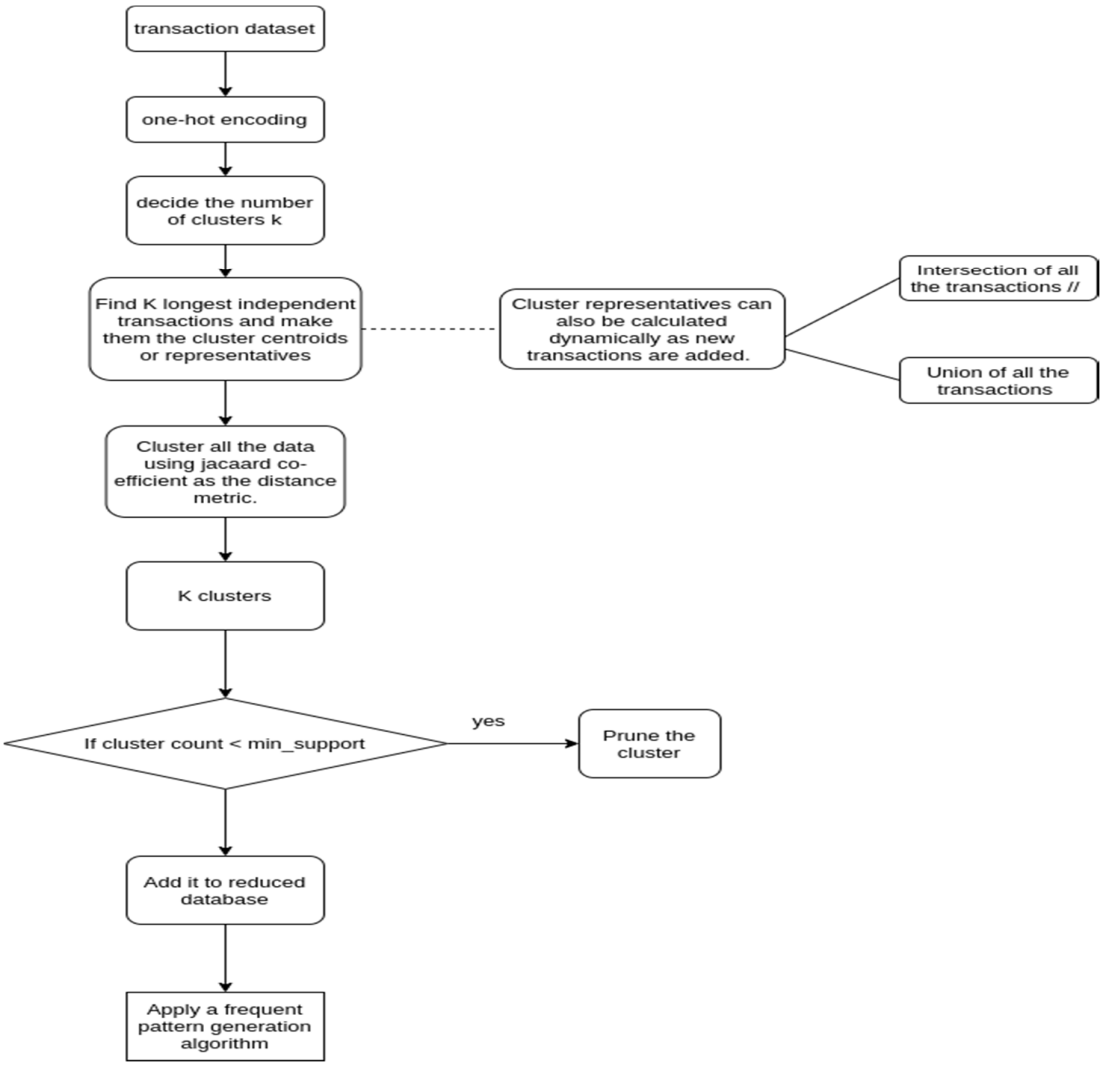

Figure 4.1. Flow Char

- Dissimilarity measure:

The standard approach used to deal with transactional data in clustering algorithms is that of representing such data by means of fixed length Boolean attributes.

Example 2. Let us suppose I = {a1,...,a10}. Itemsets I1 is represented as I1 = {a1, a2}, I2 = {a1, a2, a3, a5, a6, a7} and I3 = {a4} by means of the following vectors:

I1 [1, 1, 0, 0, 0, 0, 0, 0, 0, 0]
I2 [1, 1, 1, 0, 1, 1, 1, 0, 0, 0]
I3 [0, 0, 0, 1, 0, 0, 0, 0, 0, 0]

In this representation, position i of the boolean vector represents object ai. A value 1 corresponds to the presence of ai to the transaction, while a value 0 corresponds to its absence.

In the above example, I2 is more similar to I1 than to I3, since there is a partial match between I1 and I2 and, by the converse, I2 and I3 are disjoint. Now, the above disparity measures take into account both the presence and absence of an element in a transaction. As a consequence, sparse transactions (i.e., transactions containing a very small subset of I) are very likely to be similar, even if the items they contain are quite different.

Dissimilarity measure used by us is called Jaccard Coefficient, that computes the number of elements in common of two documents, and Cosine similarity that measures the degree of orthogonality of two document vectors. A distance measure can be straightforwardly defined from these measures. For example, we can define d(x, y) = 1

− s(x, y). In the simplified hypothesis that term-vectors do not contain frequencies, but behave simply as boolean vectors (like in the case of web user sessions), a more intuitive but equivalent way of defining the Jaccard distance function can be provided. Given two itemsets I and J, we can represent d(I,J) as the (normalized) difference between the cardinality of their union and the cardinality of their intersection:

$$dJ(I,J) = 1 - |I \cap J| / |I \cup J|$$

This measure captures our idea of similarity between objects, that is directly proportional to the number of common values, and inversely proportional to the number of different values for the same attribute.

Cluster Representative

Given a set S = {x1,...,xm}, i xi ⊆ rep(S).

We have used the intersection of all the transactions over the union to calculate the cluster representative,the intersection does not necessarily correspond to the cluster representative. Again, it can be impractical to approximate the cluster representative with the intersection. With dense population clusters, it is easy to have an empty intersection. On the other hand, the cluster representative cannot be empty.

Perform pruning

We can then perform pruning on the dataset based on the cluster representative obtained. As there are k clusters obtained we can divide the dataset into k clusters. This is done by finding if the support count of the item in a transaction is less than minimum support then it can be pruned,if not it is added to the cluster on the basis of the length of the transaction

Apply FP growth algorithm

Conventional Frequent Pattern growth algorithm is then applied on this pruned dataset and the results obtained are compared with the result obtained by applying the algorithm without the clustering part.

V. TESTING

Testing is the process of analyzing a software item to detect discrepancies between existing and required conditions and to evaluate the characteristics of the software item. The purpose of testing is verification, validation and error detection in order to find problems and the purpose of finding those problems is to get them fixed. Software Testing forms an important activity of software development and maintenance. It is the process used to help identify the correctness, security and quality of developed computer software. Testing is a technical investigative process that provides stakeholders with information about the quality of the service or product being tested. This includes the process of running a program or application for the purpose of finding errors. Software bugs will almost always exist in any moderately sized software module: not because programmers are careless or irresponsible, but because the complexity of the software is often impossible solvable. Tests can be used as measurements. It is widely used as a tool in the verification and validation process. Testers can make claims based on interpretation of the testing results, which either the product works under certain situations, or it does not work. This chapter throws light on the testing done and the results obtained and their comparison to suffice the facts of opting a particular method or approach in ultimately designing this project.

The analysis is done with the help of two datasets. The first data set is T20I6D100K which has a transaction count of 99921, it comprises 893 unique items and 19.90 is the average item count per transaction. The second data set is Market Basket Dataset which has a relatively smaller transaction count of 7500 , it comprises 120 unique items and 3.6 is the average item count per transaction.

For example - { burgers, meatballs, eggs } is a transaction wherein burgers, meatballs and eggs are the items.

Figure 5.1 and 5.2 show the snapshot of both the data sets.

VI. RESULTS AND DISCUSSION

Aim of research is to provide a feasible user-friendly solution to solve the problems occurring due to limitations of the traditional FP Growth algorithm. The findings of the test are shown in the Table 6.1 and Table 6.2 for the T20I6D100K dataset and the Market Basket dataset respectively.

Comparisons were made for both the algorithms and then the graphs were plotted in accordance to the results obtained. Figure 6.1 and Figure 6.2 are Time vs Support Count comparisons for Dataset 1 and 2 respectively. Figure 6.3 and Figure 6.4 are Dataset Size vs Support Count comparisons for Dataset 1 and 2 respectively.

752	826	834					
720	752	834					
685	751	801	811	852			
685	751	801	811	852			
661	695	716	721	727	747	938	
641	721	948	980				
641	721	948	980				
624	654	691	702				
615	630						
601	856	900	938				

Figure 5.1 Datasets

burgers	meatballs	eggs			
chutney					
turkey	avocado				
mineral water	milk	energy bar	whole wheat rice	green tea	
low fat yogurt					
whole wheat pasta	french fries				
soup	light cream	shallot			
frozen vegetables	spaghetti	green tea			
french fries					
eggs	pet food				

Figure 5.2 Datasets

TABLE 6.1 T20I6D100K DATASET

Support Count	Dataset Size	Pruned Dataset Size	Time taken for FP Growth without Clustering (in mins)	Time taken for FP Growth with Clustering (in mins)
1000	99921	96397	15.11	14
2000	99921	70191	13.5	6.3
3000	99921	37534	10.5	1.17
4000	99921	17343	7.0	0.11
5000	99921	5658	3.47	0.0151

TABLE 6.2 MARKET BASKET DATASET

Support Count	Dataset Size	Pruned Dataset Size	Time taken for FP Growth without Clustering (in mins)	Time taken for FP Growth with Clustering (in mins)
150	7500	7483	0.25	0.35
350	7500	7273	0.15	0.15
700	7500	6131	0.0371	0.0218
1050	7500	4979	0.0259	0.01426
1400	7500	4630	0.0123	0.006857

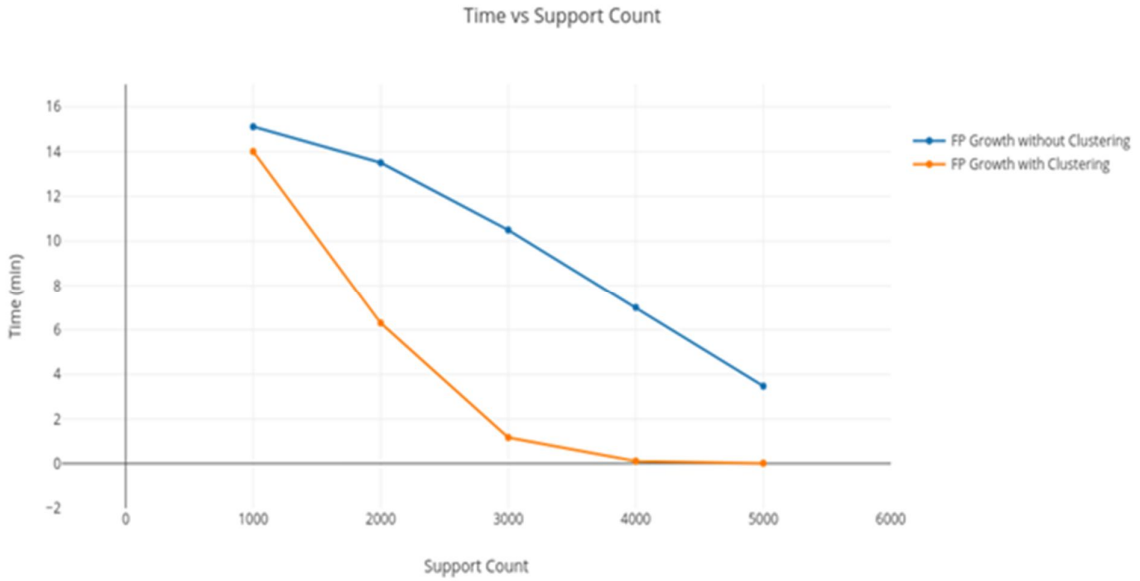

Figure 6.1 Comparison of proposed FP Growth with clustering and the existing FP growth without clustering algorithms

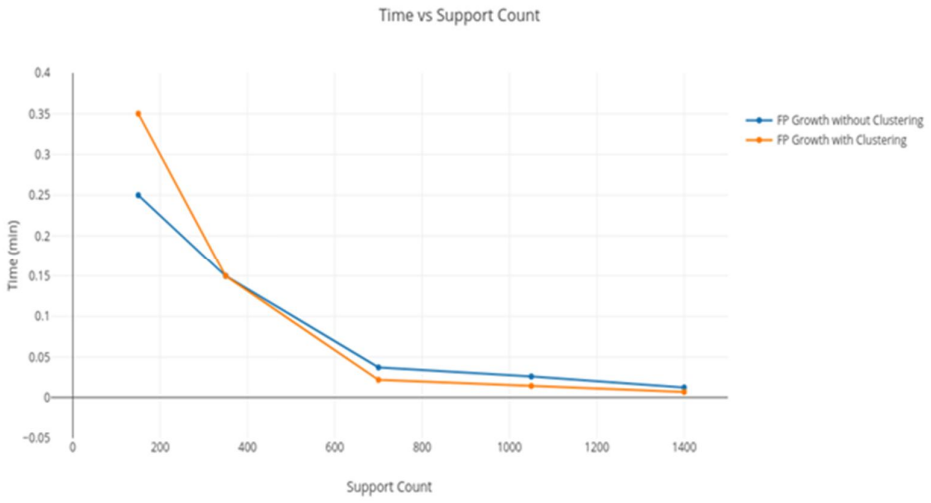

Figure 6.2 Comparison of proposed FP Growth with clustering and the existing FP growth without clustering algorithms

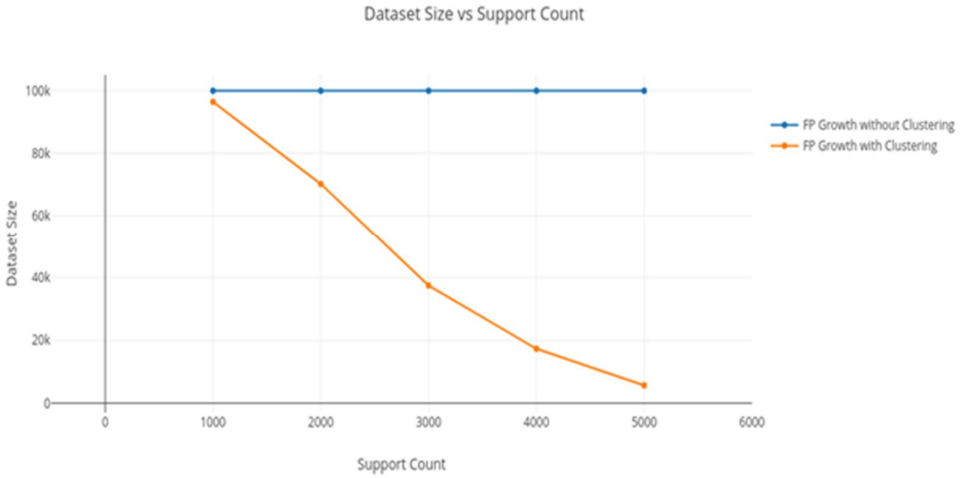

Figure 6.3 Comparison of proposed FP Growth with clustering and the existing FP growth without clustering algorithms

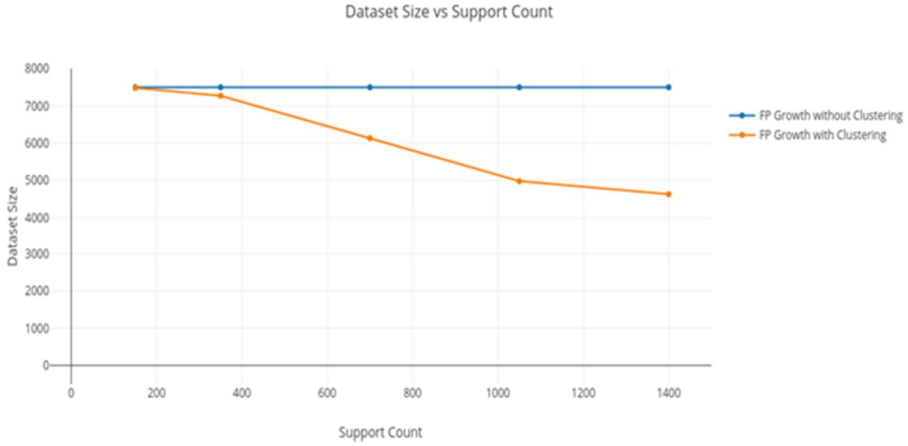

Figure 6.4 Comparison of proposed FP Growth with clustering and the existing FP growth without clustering algorithms

The above mentioned test results and graphs give a clear idea of the overall system. They help to identify the possible outcomes. The tables provide a clear picture on which functionalities are successful and their comparison with the original algorithm. Overall, the tables summarize the benefits rendered by the proposed algorithm and the graphs showcase the various comparisons.

VII. Conclusion and Future Scope

This project proposes a modified version of the FP Growth algorithm, a method wherein the trivial transactions are pruned on a cluster based method. The transactions comprising the database are divided into various clusters and then pruned according to the chosen support count. The algorithm is applied over a dataset with multiple support counts in order to get the optimal result and the same is shown in the results. The FP Growth algorithm is applied on the database to get an optimized and more efficient result. The results are presented in tabular form and graphs are plotted with respect to multiple variables for both the original and the proposed algorithm. In this project we have applied this algorithm on two datasets of varying size and detailed observations from both the datasets are mentioned in this report.

The research can be improved in the future by increasing the time and speed by using parallelization and by using map reduce.

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Design and Performance Analysis of Digital FIR Filter based on PSO Algorithm using MATLAB

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***Abstract*—Filter has an important role in digital signal processing which is basically used in the applications for the minimization of distortion in the system. For transmitting and receiving of unaffected signal, the designing of filters is required, those eliminate the distortion from the desired signal efficiently and no noise be added in signal processing itself. The various important uses of the digital filter has strained the researchers, engineers, and scientists to design such filters with spontaneous, capable, rapid techniques by the usage of advanced technology with intelligent tools. F.I.R filters are more favored over IIR filters due to linearity in the phase response and frequency stability. Various windowing functions are existing i.e Hamming, Rectangular, Blackman, Hanning, Flat-top etc but the Kaiser-window function is more advantageous due to the variable parameters to control width of main lobe and to attenuate side band ripples. Various optimization algorithms may be utilized and the researchers analyze advantages and disadvantages. Particle Swarm Optimization algorithm(P.S.O) is become a known malleable method based on Swarm-Intelligence, mainly particle's population in search space. P.S.O enhance the features of result by renovate the position and velocity of swarms. Optimized group of filter coefficients have been generated using P.S.O algorithm that provide the improved result in the stop and pass band. Digital FIR filter has been fabricated in this paper by using Blackman, Flat-top and Kaiser window function. The designed filter i.e. FIR using Kaiser window function provides the improved results. PSO algorithm has been applied on designed filter to further optimize the design in MATLAB. Results obtained by using PSO show that devised F.I.R filter is superior than earlier devised F.I.R filter with reference to frequency spectrum.**

***Index Terms*— Finite Impulse Response (F.I.R) Filter, Particle Swarm Optimization(P.S.O), Swarm Intelligence (S.I), Blackman, Flat-top, Kaiser window Functions.**

I. INTRODUCTION

Digital signal processing (DSP) is most trending field, as the signal generation, its transmission and recovering the desired signal/audio/image/video is of prime importance. A lot of noises, interferences are generally mixed with the desired/ transmitted signal. It is the utmost priority to recover desired signals/images/videos. The filter is normally utilized to eliminate undesired distortion arise during operation of video, image and signal at any level i.e. sources, transmission and destination of communication system. Digital filter is beneficial and skilled for efficiently removing distortion from the distorted signal. FIR and IIR filters are the classification of digital

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filters [1-4]. Based upon dimension of information, classification of filter is one-dimensional (1D) for signal and two dimensional (2D) filters for image processing. Various windowing functions are existing but Kaiser Window function is more advantageous as contains variable parameters [5]. To solve these problems and to perform optimization process efficiently, signal processing requires a systematic and effective algorithm. Differential evolution[6] and genetic algorithm[7] are also popular multi-objective algorithms. Many optimization problems are solved by other algorithms like Artificial Bee Colony and ant colony optimization[8]. As various type of optimization problems can be interpreted by most of the meta-heuristic algorithms but they have many drawbacks too, such as many parameters used to be tuned, requirement of fine programming skills, high estimation cost and conversion of algorithms into binary forms. Swarm algorithms are used to interpret the optimization problems of real world. PSO is well known as well as among the most trusted swarm based algorithms[9]. The easy implementation, coding, limited controlling parameters and flexible & easy to hybridize with other optimization algorithms are the main reasons behind the popularity of PSO. Different performance may occur due to a minor alteration in controlling parameters. In PSO, set of swarm particles utilized and all particles keep their finest result in process of optimization. With right choice, PSO meets the optimized result proficiently.

Remaining paper is organized as follows: section II describes the literature review. Section III describes FIR filter design and mathematical representation. In section IV F.I.R filter design using P.S.O is discussed. Section V presents discussion and results. Section VI describes conclusions.

II. Literature Review

In this research paper, new techniques like subsection sampling and proposed FIR filter for the realization of the TDA function. This is to help in the extraction of required periodic components from a signal contain noise [10].

In this research paper, real time audio signal analysis and reduction of noise present in the information signal is performed using digital filtering techniques. Digital Finite Impulse Response filter, IIR filter, and Wavelet transform are employed [11].

In this research paper, various filtering techniques are utilized to minimize noise effects in ECG signal. FIR filter as LPF is presented, which helps to decrease attenuation in the ECG signal. FIR eliminates the high-frequency components and as LPF removes the noise at a low level from the ECG signal. Moving average filter (MAF) takes the average values of the signal and produces desired signal [12].

In this research paper, the uses of digital filters are elaborated for communication system. It is required to design an efficient digital FIR (finite impulse response) filter with proper window function. Window functions such as Blackman, Triangular, Rectangular, Kaiser, Hanning and Hamming are used for the designing of digital FIR filters [13].

In these research papers, reviews of research on Particle Swarm Optimization and specific applications are being discussed. [14], [15]

In this research paper, authors reviewed existing PSO variants. After reviewing latest papers and research on P.S.O, PSO is being considered in uninterrupted search space by authors. In this paper, many crucial attribute like PSO applications and binary form have not mentioned during optimization problems[16].

In this research paper, P.S.O parameters have been customized. P.S.O is appeared as excellent tool to optimize. Although, PSO undergo from premature convergence. Authors offered their work to use P.S.O for many technical/general outcomes. [17]

In this research paper, two dimensional filters using S.A & P.S.O is given by authors. Research is foundation upon integrating the limited search of S.A & universal search of P.S.O to control weaknesses of algorithm. [18]

In this research paper, devising of L.P.F.I.R filter with Kaiser window function has been projected by the authors. Authors used beta (β). Authors made the comparative reading of diverse order of filter to manage transition bandwidth. [19]

In this research paper, Particle Swarm Optimization (PSO) is used in designing of low pass FIR filter. The designing of filter depends on the excellent result found from the P.S.O for co-efficients. Velocity vectors have customized so particle vectors be enhanced results. These improved solutions develop the better result quality acquired by P.S.O algorithm. [20]

In this research paper, authors describe improvement of malleable equalizer using Q.P.S.O. Conduction of P.S.O has been compared to Constant Weight Inertia PSO, Least Mean Square (LMS) P.S.O algorithm to verify effectiveness of P.S.O. Authors observed that QPSO improves performance. [21]

In this research paper, survey of the linear phase L.P.F.I.R filter has been described. P.S.O algorithm & customized inertia-weight of P.S.O is used towards improvement of swarm's searching ability. Here, it is

asserted, P.S.O simulation executes nice in comparison to remaining methods. Exact Coefficient and fast convergence can be achieved with P.S.O algorithm. [22]
In this research paper, PSO has been utilized to devise Low Pass F.I.R filter. By using PSO, excellent filter's coefficient has acquired. In this, writers claimed, "P.S.O is an easy swarm optimization method to optimize multidimensional difficult technical confront. [23]
In this research paper, filter has been devised & made comparison between different parameters & coefficients. Grasshopper Optimization algorithms (GOA) is taken to optimize the concert. L.P.L.P.F.I.R filter is devised by G.O.A. Design of L.P, H.P, B.P, and B.S filter has been described. Writers declared that ripples have been compacted the use of G.O.A. [24]
In this research paper, PSO has been used for the designing of FIR filter. The performance of A.R.P.S.O & C.R.P.S.O has been compared using MATLAB to design F.I.R filter. Performance has been matched to P.M. Acquired solutions shows that PSO-based algorithm performs better while designing linear phase FIR filters regarding RMS error & frequency spectrum. [25]
In this research paper, broad analysis of many optimization techniques for devising F.I.R & I.I.R has been obtained. Nature inspired methods to optimize difficult engineering issues have been discussed. Authors explained various optimization algorithms like Swarm Intelligence (SI), Genetic Algorithms (GA), Artificial Bee Colony (A.B.C), Particle Swarm Optimization (P.S.O), Grasshopper Optimization Algorithm (G.O.A), Cuckoo Search (C.S), Ant Colony Optimization (A.C.O), Biogeography-based optimization (B.B.O), Bacterial foraging optimization (B.F.O), Bat Algorithms (B.A)

III. Design of Finite Impulse Response Filter

Filter, whose impulse response is of finite time period is called finite impulse response (F.I.R) filter [28], [29]. Impulse response is finite as any feedback has not been provided to filter. Single dimensional digital F.I.R filter is illustrated by transfer function H(z) is:

$$H(Z) = \sum_{n=0}^{N-1} h(n) z^{-n} \quad (1)$$

$$H(z) = \square(0) + \square(1) z^{-1} + - - + \hbar\,(n) z^{-(N-1)} \quad (2)$$

Where N is filter length of the impulse response $h(n)$. Output y(n) in time domain is

$$y(n) = x(n) * h(n) \quad (3)$$

And output Y(z) in frequency domain is,

$$Y(z) = X(z)\, H(z) \quad (4)$$

In equation (3) & (4), $x(n)$ & X(z) are inputs in time & frequency domain . Freq. response of single dimensional F.I.R filter is;

$$H(w_k) = \Sigma\, h\,(n)\, e^{-jw_k n} \quad (5)$$

Where $w_k = 2\pi k/n$; (w_k) is F.T complex vector. Frequency $[0, \pi]$ sampled to N values.

A. Blackman Window

Time domain sequence of the Blackman window is:

$$w(n) = 0.42 - 0.5\cos\left(\frac{2\pi n}{M-1}\right) + 0.008\cos\left(\frac{4\pi n}{M-1}\right), \quad 0 \le n \le M-1 \quad (6)$$

Where, M is N/2 when N is even and (N+1)/2 when N is odd,
$M \le n \le N-1$, has achieved as reflecting 1st half around midpoint due to symmetry of Blackman. Symmetric method is a favorite technique while Blackman Window used to devise F.I.R filter.
Where M denotes length of a filter and n denotes time. Periodic Blackman Window designed using broadens required window length with single sample to N+1, designing symmetric window by removal of last sample. Favorite technique to use Blackman window in spectral analysis is periodic version as Discrete Fourier transform considers the periodic extension of an i/p vector.

B. Flat top Window

Flat top window is the summation of cosines. Co-efficients of flat top window are calculated by given equation:

$$w(n)=a_0 - a_1 cos\left(\frac{2\pi n}{N-1}\right) + a_2 cos\left(\frac{4\pi n}{N-1}\right) - a_3 cos\left(\frac{6\pi n}{N-1}\right) + a_4 cos\left(\frac{8\pi n}{N-1}\right) \quad (7)$$

Where $0 \leq n \leq N-1$. Values of co-efficients are

$a_0 = 0.2155789, a_1 = 0.4166316, \ a_2 = 0.27726316, a_3 = 0.8357895, a_4 = 0.00694737$

Flat-top window has low pass-band ripples (<0.01dB) and used mainly to calibrate function.

C. Kaiser window

It approximates prolate spheroidal window i.e. pointy instead of squashed. Basically, it is ratio of main-lobe to side-lobe energy. β manages relative side-lobe attenuation. Parameter β, side-lobe attenuation is rigid with respect to the window length.

Kaiser statement (n,beta) calculate the length n and parameter β. Co-efficients are calculated as

$$w(n) = \frac{I0\left(\beta\sqrt{1-\left(\frac{n-\frac{N}{2}}{\frac{N}{2}}\right)^2}\right)}{I0(\beta)} \quad \text{for } 0 \leq n \leq N \quad (8)$$

Where, I0 is zero order updated Bessel functions.

$$\text{length } L = N + 1 \quad (9)$$

Bessel i(0, beta * sqrt (1-(((0:L-1) - (L-1)/2) / ((L-1)/2)).^2)) / Bessel i(0, beta)

Kaiser Window has utilized for designing of F.I.R. filter. B is utilized to attain relative side lobe attenuation of α dB.

$$\beta = (0.1102(\alpha - 8.7)) \ ; \quad \text{for } \alpha > 50 \quad (10)$$

$$\beta = 0.5842(\alpha - 21)^{0.4} + 0.07886(\alpha - 21) \quad for \ \ 50 \geq \alpha \geq 21 \quad (11)$$

$$\beta = 0 \ ; \ \text{for } \alpha < 21 \quad (12)$$

$$n = \frac{\alpha - 8}{2.285\Delta w} + 1 \quad (13)$$

IV. PSO Algorithm in FIR Filter Design

P.S.O was introduced and used as continuous real valued algorithm [30]. Swarm of element revolves in D-dimensional search space to find an optimal solution. Particle (i) tends to store the current velocity vector

$$V_i = [v_{i1}, v_{i2}, \ldots, v_{iD}] \quad (14)$$

Current position vector stored as

$$X_i = [x_{i1}, x_{i2}, \ldots, x_{iD}] \quad (15)$$

P.S.O has started by taking arbitrarily X_i & V_i. After every iteration, particle attains excellent position i.e.

$$iPbest_i = [Pbest_{i1}, Pbest_{i2}, \ldots, Pbest_{iD}] \quad (16)$$

Finest position attained to swarms

$$Gbest = [Gbest_1, Gbest_2, \ldots, Gbest_D] \quad (17)$$

Updated position and velocity of particle is given below:

$$v_{id}(t+1) = [v_{id}(t) + c_1 r_1 (Pbest_{id}(t) - x_{id}(t)) + c_2 r_2 (Gbest_d(t) - x_{id}(t))] \quad (18)$$

$$x_{id}(t+1) = x_{id}(t) + v_{id}(t+1) \quad (19)$$

V. Results and Discussions

A F.I.R L.P.F is designed in MATLAB Simulink using DSP toolbox. The table-1given below illustrates the specified parameters utilized to devise digital F.I.R filter. Table includes structure type, response, designing method, filter order and frequency specification for digital filters. The FIR filter was designed using these parameters for both Blackman and Flat top windows. [31]. Magnitude response of the designed filter for both windows are revealed in diagrams (1 & 2) given below.

The table-2 given below describes the specified parameters utilized to devise digital F.I.R filter using Kaiser window. Table includes variable parameter beta, length of window function, max. & min. amplitude in time domain and main lobe width and side lobe attenuation in frequency domain for digital filters. [32]. Magnitude Response of devised filters for Kaiser window is given below in fig (3).

TABLE I-FIR FILTER PARAMETER SPECIFICATIONS FOR BLACKMAN AND FLAT TOP WINDOW

Filter Parameter	Value
Structure	Direct FIR Filter
Response	Low Pass Filter
Devise Method	Flat top and Blackman window
Filter order	34
Frequency Specification	(0-1) Normalized
Cut-off frequency	0.2

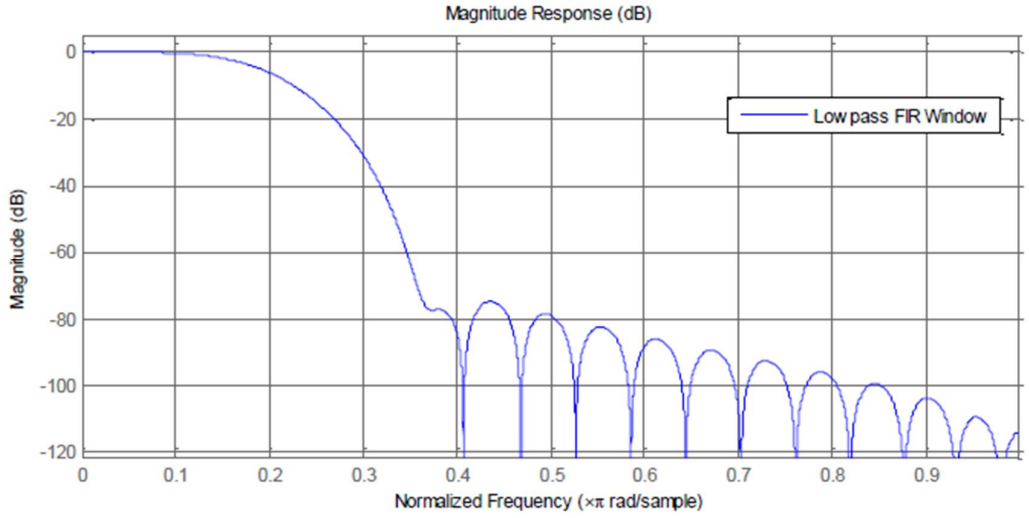

Fig.1 Magnitude Response (dB) of F.I.R for Blackman window

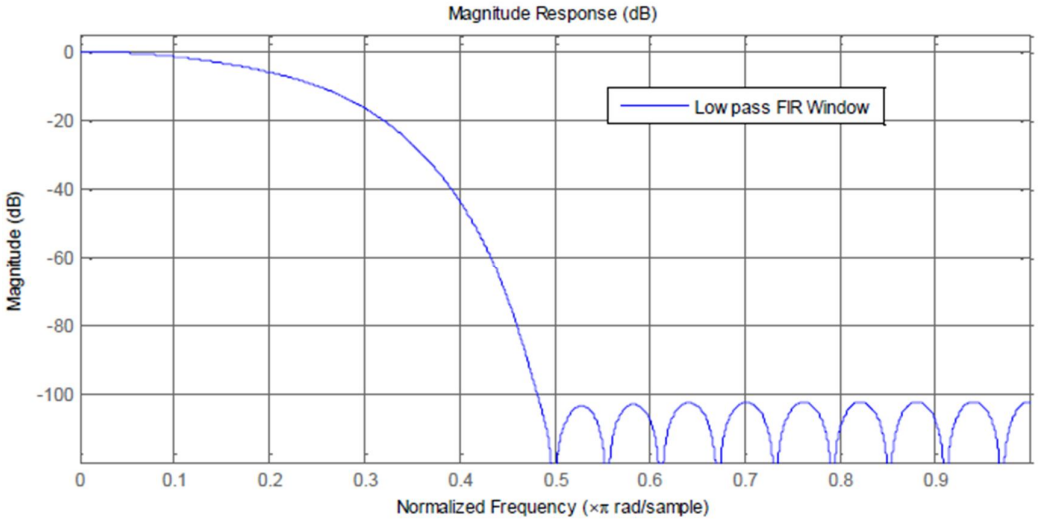

Fig.2 Magnitude Response of F.I.R for Flat-top window

TABLE II-FIR FILTER PARAMETER SPECIFICATIONS FOR KAISER WINDOW

Variable parameter beta	Window function's length	Time-domain		Frequency-domain	
		Maximum Amplitude	Minimum Amplitude	Main-lobe width	Relative side-lobe attenuation(dB)
4	38	1.0	0.01	0.625000	-31.0

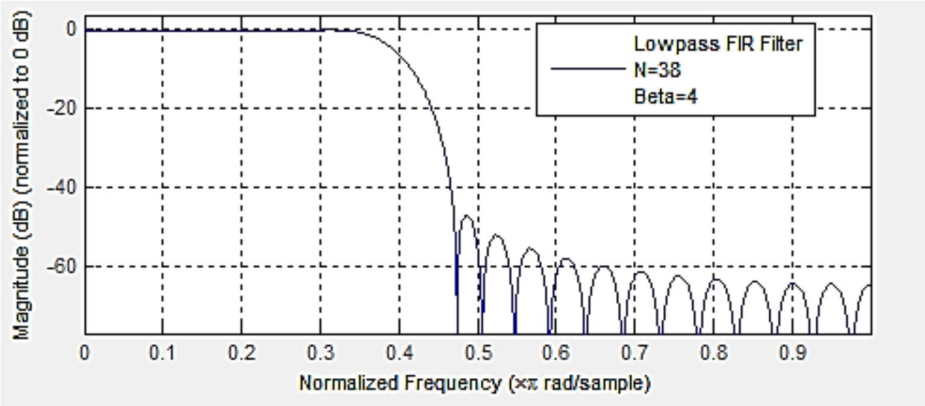

Fig.3 Mag. Response of Low pass F.I.R Filter

F.I.R filter utilizing Kaiser window function is more efficient. Main lobe's width and side-lobe's attenuation can be controlled by the beta parameters and the length (n). But it has a drawback too, i.e. when value of beta is increased, width main lobe's width increases & side lobe's attenuation decreases. [33]

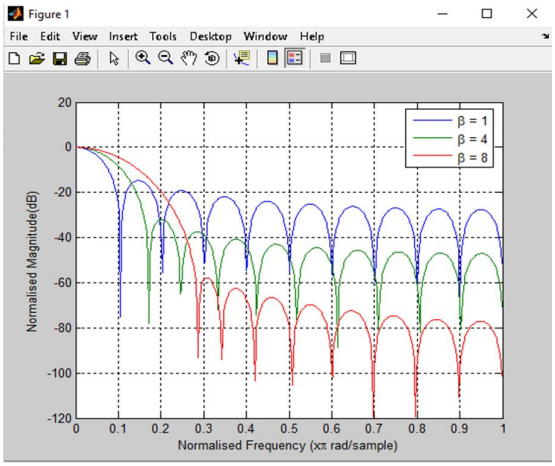

Fig.4: Kaiser Window of length 20 and different beta parameters

When the window size is increased, main lobe width and side lobe attenuation decreases shown in fig 5.

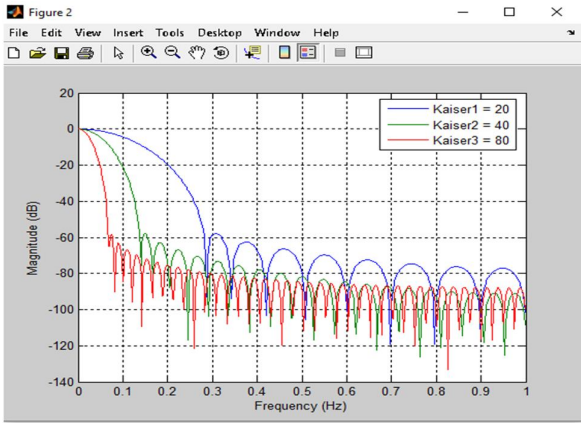

Fig.5: K. window of beta 8 and different lengths

TABLE III. PARAMETER FOR P.S.O

Parameters	PSO Value
Order of Filter	20.0
Size of Swarm	22.0
Acceleration Coef. (C1)	02
Acceleration Coef. (C2)	02
Inertia Coef. (w)	0.30
Damping Ratio of Inertia Coefficient (w damp)	0.99
Max no. of Iteration	100

P.S.O algorithms are executed on devised F.I.R filters utilizing the K.Window function of length n = 20 & β=8 which is common in above figures. P.S.O devises values given below Tab.3.
Implementation of provided values on Band Stop F.I.R filter provided following result.(Fig.6).

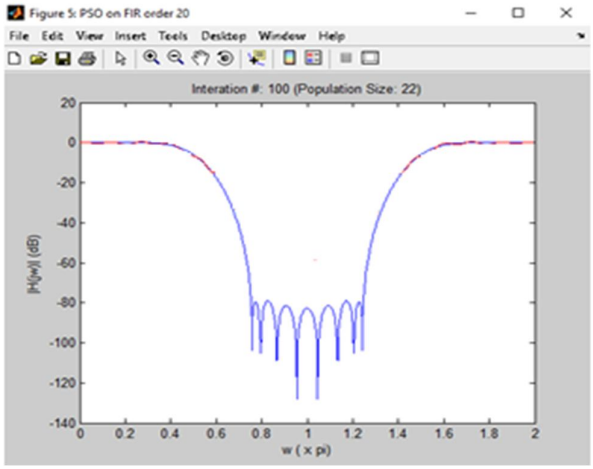

Fig. 6: O/P of P.S.O on 20th order F.I.R filter

VI. CONCLUSION

Digital F.I.R filter devised by the use of Blackman Window, Flattop window and Kaiser Window Function. Magnitude response of L.P. F.I.R filter is analyzed by given window-functions. FIR filter's magnitude response achieved nice by using Blackman window. It is observed that Flat-top window function performs better than Blackman Window function and performance is best using Kaiser Window function. Further, P.S.O method employed to devise the Band Stop F.I.R filters by the use of Kaiserwin. function. P.S.O modifies result due to an exclusive application offered to update position and velocity of swarm. A batch of upgraded coefficients have been acquired with P.S.O algorithm, gives advanced solutions to stop band. F.I.R filters have been designed utilizing Kaiser-window function in MATLAB efficiently. This devised filter is further upgraded by P.S.O algorithm. Solution shows, devised F.I.R filter performs excellent in comparison to earlier devised F.I.R filters. Stop band ripples decrease to a vast extent.

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Weed Identification and Categorization in Agriculture using Hybrid Deep Learning Algorithm

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***Abstract*—The use of insecticides, herbicides, and fertilizer in conventional agricultural crop spraying techniques can be decreased thanks to the smart agricultural robotic system. Spraying agro-chemicals to manage weeds and get better crop output is insufficient to meet the world population's food needs. As a result, a elegant and intelligent agricultural farming system is implemented in order to boost crop yield and meet agricultural production targets. Using a mix of Convolutional Neural Networks (CNN) and Long-Short-Term Memory (LSTM), Deep Learning (DL) based algorithms are used to identify and classify weed plants in this paper (LSTM). Convolutional Neural Networks (CNN) has a distinct structure for extracting differential features from input plant images, while LSTM imply granting for combined classification optimization. In order to the proposed method is used to classify nine types of weeds, including prickly weeds, vine weeds, persistent creeping weeds, and three-leaf weeds. We conducted several comprehensive experiments and attained an average classification accuracy of 99.36 percent. The collected results suggest that the CCN-LSTM combo has much better classification capabilities than other well-known techniques.**

***Index Terms*— Deep learning, LSTM, CNN, Classification.**

I. INTRODUCTION

The Earth population is expected to grow to 9.8 billion people by 2050. As of right moment, more than 7.3 billion people are thought to live on Earth, and it is growing, according to a United Nations (UN) estimate [1]. With such a large population comes a host of problems, with proper food production being one of the most urgent. According to the UN Food and Agriculture Organization, food production must rise globally over the next few decades by 70% in order to provide food for the predictable population of 2050. There are about 2,500,000 different plant species, and 250 of them are weed plants. These weed plants have a considerable effect on the decline in agricultural production.

In essence, unwanted weed plants are byproducts of productive crops that coexist with them. Weeds inhibit the growth of desired plants, which are the crop's essential and primary products, because they devour water and plant nutrients and minerals. In order to solve this issue, this study article performs precise and trustworthy weed and desirable plant detection. We employ CNN and LSTM models to carry out the detection of weed plants. The identification and separation of weed plants is based on two key factors: life span and ecological affinities. Lifespan: Lifespan weeds can live for more than two years and are often found in uncultivated places. They can

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kill seeds, underground stems, roots, rhizomes, tubers, and other plant parts. Ecological affinities: These weeds are cultivated for a variety of purposes, and in semi-aquatic conditions, they germinate as seeds. The most frequently studied topic for enhancing crop productivity and controlling weeds is agricultural mechanization [10, 11]. An essential component of the intelligent sprayer system for boosting agricultural output is the classification of weed plants [12]. Agricultural pesticides provide advantages like enhanced agricultural yield, but they can also have harmful effects on human health and the environment [13, 14]. Precision farming equipment is necessary to prevent the overuse of herbicides and pesticides [15, 16].

Weed identification is a fascinating area of study for data scientists, and many machine learning-based techniques have been reported [17]. Numerous studies use computer vision algorithms to identify and categorize weed and agricultural plants [18, 19]. There are a lot of hand-crafted, deep learning-based models that have contributed a lot to the literature [20–25].

There have been many different classification approaches for weeds, such as colour categorization techniques for identifying perennial weeds [18], Sugar beet plants and weeds may be distinguished using a deep convolutional neural network (DNN), CNN-based technique[29], Gabor wavelets and neural networks [31], Kalman filter [32], artificial neural networks and decision trees, hyper spectral imaging with wavelet analysis [34], supported by Skovsen et al. [39], among others To identify weeds, Tang et al. [40] combined a K-Means feature with CNN. Tang et al. [40] used CNN's K-Means function to identify weeds. Support vector machines and artificial neural networks were presented by Adel et al. [41] in order to identify weed plants using shape-features.

These techniques have produced astounding results and shown tremendous progress in the agricultural industry. To increase the categorization accuracy of the weed plants, however, efficient and sophisticated classification methods are needed. Categorization of weeds is particularly challenging since, during late growth stages, the leaves of crops and weeds frequently overlap [41]. In this study, a deep learning-based hybrid approach made up of CNN and LSTM is employed to identify and classify weed species. The D-CNN-main LSTM's objective is to develop a self-learning system for weed species classification accuracy improvement by learning characteristics.

A. Techniques for Classifying Weeds

Long short-term memory (LSTM) and convolutional neural networks (CNN) models are suggested in a recent research study for the categorization of weed plants. The suggested paradigm consists of three main steps. With CNN as the first step in feature capture, LSTM as the second step, and fully linked layers as the third, the features are produced. The subsections that follow go into further detail.

Convolutional Neural Network (CNN)

Deep neural networks (DNNs) are networks of neurons connected by weighted edges. Each edge and neuron is given an activation value and weight respectively. The three core elements of CNN are the convolution layer, max-pooling layer, and fully connected layer. Convolution layers are one of the CNN's activities, can carry out a convolution operation on an array of data and pooling algorithms. In addition, a rectified linear unit serves as an activation function (ReLU). CNN models' capacity to automatically extract characteristics, in particular, expands the breadth of research applications for which they can be used [42]. Modern deep CNN models that have been successfully used in numerous fields include ResNet-50, GoogLeNet [43], Inception-v3, ResNet-50 [44], Alex Net and VGGNets [46]. These are just a few examples. In 2012, Comparing AlexNet to earlier models, classification error rates was much lower [42]. In order to drastically reduce the error rate, the winning technique (GoogLeNet) was used as an upgraded model in 2014 [43]. The CNN model's layers include:

Convolution Layer: The convolutional layer, which creates new images called feature maps, is the primary layer of CNN. Figure 1 depicts the general architecture of CNN models. The feature map emphasizes the distinctive elements of the original image. When a 2D input picture of a weed plant is used, such as a matrix A n1n2 and the clean matrix X m1m2, where m1 n1 and n2 m2, the matrix B = A X is produced because of the 2D convolution of A with X and may be characterized mathematically as:

$$H = A * X \rightarrow H_{i,j} = \sum_{k=1}^{m} \sum_{l=1}^{n} A_{i+k-1,j+l-1} X_{k,l} \quad \text{-- (1)}$$

Pooling Layer: The image's size is decreased by the pooling layer by combining nearby pixels in a particular area of the image into a single representative value. Mean pooling or max-pooling are the two most popular types of pooling layer. In this study, max pooling is used, and its mathematical definition is:

$$H_{i,j} = \max\{A_{i+k-1,j+l-1} \forall 1 \le k \le m \text{ and } 1 \le l \le m\} \text{-(2)}$$

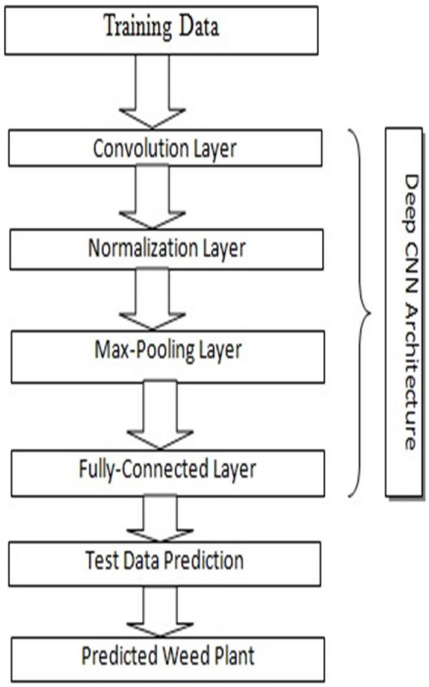

Figure 1. Deep learning algorithms for weed identification

Long-Term Short Memory (LSTM)

In this article, weed plant characteristics are extracted using the peephole LSTM model. W and b are the model parameters, the sigmoid function is taken into account, and gt is the nonlinear transformation of the inputs. The internal state of the LSTM component is stored in memory cell ct (where t denotes step time), with the LSTM's inputs and outputs being represented by xt and ht, respectively. The input gate it, output gate ot, and forget gate ft are three additional gates in the LSTM. The mathematical formulation of the LSTM approach is as follows:

$$it = \sigma(Xi[ht-1, xt, ct-1] + bi)$$
$$ft = \sigma(Xf[ht-1, xt, ct-1] + bf)$$
$$ot = \sigma(Xo[ht-1, xt, ct-1] + bo)$$
$$gt = \tanh(Xo[ht-1, xt] + bg)$$
$$ct = ft \odot ct-1 + it \odot gt$$
$$ht = ot \odot \tanh(ct)$$

Here '⊙' denotes the Hadamard product. The memory cell is the essential idea in an LSTM network it enables long-range dependency learning from input sequences and state storage across time.

II. Proposed Algorithm

The proposed algorithm is CNN-LSTM; it is combination of CNN and LSTM algorithms results in outstanding weed plant classification accuracy. In a wide range of applications, pre-trained DL networks are frequently used. This is also a typical technique in the DL field. In this study, we created a weed classification system that we trained using information from more than 17,000 weed plants. The DL is made up of multiple layers, including a batch normalizing layer and a convolution layer. The max-pooling layer, rectified linear unit layer, LSTM layer, and soft-max layer were used to categorize the weeds. This strategy is seen in Figure 2.

Initially, the recommended CNN-LSTM based design had four convolutional layers. The first convolutional layer had a 1010 frequency-time filter. The second layer 99 filter, third layer 54 filters, and fourth layer 43 filters operate similarly. We employed batch normalization and adjusted linear units for each convolutional layer. Three different size-pooling layers are applied to each of the convolutional layers. A forget gate, a cell, an input gate, and an output gate comprise an LSTM unit. [49].

The cell's primary function is to store data for arbitrary time intervals, and each of the three gates regulates the flow of information into and out of the cell. The four layers of the 32-unit LSTM network used in this study. The LSTM output data is modified using a flatten layer, which also acts as a communication link between the dense layers.

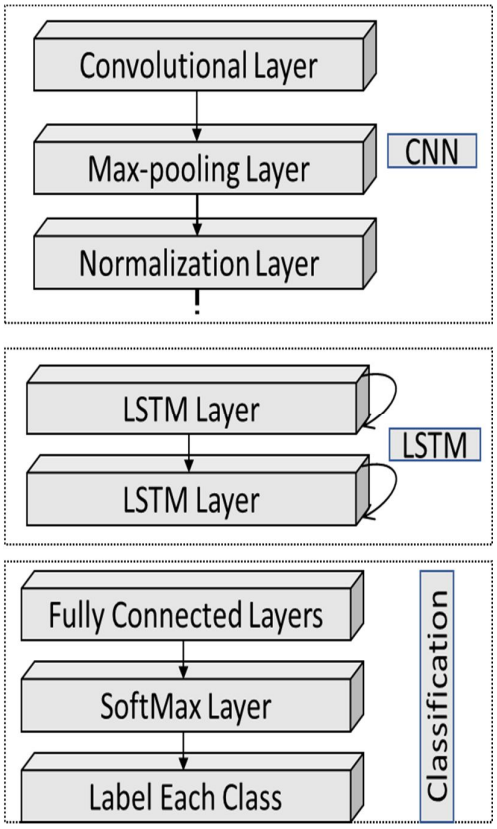

Figure. 2 The suggested classifier is based on LSTM and CNN

III. EXPERIMENTS

A. Weeds Dataset

An Australian research team initially compiled the dataset [50]. They gathered in various parts of northern Australia. To attain the requisite variety and generality of the dataset, they developed two key goals. First, the collecting of dissimilar crop species, which totals roughly 1,000 photos, aids in high-complexity CNN training if large labeled data sets are required. Second, divide them equally between positive and negative locations. By guaranteeing that targets can be distinguished from their natural backgrounds, it also helps prevent over-fitting existing models to scene-level visual features. Finally, professional analysis was required to each image regarding whether it contains a specific weed species or not. The name of the weed and representation is shown in Table 1, Figure 3 represents the weed plants and their distributions and Figure 4 represents the images of the weed plants.

During the training and validation process, over fitting has been reduced by using the data augmentation technique [51]. A technique for creating more training and validation data from the present data collection is called data augmentation. The data augmentation technique included the use of flipping, color rotating, zooming, horizontal and vertical shift, modifying the brightness level, and cropping to create new weeds photographs for the training set. (OpenCV) and another deep learning algorithm have been applied as augmentation. For instance, Fig. 5 displays the virtual, randomly created graphics. The range now lies between [0.8, 1.2] after each picture has been zoomed at random by +/-20%. In the +/-360° range, rotation augmentation has been done at random. Each image's colour has been randomly changed by +/-20%. The picture data contains a Boolean horizontal or vertical flip parameter that indicates the flip augmentation. Each picture has been shifted roughly both vertically

TABLE I. WEED PLANTS REPRESENTATIONS

Name of Weed	Representation
Chinee apple	W1
Snakeweed	W2
Prickly acacia	W3
Lantana	W4
Parthenium	W5
Parkinsonia	W6
Negatives	W7
Siam weed	W8
Rubber vine	W9

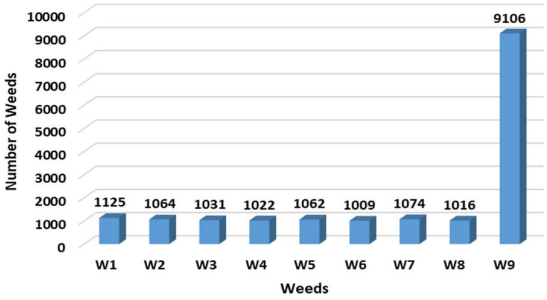

Figure 3. Weed plants and their distributions

and horizontally [-0.5, 1] thanks to shift augmentation, which involves shifting all of the pixels in a picture in one direction, such a horizontal or vertical shift.

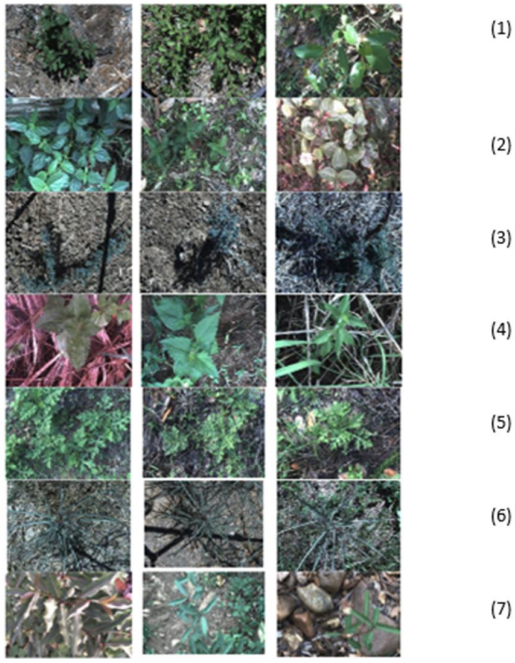

Figure 4. (1) Chinee apple, (2) Snakeweed (3) Prickly Acacia (4) Lantana (5) Parthenium, (6) Parkinsonia (7) Negatives (8) Siamweed (9) Rubber wine

The image is randomly brightened, darkened, or both as part of the brightness augmentation process. Brightness enhancement has been used in this study between [0.5, 1.5]. Each image in this experiment has its dimensions randomly reduced from 256 by 256 to 224 by 224.

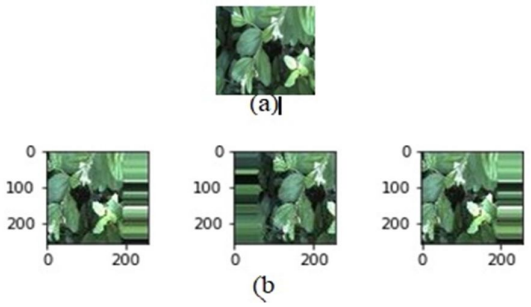

Figure 5. Training Actual image (a) and the images were produced using the augmentation technique. (b)

A deep learning network must learn and be validated at a certain learning rate. This study used an finding the best learning rate to maximize the effectiveness of the learning process. The optimizer may exceed its target value if the learning rate is too high or become wickedest divergent, and if it is too low, the optimization process takes longer to learn.The effectiveness of the model was evaluated using the 5-fold cross-validation technique. The data sets were divided into two groups, with 40% used for validation and 60% utilized for training. Each of the five epochs is used to train the model 30 times, and each training and validation's accuracy of validation is reported. The HP computer with the following specifications was used in the test: Intel(R) Core TM i5-4790 CPU, Windows 64-bit OS and 16GB RAM.

IV. Results and Discussion

We used an amalgamation of CNN and LSTM techniques to categorize the weeds shown in Table 1 by using their characteristics. Table 2 displays the outcomes of the suggested technique. It explains how accurately each weed is classified. The obtained results are encouraging because, with the exception of negative weeds, their average classification accuracy is greater than 98%. We reached 100% accuracy in two weed scenarios, Parkinsonia and Prickly acacia. It demonstrates how effective the suggested method is in accurately classifying weeds. The reason for this is because while CNN gives features from the data sets, LSTM assists in producing textual descriptions from picture data sets. Additionally, LSTM interpreters are highly effective in classifying the weed data sets, as is this ensemble technique. The findings give us the notion that all weeds must be categorized for better agricultural performance.

The use of deep learning techniques on agricultural data sets will aid in the development of farm supervision systems with true AI systems, offering solid recommendations and insights for increasing agricultural crop production and protecting them from undesirable crops that could lower crop productivity.

Although the model iterates repeatedly in this case, the categorization rate was established after the 90th iteration. Here we used the 5-fold cross-validation technique mendacity at the counselled system, as illustrated in Figure. 6 and Figure.7, to track training and validation progress. The CNN and LSTM models are anticipated to be even more common on farm data sets in the future, improving productivity.

The suggested work has some drawbacks, including the need for high-end calculation time on both methods with or without augmentation due to large data sets. To get around this, we advise the prospective researcher to divide the data set into epochs before training it, then use each time as a training set to verify the classification accuracy. Where a different prediction model will be produced for each period.

TABLE II. THE CLASSIFICATION ACCURACY OF NINE WEEDS PLANTS CONFUSION MATRIX

Name	W1	W2	W3	W4	W5	W6	W7	W8	W9
W1	99.3	0.02	0	0.1	0	0.3	0.5	0.09	1.01
W2	0.13	99.2	0	0.01	0	0	0.3	0.03	0.03
W3	0.01	0.02	100	0.02	0	0	0.04	0	0
W4	0	0.01	0	99.8	0	0.1	0.06	0.03	0.01
W5	0.2	0.03	0	0.03	100	0	0.03	0	0.53
W6	0.1	0.05	0	0	0	99.4	0.01	0.4	0.14
W7	0.02	0.21	0	0	0	0	99	0	0.03
W8	0.23	0.06	0	0.04	0	0	0.02	99.4	0.15
W9	0.01	0.4	0	0	0	0.2	0.04	0.05	98.1
Average (%)	99.3	99.2	100	99.8	100	99.4	99	99.4	98.1

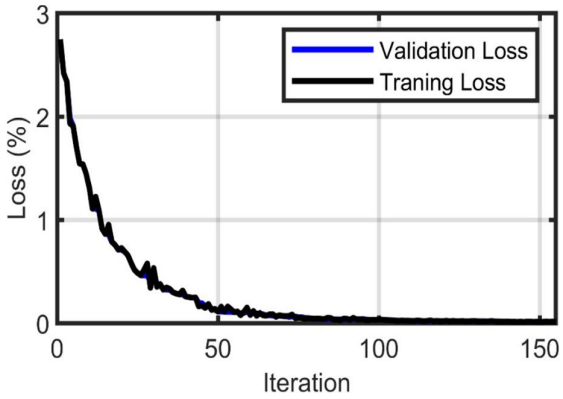

Figure. 6 The proposed CNN-LSTM method Classification Error

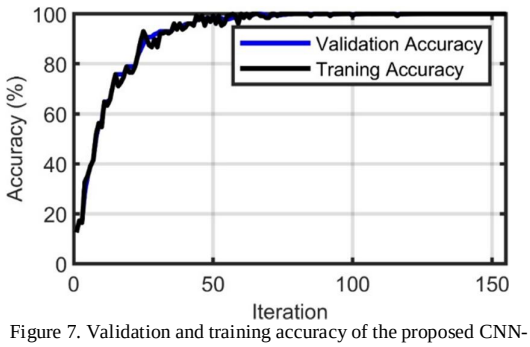

Figure 7. Validation and training accuracy of the proposed CNN-LSTM method

A. Performance Comparison

In order to justify the proposed method, the recorded findings are compared against recently revealed methodologies using the same data sets. The results of the comparison are displayed in Table 3. The nine weed plants were classified using the Inception-v3 model, with an average classification accuracy of 95.1%. Nine weed plants were used to test the ResNet-50 deep learning model, with an average accuracy of 95.7% [50]. The suggested strategy outperforms Both testing methods using Inception-v3 and ResNet-50 need data augmentation as shown in Table 3. A workable method for improving the dataset and network performance in weed data categorization is offered by the augmentation strategy. As a result, we carried out research both with and without augmented data. The reported accuracy of with data augmentation is 99.36%, and without data augmentation is 96.06 %, as shown in Table 3 and Figure 8.While the classification accuracy is somewhat greater without data augmentation, the proposed strategy performs better with it. However, we think that there is space for improvement in categorization when studies are carried out without enhancement findings.

TABLE III. COMPARISON OF CLASSIFICATION ACCURACY (%) THE WEED PLANTS WITH THE CURRENT APPROACHES

Name of the Weed	Inception-v3	ResNet-50	The Proposed Method	
			With	Without
Chinne Apple	85.3	88.5	99.3	97.3
Snake weed	88	88.8	99.4	93.9
PricklyAcacia	92.8	95.5	100	96.4
Lantana	94.4	95	99.2	95.5
Parthenium	94.9	95.8	99.8	98.1
Parkinsonia	96.8	97.2	100	97.7
Nagatives	97.2	97.6	98.1	95.2
Siamweed	97.6	96.5	99	94.8
Rubberwine	93.1	92.5	99.4	95.7

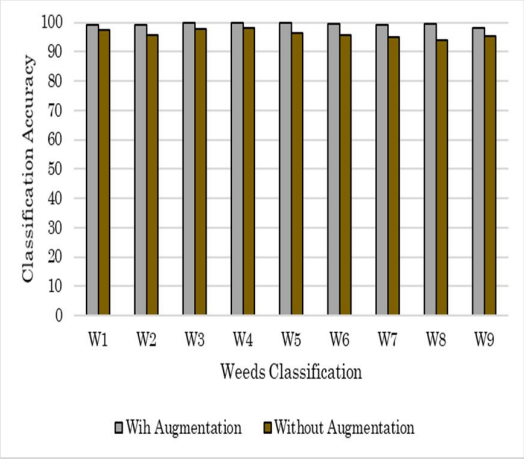

Figure 8. Comparisons between outcomes with and without augmentation

V. CONCLUSIONS

In this study, a novel system based on convolutional LSTM was created for the classification of weed plants. Although a number of approaches based on computer vision have been put forth for classifying plants, this research area still needs sophisticated and automatic classifiers. The suggested method delivers excellent weed plant identification and categorization capabilities. The algorithms have been put to the test in a number of trials, and the results point to the proposed schemes as being a significantly better categorization method. For weed plant identification, commercial solutions are also required. Commercial robotic-based solutions for weed identification and pesticide application will be developed in the future.

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Framework for Arrhythmia Identification using Real Time ECG Signals

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***Abstract*—Abnormal heartbeats or Cardiac arrhythmia denotes a dangerous condition of irregular electrical activity in the heart. Arrhythmia is the disease affecting 30 million people worldwide. There is need of introducing a method of real time Arrhythmia detection from low cost hardware. This article focuses on for the Arrhythmia identification using electrocardiogram (ECG) signals. The Electrocardiogram (ECG) signals are having small amplitude of about 1mv but carry a lot of noise. This paper is about a framework design to build, evaluate, and create a system that can record a patient's ECG in real time and measure the heartrate and irregular rhythm of the heartbeats. The framework further performs Arrhythmia detection. The process of acquiring the ECG is done using electrodes connected to PC/laptop having Matlab software. Filtering, describing, and evaluating the Electrocardiogram (ECG) data are further steps in the process of classifying heartbeats into Tachycardia, Bradycardia or Arrhythmias. RT interval, RR interval, and QRS complex are the features that were calculated. Tachycardia, Bradycardia, and the "normal state" are examples of various cardiac arrhythmias that cause changes in heart rate. The threshold is chosen in accordance with algorithm, and ECG signal peaks. The patient's anomaly is identified in accordance with the feature extraction algorithm and thresholding.**

***Index Terms*—Matlab, Arduino IDE, AD8232, Arduino UNO Microcontroller (based on ATmega328P), RT, interval, RR interval, QRS complex, Tachycardia, Bradycardia, Normal condition, Threshold.**

I. INTRODUCTION

Around 30 million people worldwide are affected by heart related diseases. From the data of WHO (World Health Organization), due to heart and cardiovascular diseases India has lost 237 billion dollars in the years between 2005 to 2015. In accordance with the Global Burden of Disease report, published in September 2017, India had lost 1.7 million people due to cardiovascular disease.

The electrocardiogram is an important resource for doctors to diagnose a patient's health condition. The rate at which the heart conducts electrical impulses is referred to as cardiac conduction. An ECG waveform can be used to extract features such as the rate and regularity of heartbeats, chambers positions, heart damages if any, as well as the effects of drugs and devices used to control the heart. The heart is a muscle with a unique electrical conduction system. Cardiac Arrhythmia is a term used to describe a classification of disorders that cause the heart to beat irregularly, slowly, or too quickly. Arrhythmias are classified into several types, such as

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bradycardia (slow heartbeat). Tachycardia is characterized by a rapid heartbeat. Fibrillation is another name for it.

The heart rate is calculated in terms of pulse. Heart rate means heart beats per minute. It differs from one person to the next. A person's heart rate is shown as a waveform on the Electrocardiogram (ECG). The electrocardiogram (ECG) is an important resource for physicians who need information to diagnose a patient's health condition and pathology. Electrocardiogram (ECG) is one of the medical devices that looks for any heart disease or heart abnormalities. A healthy person's heart rate fluctuates between 60 and 100 beats per minute. When the heartbeat is very fast in the range above 100, it is called Tachycardia. And when the heartbeat is less than 60 it is called Bradycardia.

The Arrhythmia can affect anyone who is healthy, normal and free from other heart diseases. Arrhythmia can affect several types of symptoms. When there is Arrhythmia condition the heart is not working well this causes the symptoms like Chest pain, shortness of breath, and temporary inability to breathe, symptoms of high blood pressure, diabetes, and other medical conditions. In other medical cases like High cholesterol, heart disease. It may increase the chance of heart problems that can lead to arrhythmias.

The tabular form of risk factors causing the various types of heart diseases are as follows:

TABLE I. RISK FACTORS AND HEART DISEASES

Sr. No.	Risk Factors	Types of heart diseases
1.	Hypertension	Arrhythmia
2.	High cholesterol	Heart valve disease
3.	Stress	Heart Failure
4.	Smoking	Acute myocardial infarction
5.	Physical Inactivity	Coronary Artery disease
6.	Diabetics	Cardiomyopathy
7.	Obesity	Pericardial disease

The human heart is the pump like biological structure and is one of the important organs of vital importance. The heart health and diseases are always has been significant research area. Following graphs show the worldwide occurrences of the heart diseases such as arrhythmia for developing countries and developed countries. Both The graphs are having scale of the scale on Y-axis is as mortality per 10,000 and on X-axis years is considered.

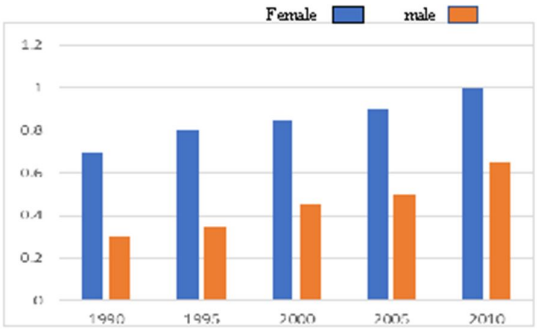

Figure.1. Arrhythmia cases found in worldwide population in developing countries

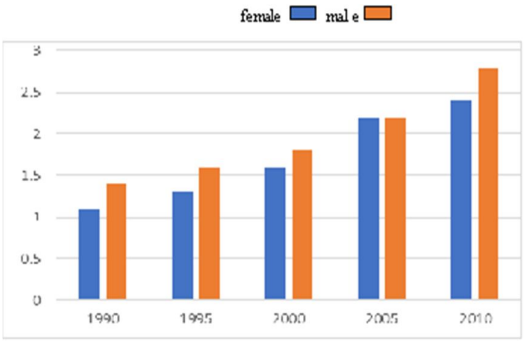

Figure.2 Arrhythmia cases found in worldwide population in developed countries

II. LITERATURE SURVEY

Yan sun et al, [1] In his article, proposed a function for wave detection in ECG that realizes the use of singularity detector-based multiscale morphological derivative (MMD). The article demonstrates the advanced MMD method that exhibits suitable potential for computerized ECG signal evaluation and the popularity of cardiovascular arrhythmias. Thakor et al [2] submitted a work on Noise Cancellation and Arrhythmia Detection by removing various types of noise using numerous adaptive clear-out techniques. The adaptive filter out minimises the suggest-squared errors. Preeti Raman et al [3], Have shown that the phase of heart disease based on ECG analysis is eliminated through the use of data mining techniques. The range of extracurricular activities was reduce using a PCA (key feature test) and compiled using a set of FCM rules (Fuzzy C Means) identified

with the help of the use of SVM (Vector auxiliary machine) for class purpose with 90% accuracy. Vijayavanan et al [4] An automatic class of ECG signs for coronary heart disorder prognosis proposed with the aid of the author said that morphological characteristics should be retrieved in in order to differentiate between normal and arrhythmic ECG signals impacted (weird) categories. In their example, they employed Probabilistic neural community (PNN), a modelling method used to document the spread of the category's characteristic vectors. Arumugam and colleagues [5] The authors of the study Detection of Cardiac Arrhythmia from ECG Warnings offered a summary of several methodologies utilised in the function extraction and classification of ECG alerts. This investigation discovered that the wavelet transform is utilised to extract functions, and the SVM classifier is used to categorise bio alerts. because to its high category accuracy Yan Sun, Kap Luk Chan, and Shankar Muthu Krishnan, among others [6]. The Multi-scale Morphological Derivative (MMD) transform-based singularity detector, which utilised for the identification of fiducial spots in ECG signals, was used to recognise characteristic waves in ECG signals, according to a study report published by the authors. The new MMD approach showed promising results for automated ECG signal processing and cardiovascular arrhythmia detection. Mr. Vyankatesh S. Thorat, Dr. Suresh D. Shirbahadurkar, Mrs. Vaishali V. Thorat et al [7] investigated real-time detection utilising 180 ECG data [60 atrial fibrillation, 60 ventricular fibrillation, and 60 ventricular tachycardia]. The suggested technique has excellent detection accuracy (up to 100 percent) and is ECG characteristic wave recognition computed quick. Cardiac arrhythmias can occur as a result of consistent or periodic heart rhythm abnormalities. Recurrent arrhythmic episodes (also known as cardiac dysrhythmia or irregular heartbeats) are present, as is erroneous beat detection due to poor signal quality.

Prof. A N Jadhav et al [8] and V. S. Waydande The authors of the study on cardiac telemonitoring system made an effort to aid and save cardiac patients by developing a system that allows real-time transmission of a patient's ECG to be diagnosed by an experienced cardiologist via wireless means. It aids cardiac patients in receiving medical attention in an emergency. It may also be used to send ECG signals on a regular basis to warn the concerned doctor or other medical personnel for patients who have been discharged from the hospital or those who have been kept on observation. One of the most significant advantages of this system's ECG monitoring This technique recognises significant emergency situations before they become harmful. Sharma A and Bhardwaj K, 2015 et al [9], developed a technique for discriminating between normal and abnormal ECGs based on neural pattern recognition. ECG classification encompasses a variety of methodologies and procedures that have improved performance and accuracy in the study of cardiac disorders. The Artificial Neural Network is used to detect regular and irregular ECG's. The authors, Sathya R and Akilandeswari K, 2015 et al [10], wanted to Classification utilising all retrieved characteristics results in anomalies being misclassified. As a result, feature selection is a key notion in distinguishing normal and pathological cardiac behaviour. The classification is done in Matlab using on the MIT-BIH Arrhythmia dataset.

III. METHODOLOGY

Cardiac Arrhythmia indicates the state of abnormal electrical activity of the heart that threatens human life. Processing, Filtering and extracting features from the electrocardiogram (ECG) signal. Further analysis of the extracted features is done. hence the processed signal is used for classification of heartbeats according to different Arrhythmia conditions.

Step 1. Pre-processing of data

The calculated features are: RT interval, RR interval, QRS complex. The heart rate changes observed for cardiac arrhythmias are as follows: Tachycardia, Bradycardia. Except for these two cardiac arrhythmias, the Normal state is observed. The preliminary data processing step includes steps for signal, signal measurement, R-peak detection, splitting, and finally removing noise from the output element. The extracted components are segregated into the next processing phase for arrhythmia detection once the previous data processing processes have been completed. Finally, in the final stage of processing, the removed factor is categorised based on the arrhythmia detection stage.

Step 2. To import the data from MIT-BIH Database into Matlab function

The first step is to import data from the MIT-BIH website into Matlab. In this case, we use the load() function in Matlab In this case, we have to add the path of that database to the function

Step 3. To remove Noise or distortion using Savitzky–Golay filter is used in Matlab for smoothing.

In Matlab, this filter is used to smooth. The next stage in data processing is to remove the noise and compare the data to the behaviour of each sensor. Medical data, such as an ECG signal, might appear in a range of sounds based on the natural surroundings, which can influence its accuracy. To acquire trustworthy signal data without

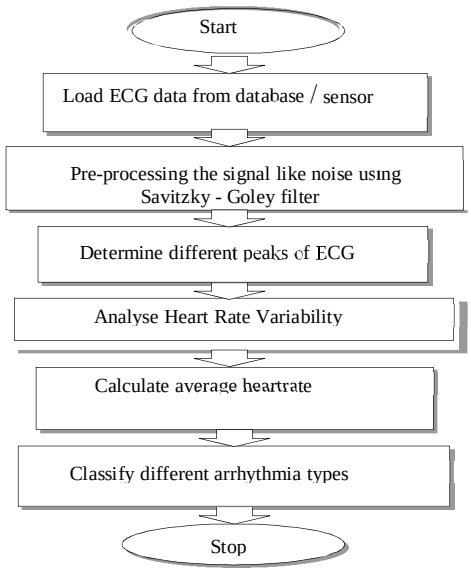

Figure.3 Flowchart of Methodology used

distortion or early loss of information, we must first eliminate this noise before eliminating the ECG signal components.

The Savitzky-Golay filter is a digital filter that can smooth a variety of digital data points., hence increasing data accuracy without diminishing signal bias. Convolution is performed by adding sequential selections of neighbouring polynomial data points in the form of linear squares.

Step 4. QRS complex Detection

Each heartbeat is composed of a sequence of electrical impulses produced by the heart, and they demonstrate the timing of the electrical impulses produced by the heart in a single beat. Each arrhythmia alters one or more of these waves. Different arrhythmias can be recognised by recognising and quantifying these changes. The QRS complex, which combines the Q, R, and S waves to form one big wave of a typical pulse, is the most critical element of the heartbeat. We acquired R points that make up the highest QRS complex for a single pulse at this level of our research, as each heartbeat has a single QRS complex. We will be able to transform a huge ECG signal file into using these points. units in the next step through the splitting process.

To extract the peaks from the waves, we utilised the findpeaks() method. It is critical to precisely calculate the R-points of the ECG signal since this allows us to detect the pulse, which has a significant impact on the final findings of detecting cardiac arrhythmia. To do so, we must eliminate the waveform's edges in order to appropriately identify all of the peaks. To eliminate the margins in this example, we utilised a random function(). T-QRS-P waves make up the cardiac signal loop.

The ECG signal contains useful clinical information at the distances and amplitudes determined by its waves.

Step 5. Heart Rate Variability Analysis

We may evaluate the characteristics in additional ways after deleting them using complicated QRS detection. For example, we may use the R-R intermediate signal to do a heart rate (HRV) analysis to determine the status of the heart and neurological system.

Step 6. Identification and Graphical representation of Arrhythmia's in Matlab The ECG data is processed using Wavelet Transforms' built-in function to determine rate of heart. The typical heart rate ranges from 60 to 100 beats per minute. A lower level is referred to be bradycardia (tired heart), while a greater level is referred to as tachycardia. If the cycles are not evenly spaced, arrhythmia may be suspected, If the PR interval is longer than 0.2 seconds. The following is an equation for estimating heart rate:

$$\text{Heart Rate} = (1/\text{RR INTERVAL per Second}) * 60 \quad ..(1)$$

ECG analysis after processing the same type of signals indicates Normal Rhythm and all Wave, Phase and Interval values are detected in such signals has plummeted below 60 BPM, although being within the typical range. The heart rate is under 60 beats per minute., which is outside of the usual range. BRADYCARDIA is represented by this.

ECG analysis after processing the same type of signals indicates it is Normal Rhythm and while all Waves, Sectors, and Intervals values are within normal limits, the level seen in such signals surpasses 60 BPM. The heart rate is above 60 beats per minute, which is not within the usual range. Tachycardia is represented by this.
We use Matlab sites to view all the information obtained from the ECG signal. The structure will create an image representation in Matlab and will be used to display the waves and peaks of the listed Signals.

IV. BLOCK DIAGRAM

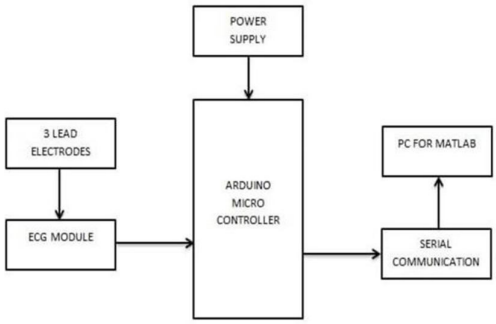

Figure 4: Block diagram of a system

V. FEATURES EXTRACTION

As presented in the previous topic, signal normalization and character extraction Tests were performed using MATLAB software. This step was necessary to use a modular and complete algorithm that can perform from signal windowing to feature extraction for training with a learning machine, Arrhythmias reference is from the MIT-BIH database. At the base are 48 samples from different subjects, each with a duration of approximately 30 minutes and random windows of different types of arrhythmias. For each sample, it is possible to perform the extraction of several types of files, four types were analysed. signal extraction with a band in a .mat file (MLII potential derived from type V2); extracting information from the full signal in an .info file; extracting essential patient health information into a file header; finally, extracting the details of each signal period along with the arrhythmia types - from professional cardiologists' assessments - in a .txt file. With the signal samples it was possible to perform the normalization and subtraction of the 3 suggested arrhythmias with some steps performed in MATLAB on each of the samples:

1. The first step consisted of loading each of the ECG signals, subtracting the electrical values in amplitude and time in addition to frequency, number of samples, and total signal duration.
2. Next, the signal annotation file was read, capturing the periods and times of the arrhythmia samples selected for extraction in a vector object.
3. With each of the specific periods of the arrhythmias, it was possible to perform the windowing of the QRS portion of each wave, capturing a previous time interval and after the arrhythmia time sample extracted in the previous step.
4. After subtracting the signal in amplitude and time in a windowing vector object, each subtracted QRS signal is plotted, except when there is no arrhythmia, called normal Sine Rhythm (N).
5. Splitting signal windows into vector objects, decomposing each windowed signal into time-varying frequency components with Maximum Overlapping Discrete Wavelet Transform (MODWT) and Inverse Maximum Overlapping Discrete Wavelet (IMODWT) at Scale 3 - Functions available through Wavelet MATLAB software toolbox.
6. After extracting the modulated and filtered signal with the Discrete Wavelet Transform, the amplitude and time of the peaks of the windowed signal are extracted via the Find peaks function of the Signal Processing Toolbox.
7. After removing the peaks in a vector object, plotting each signal with its corresponding peaks, except in the absence of arrhythmia
8. Perform feature extraction with amplitude and time data extracted from a vector object, capturing the amplitude value of the last peak of the signal, the R-R time difference between the last and first peak (middle

peak is not characterized). as peak R) and the peak velocity of wave R (the division between the peak amplitude and the R-R time period).

9. To finish off the extraction process, combine the three previously used extra features with patient-informative features from each sample header: gender, age, and drug administration. When combined, the extraction of these six feature sets is performed along with the arrhythmia type in a file, and each row of the file is populated with each sample period found for the selected arrhythmia. These presented steps were performed for each of the files and for all arrhythmias, in addition to extracting features from a healthy signal (N). After extraction, the arrhythmia features were organized in MATLAB into a single file used for each training classifier.

Flowchart for MATLAB program is as follows:

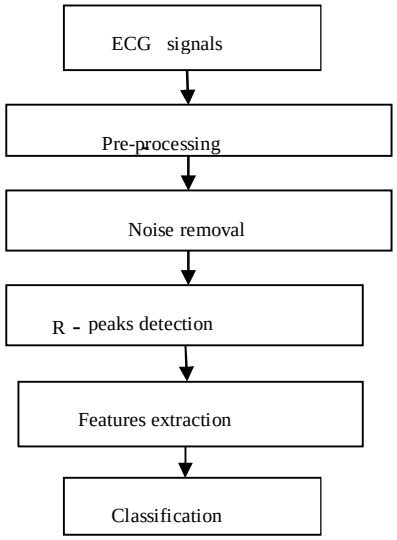

Figure 5: Flowchart of program

VI. SYSTEM DESIGN

Our proposed work entails designing, analysing, and developing a system capable of capturing a real-time ECG signal from a person and transmitting the data/signal to a processing device such as a laptop or PC. The suggested approach extracts ECG signals from a dataset (MIT-BIH).

The proposed work involves the collecting of ECG data using electrodes and connection to a PC/Laptop using MATLAB, followed by the detection of different arrhythmias (abnormal heartbeat).

The suggested System for Arrhythmia Detection in ECG Signals must meet the following parameters.

1. The system which is designed is capable of capturing real-time ECG signals through the human body and dataset values.
2. The system which is designed must be capable of recognising and categorising various forms of arrhythmias
3. The system which is designed is capable of determining severity.
4. The system which is designed is capable of calculating the time duration between two pulses.

The following components are chosen based on the system requirement.

Hardware used

a) ECG Module AD8232
b) ARDUINO UNO R3 Microcontroller
c) Serial USB to TTL converter
d) Arduino programming cable

Software used

a) MATLAB IDE R2013A.

Arduino IDE V1.8.19

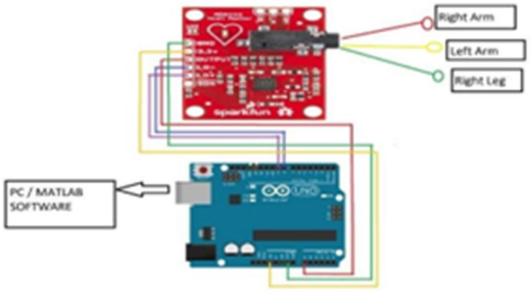

Figure 6: Interfacing of ECG module AD8232 Arduino microcontroller Diagram With

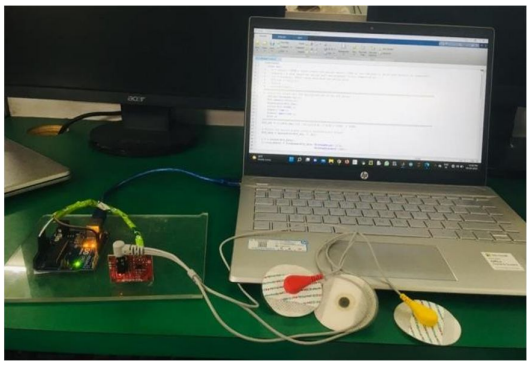

Figure 7: Hardware interfacing to pc/laptop

Figure 8: Hardware implementation

1. ECG MODULE AD8232

This sensor is interfaced with microcontroller. The AD8232 is a little chip that monitors the heart's electrical activity. An ECG, or electrocardiogram, can be used to record this electrical activity. Electrocardiography is used to assist in the diagnosis of various cardiac diseases.

2. ARDUINO UNO R3 MICRO-CONTROLLER

Arduino Uno microcontroller is interfaced with pc/laptop. It has inbuilt TTL (Transistor Transistor Logic) and Analog to Digital converter which converts the ECG analog signal into digital signal.

3. ARDUINO PROGRAMMING CABLE

For connecting an ARDUINO microcontroller to a laptop or PC programming cable is required.

4. MATLAB IDE (R2013A)

MATLAB is used for signal processing of ECG for example: to extract the mathematical values of the detected peaks.

5. ARDUINO IDE V1.8.19

In this Software (IDE) is code was written and uploaded to the board.

VII. TEST AND RESULTS

The system is capable of detecting/ identifying the various types of Arrhythmias.

1.The first stage is used to distinguish a normal or abnormal ECG.

2.The second stage is used to distinguish the different types of arrhythmias found in the ECG signal.

The proposed system extracts features of real time ECG signal and can classify it to be normal or Irregular ECG signals.

Case 1: **Tachycardia detected**

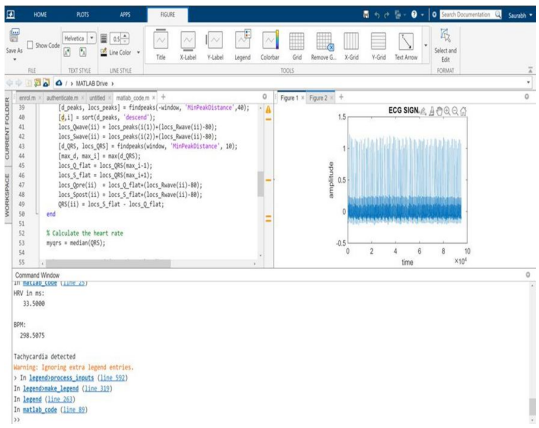

Figure 9: Tachycardia Detection

The figure above shows value of 298,5075 beats per minute. The Heart Rate Variability (HRV) for the above waveform is 33.5 milliseconds (ms). The waveform has an R-R interval of shorter than 0.6 seconds. From this data, the proposed system identifies TACHYCARDIA condition of heart based on MIT-BIH arrhythmia database. Using our proposed setup, we have taken readings of 50 persons and found that Arrhythmia is not proportional to age and effort/activity level.

Case 2: No Arrhythmia detected

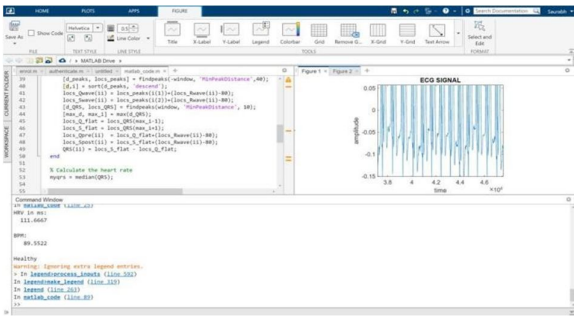

Figure 10: No Arrhythmia detection

The above figure shows 89,552 beats per minute and Heart Rate Variability (HRV) is 111.667 milliseconds (ms). From this data, the proposed system identifies NO ARRHYTHMIA condition of heart based on MIT-BIH arrhythmia database. Thus this case is about healthy person's ECG signal.

Case 3: Bradycardia detected

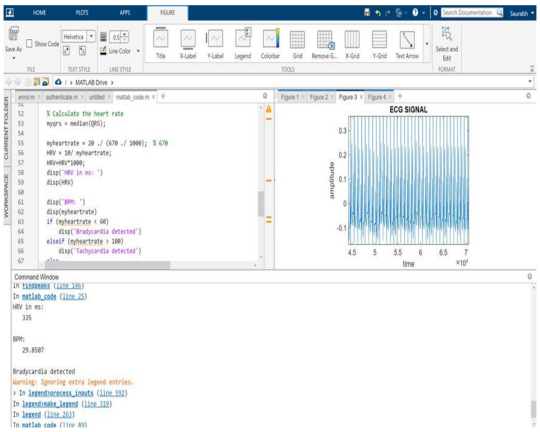

Figure 11: Bradycardia detection

The above figure shows 29,8507 beats per minute and Heart Rate Variability (HRV) is 335 milliseconds (m s). From this data, the proposed system identifies BRADYCARDIA condition of heart based on MIT-BIH arrhythmia database. In this condition it is observed that a person having bradycardia is having slower heartbeat i.e. below 60 BPM.

Case 4: Real Time ECG Waveform

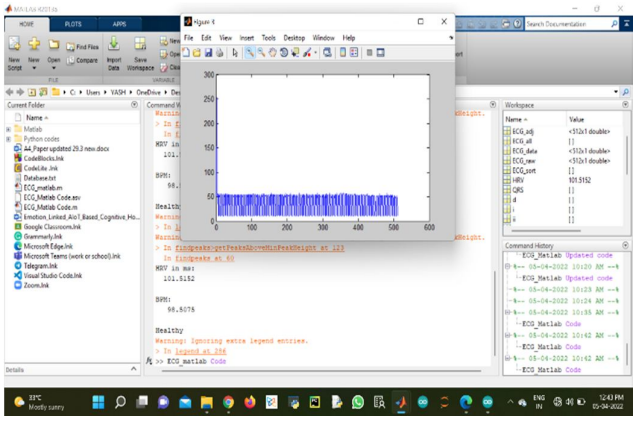

Figure 12: Real-time ECG Waveform

Figure 12 shows a real time ECG signal captured on the fly for a random person. The proposed system captures Real Time ECG signal with the help of AD 8232 ECG sensor. We have observed that the heart rate is 98.5075 beats per minutes (BPM) and the Heart Rate Variability reading is having 101.5152 milliseconds (m s) value. The proposed system identifies the persons heart condition as Healthy.

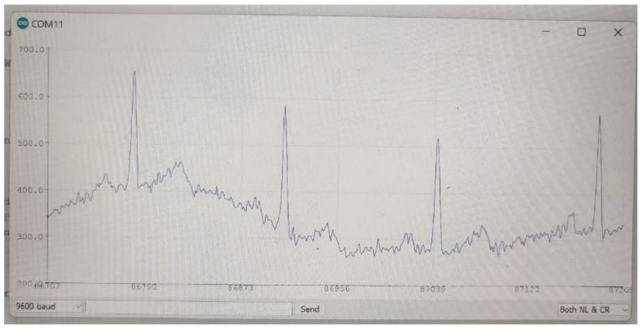

Figure 13: Output waveform captured for healthy person

Above figure shows Real-time Waveform generated for healthy person with normal heartbeat rhythm.
Following table shows various types of Arrhythmias detected with proposed framework.

Value in BPM	Condition	Remark
298.5057	Tachycardia	It is a medical term for heart rate greater than 100 beats per minute
89.5522	Healthy	The normal Heartrate for adults is in the range of 60-100 beats per minute.
29.8507	Bradycardia	It is a medical term in which heartrate is slow usually lower than 60 beats per minute.

Figure 14: classification of Arrhythmias as per obtained Results

VIII. CONCLUSION

This Paper provides a better ECG waveform observed in MATLAB we also calculated real-time ECG waveforms and waveforms generated using database, thus we observed various types of arrhythmias. The detection and calculation of Heart Arrhythmia was made successfully considering all aspects. All the required parameters of R peaks, P, QRS, T, U components are and used to detect heart abnormalities. Many persistent heart problems can be detected due to a person's ECG deficiency just by counting. heart rate but also the above

parameters. The normal ECG signal conditions are considered and compared with the human ECG to assess whether a person has normal or abnormal heartbeat or heart rate. Hence a complete analysis and diagnosis of cardiac arrhythmia is performed.

ACKNOWLEDGMENT

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Bug or Pest Identification in Agriculture using ML and Blockchain

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***Abstract*—The blockchain is a smart contracts transactions and stored by all the members in the chain. The chain contains different types of farmers, agents, dealers and pesticide controllers. It is one of the most convincing use instances of blockchain that makes the method involved with developing and providing food more straightforward. Keeping steady over the most current advancements in agrarian cycles is however intricate as it very well might be fundamental for working on the whole area. Given the quick advancement of this innovation, it has turned into a need to remain educated regarding the latest improvements in the field to remain in front of the opposition. The proposed solution of the paper to identify the pest or bug using recent trends of neural network algorithms.**

***Index Terms*— Blockchain, Agriculture, CNN, KNN.**

I. INTRODUCTION

Blockchain for Agriculture is one of the most convincing use instances of blockchain that makes the method involved with developing and providing food more straightforward [1]. Blockchain is quick ending up the innovation that can re-engineer many existing cycle from settling exchanges, following the food beginning and following the client interest to making new thrilling commercial centers [2].To implement blockchain technology using Distributed ledger technology, the innovation that is behind the leader digital currency coin bitcoin and numerous other different elective cryptographic forms of money available for use today, has kept on reforming the commercial center consistently with novel applications being disclosed consistently [3]. Blockchain will probably quick track the agriculture business' development toward more noteworthy straightforwardness and detectability from the field to the table and fork. This will bring open doors and instruments for ranchers and the remainder of the store network to battle food misrepresentation and deal confirmed items to buyers [4].

Blockchain additionally assists with watching bountiful items and decrease instances of unlawful reaping and transporting cheats. The United Nations uncovers that food cheats cost the worldwide economy around $40 billion every year in view of illegal exchanges [5].

Rustic insurance in view of the blockchain with key environment episodes and related pay-outs drafted on a clever contract all associated with flexible wallets with environment data being given reliably by sensors in the field and related by data from area weather patterns stations will work with brief remuneration outs to farmers because of a drought or flooding in the field [6].

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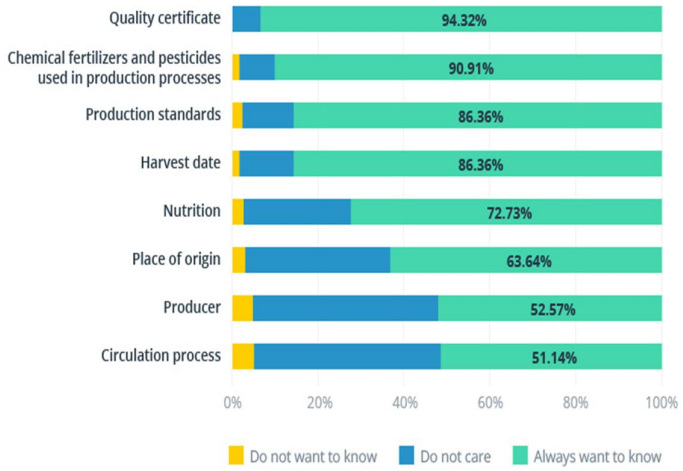


Figure 1: Consumer Preferences for Traceable Food (Source Ref :9)

Agriculture innovations like accuracy cultivating, planning of farmlands, IoT sensors, vertical cultivating frameworks, area knowledge, and yield the executives programming — notwithstanding transportation advances — are engaging rural organizations to accomplish improved results as far as food creation and the whole production network the board in agribusiness [7]. An extended interest for food conveys new issues with it, for instance, counterfeit things that compromise food supply chains at different stages. Nonattendance of straightforwardness and low adequacy put farmers and customers in a difficult situation [8].

In the long run, blockchain developing and appropriated record advancement in dispersed record innovation might conceivably fabricate capability, straightforwardness, and trust all through agrarian stock chains [9]. Blockchain for agribusiness store organization can empower all market players by building associations of trust [10].

II. Agriculture In Blockchain Technology

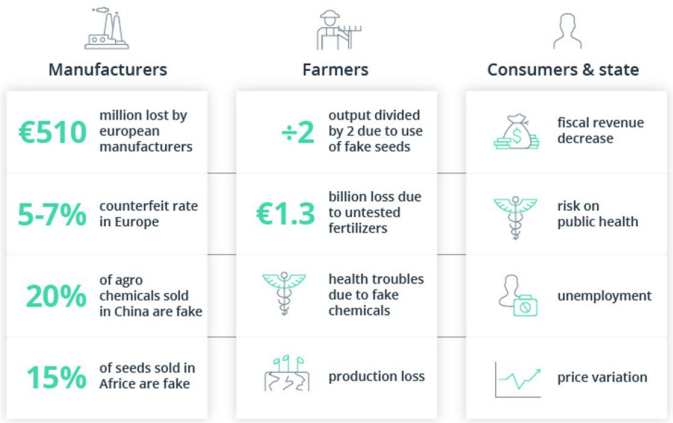


Figure 2: Agriculture challenges & solutions in African country (Source ref :9)

The current framework is, a nuisance's characterization model in view of CNN was recommended in this article. The proposed model gives significant offices to the ranchers to handily perceive gainful and unsafe bugs. To lay out the model irritations with two distinct classes were viewed as where each class thinks about 10 unique species. Countless bugs' pictures were taken to prepare and test the framework. The framework considers different sorts of CNN based order procedures for figuring out the best classifier. To overcome the challenges and improve the productivity of the agriculture system.

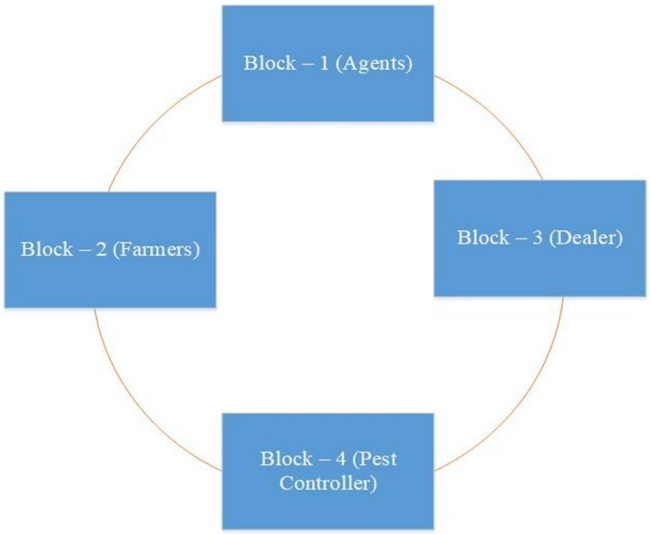


Figure 3: Blockchain based disease identification

In Figure 3 shows that, each and every blocks contains various roles of participants in agriculture sectors. Each and every blocks have crypto id and hash key in the chain. Any of the participants shared the disease leaf in the chain. Inside the chain the particular leaf images shared to all the participants. Some or all the participants shared or find out the leaf disease related information. Based on the feedback and maximum responses from the chain identified and find out the disease.

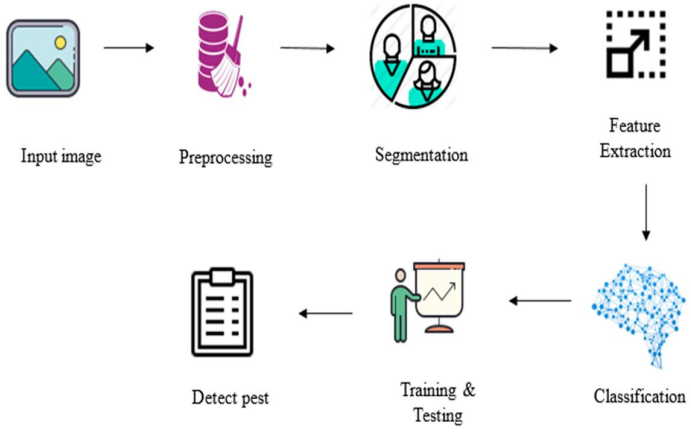


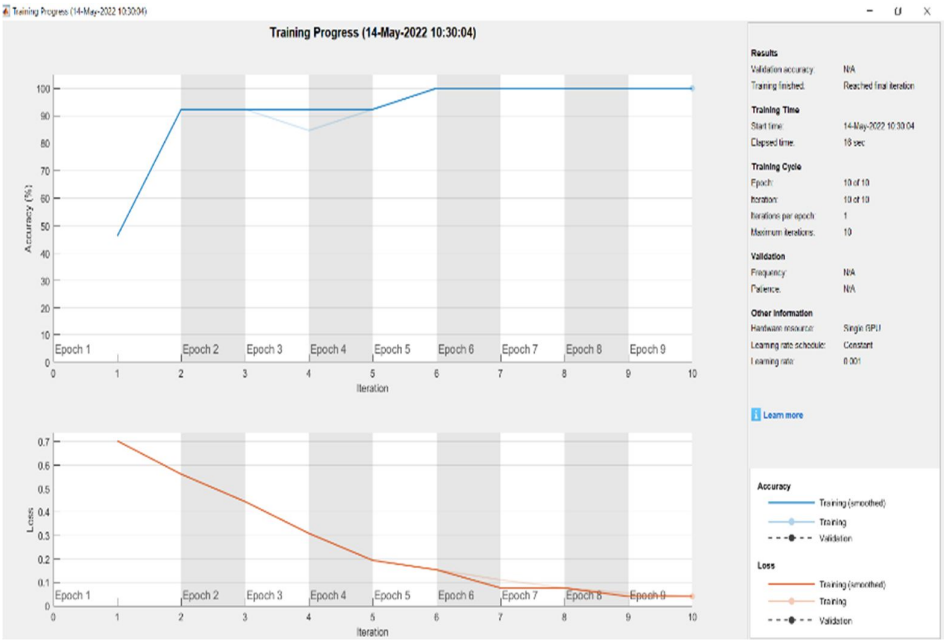
Figure 4: Proposed model leaf disease process

Figure 4 shows that proposed model pest or bug disease process to find out the different types of leaf diseases. In the classification model properties of pest and leaf affected ratio identified. In the classification phase training set applied and convolution neural network compare the user image and training set and gives best accuracy in the given bug.

III. Results And Disscussion

Graph 1 shows that, First iteration of images can secured 46.15% accuracy and continue the iteration in the stage of 10 and secured 100% accuracy with best learning rate. It will help us to identify exact identification of bug or pest and it will check harmfulness in the agriculture system.

In the training system graph1, Accuracy of the pest which we have selected and it will be show the iteration percentage of the particular pest. In this graph will be compared to the trained sets which will give to the Eposh.

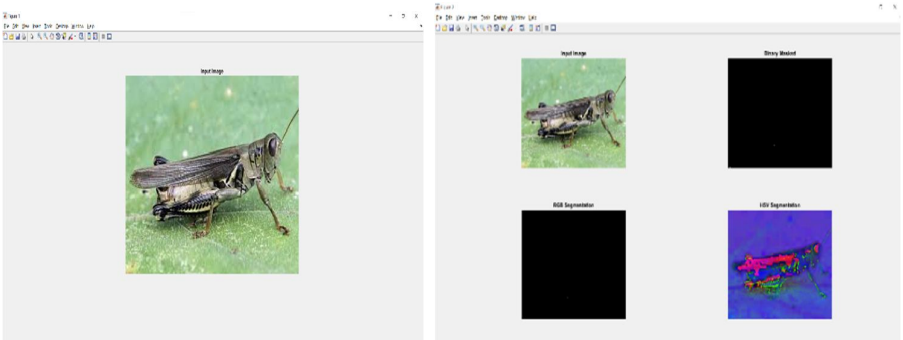


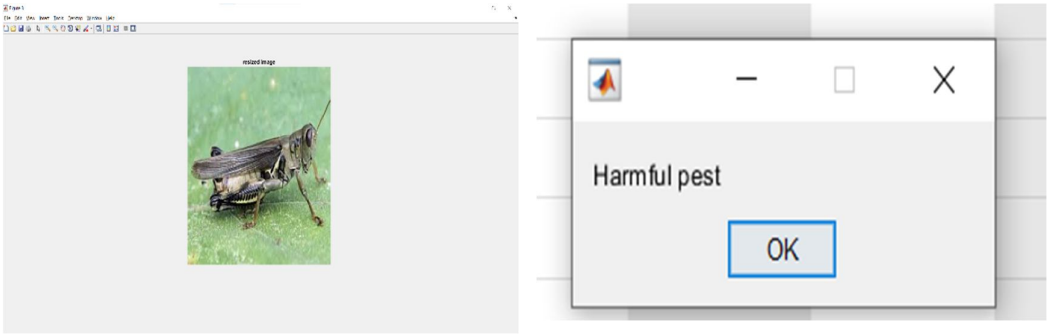
Graph 1: loss in Accuracy and training system

Graph 2: Accuracy representation & Loss representation

TABLE II: ITERATION CYCLE

Training Cycle	
Epoch	10 Of 10
Iteration	10 Of 10
Iteration Per Epoch	1
Maximum Iteration	10





Screenshots

IV. Conclusion

In the decentralized network secured transactions in the supply chain. Accuracy of the system is 100% has been secured in the agriculture system. In the existing system observed that less accuracy and heavy loss in the training system. In this paper secured 100% accuracy and harm bug identified in the system.

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SDN based Network Security Challenges and Methods of Mitigation

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***Abstract*—The software-defined network is one of the most important areas for future networking in 5G and next-generation networks (SDN). As a result of the SDN design, the conventional network is forced to be software-based, which boosts mobility, substantially automates workflows, and accelerates delivery. It is easier to manage and keep track of the network's resources with a centralized view of the entire network and dynamic SDN separation of the control plane from the network layer. The early SDN architecture misinterprets the security requirements due to its centralized control point, raising security vulnerabilities. This paper contributes to the advancement of both the scientific community and the industry by investigating the security and authentication processes used in SDN. Make a list of every security threat and SDN violation that is currently known. The study investigates the previously mentioned SDN security and authentication methods. The defense against attacker is challenging task. These challenges and security requirements in SDN are discussed. Future research directions will be determined based on the essential elements needed for the creation of algorithms for delivering security in SDN.**

***Index Terms*— Authentication, SDN, Security, DDoS Detection.**

I. INTRODUCTION

The huge requirements from consumers', such as data rate, accessibility help, bandwidth growth, delays are being satisfied by network operations. It would be hopeful if the fifth-generation (5 G) network could eventually satisfy these user needs. All networks such as Long Term Evolution (LTE) or 5G, should now include security as a fundamental function. Every network must have security.

The attack types such as IP spoofing and denial of service (DoS) or distributed denial of service (DDoS) have been used in attacks against 5 G networks. A DDoS assault is considered to be more disruptive in this case because it affects all three systems.

Other attacks will have an impact on any of these systems or any combination of these technologies. Information is everywhere, and this period of time in human history is referred to as the "Information Age." Since the Internet's inception in the 1960s, it has been used extensively by roughly 40% of the world's population, revolutionizing the economy through the growth of the communication and entertainment industries. This paper presents a study on several security concerns in Software Defined Networks (SDN) and approaches developed for authentication and DoS/DDoS attack detection.

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II. LITERATURE REVIEW

A. SDN architecture and Security

The requirements of modern networking have been divided into seven areas by the Open Data Center Alliance (ODCA) On-demand scaling, model management, integrated security, mobility, flexibility, automation, and maintenance. Each of these goals is met by SDN, which is more open and flexible than proprietary solutions. In SDN configured environment data plane and control plane are on distinct devices. These two planes serve as the divisions of the switching function. The data plane is in charge of packet forwarding in this case. The data plane is composed of actual switches and virtual switches. By selecting the parameters for the priority and routing policies, creating routes, and adapting to changing traffic patterns the QoS and QoE requirements must be met, and it is the control plane's responsibility to do so. Open interfaces are used to enable communication between SDN controllers and networking applications and to guarantee a consistent user experience regardless of internal implementations. A physical server or a virtual server can be used to set up an SDN controller.

A few of the attacks on SDN that are mentioned in [1] include eavesdropping, distributed denial of service (DDoS), password-related attacks, identity spoofing, sniffer attacks, applications attacks, man in the middle (MITM) attacks, denial of service (DOS), sensitive data protection, and security into software.

Figure 1 illustrates how security issues might appear at any of the three layers as well as during interlayer communication. A system attack, such as a software or hardware attack, can occur at any layer of the SDN, as shown in Figure 1. Protocol attacks occur when the aero planes communicate with one another.

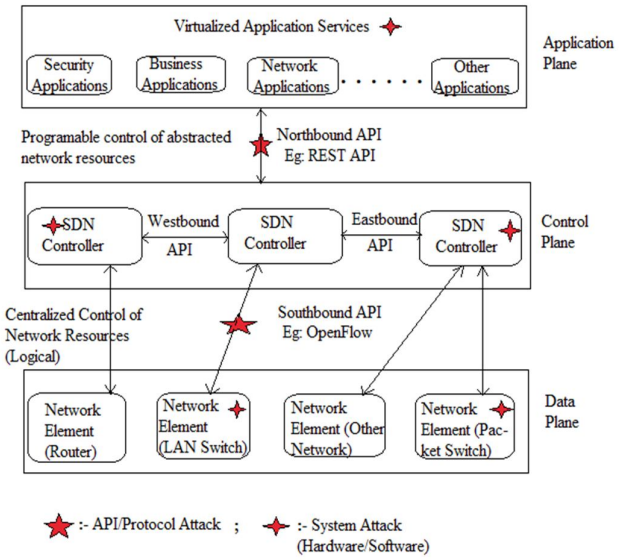

Figure 1: Security in SDN Networks

B. Classification of SDN Security

The links between SDN components may cause new security issues for existing networks. For instance, the Open Flow network does not mandate the use of a secure transport layer. Therefore, the peculiarities of the communication protocol could result in safety issues including DoS, fictional flow rules, and rule alterations. All three SDN planes—the data plane, control plane, and application plane—are under jeopardy. Applications flaws could endanger SDN controllers. There are variety of SDN controllers which includes Opendaylight, ONOS, and Floodlight. Additionally, there can be security vulnerabilities in the channels of communication between the three levels' southern (four) and northern APIs (5). Several of the target component attack vectors are thoroughly explained below:

Application Plane: Applications developed for SDN operations like orchestration, telemetry, and others might have security issues. In normal web applications, common issues of security that may arise incldes Cross-Site Scripting, are relevant to SDN due to the Cross-Site Request Forgery (CSRF) vulnerability (XSS). The network will be vulnerable to attacks because of the malicious/committed programs.

Control Plane: This control unit, which manages many protocols like OpenDaylight, POX, ONOS, and other plugins and applications, is made up of one or more controllers. The attacker will use the IP address to produce a lot of traffic and send it to the controller. The switch and controller will struggle to communicate as a result of this assault, which will lengthen network latency.

Data Plane: The attackers generate an imaginary scenario by cloning the Link Layer Discovery Protocol (LLDP) packets. Attackers utilizing specially created packets can also see the lag in communication with the control plane apps that correspond to the data plane apps. The main intension of this strategy is to locate the system logical controller. Switches are also used by attackers in similar fashion. Too many flood controls can cause the data flow control switch's memory to overflow because it is often restricted.

Communication Channels: A man in the middle (MITM) attack is performed by connecting managed devices between south bound and north bound APIs and switches. By monitoring host-to-host communication and gradually rerouting traffic between hosts the records are generated by authors for attacks monitoring. In order to determine whether a better SDN stage structure could help manage both internal and external security threats, some of the most significant SDN Threats Vectors (TVs) are examined in-depth in this section.

C. Threats in SDN

Fake Traffic Flows (threat Type 1): DoS attacks can be used to deactivate the switches by the attackers. In this type, switches may include the type TCAM (ternary content-addressable memory). The issue can be resolved with a straightforward authentication scheme, but if the attacker is successful in accessing the application server that houses client data, they can inject forged approved streams into the network using the same validated ports and source MAC addresses.

Switch Specific Vulnerabilities (threat Type 2): The switches used in the SDN environment could have problems. The SNMP MIB-II subagent daemon (mib2d) in Juniper OS is an illustration of this. It includes a vulnerability (CVE-2018-0019) that enables a remote attacker via a network to crash the mib2d function and subsequently in SNMP subsystem a denial of service (DoS) attack is performed. In an SDN setting, a switch can be used to restrict traffic, redirect network traffic for data collection, or create fictitious traffic needs in an effort to overburden the controller or other switches.

Control Plane Communication Attack (threat Type 3): TLS/SSL security is not applied to data transfers between the control and data planes. In an SDN setting, Public Key Infrastructure (PKI) is available, but the channel correspondence is not entirely secure. There are studies available on TLS/SSL security concerns. Through a weak Certificate Authority (CA) application, an attacker might gain access to the SDN's control plane channel. If there are constrained switches in control plane, such switches are targeted by attackers for DDoS attacks.

Controller Vulnerabilities (threat Type 4): In an SDN setup, the controller is the most crucial component. An unreliable controller has the power to bring down the entire network. For instance, in a remote denial of service attack (CVE-2015-7516), an older version of the SDN controller ONOS was targeted. The attacker can perform a switch disconnect and a NULL pointer dereference by sending the ONOS controller having versionv1.5.0 using Ethernet outlines from the Jumbo Frame (0x8870) ether type. The specific set of circumstances that lead to a certain action or the question of whether it is risky or not cannot be answered by a combination of mark-based interruption location devices.

Between the management applications to the controller Trust (threat type 5): Applications on the executive's and controller's aircraft are lacking in a system to build trust. In the SDN scenario, there may be differences in the trust system between ordinary programs, endorsement creation, and trust confirmation between organizing devices.

D. Challenges in SDN Security

In addition to the indicated treat types in the paragraphs above, some security issues unique to SDN are not present in traditional networks. In this subsection, these security issues and appropriate practices are emphasized in an effort to prevent them in SDN.

1. Programmability: Thanks to SDN, customers from diverse industries and organizations can select among programmable options. Modern businesses have an organizational structure that mimics a closed domain. In a number of business and administrative domains, the SDN business model is necessary to protect system integrity, data from outside parties and open interfaces.

Isolation in Traffic and Resource: One program's corporate planning and real-time data must be totally segregated from other applications. Tenants must be given the assurance of traffic and resource isolation in the SDN scenario. Due to the SLA requirements and private addressing approach, fine-grain isolation can be obtained by complex interactions.

Third-party applications and controller trust factor: To lessen the controller's susceptibility, authorization and authentication at the application registration stage should be implemented.

2. Legacy Protocols and their integration facility: Some operational and technical issues with the conventional protocols were resolved with the introduction of SDN. However, it could be challenging to upgrade security measures for currently in use systems like DNS and BGP. Prior to incorporating the present protocols into SDN, it is critical to validate their functionality.

3. Cross-Domain Connection: Various physical servers, data centers and clusters are connected via SDN infrastructure. Each security domain may have one or more controllers in charge of it. A viable approach for developing trust between controllers must be provided by the SDN design. Abuse must be prevented by the confidence structure, which must also establish a secure channel.

E. DoS/DDoS Detection Methods

The DoS attack was discovered to be a weakness in SDN. To create an efficient and trustworthy DoS/DDoS security mechanism, a variety of methods were combined with traffic monitoring at the control layer and data layer programmability. Traffic data are introduced in each situation, depending on the network environment, to identify the DDoS intrusion using the chosen technique. The challenges and recommendations made for each research project addressed under the topic "DoS/DDoS Protection on Network Security Enhancements in SDN" are thoroughly explained in Table I.

TABLE I: DOS/DDOS DETECTION METHODS

Paper	Problem	Solution
[2]	DoS attack problem affecting SDN performance at the controller	Introduced an NID approach to bolster the DoS attack defences of SDN controllers.
[3]	SDN lacked a reliable system for identifying malicious traffic. The issue with utilising a single controller Problem with connected data in a dataset that is available	Proposed NIDS detection techniques based on machine learning. Introduced several controller mechanisms to deal with incoming packets that were new. Introduced feature selection techniques to a dataset that was prepared without duplication.
[4]	The Controller's DoS issues and performance flexibility	To recognize DDoS assaults against SDN controllers, correlation-based and entropy-based rules have been introduced.
[5]	DDoS assault detection problem	Presented how self-organizing maps can be used to classify traffic flow as either normal or malicious statistically.
[6]	To prevent Threat from overloading the SDN controller and targeting it	A method for classifying and identifying fraudulent network flow based on traffic statistics was presented.
[7]	Machine learning classifiers are ineffective at classifying DoS traffic redundancy	Utilized feature selection techniques before processing the data.
[8]	to solve the issue of botnet DDoS attack detection and blocking	Presented a DDoS blocking method for SDN-controlled network infrastructure.
[9]	Network performance issues brought on by DoS cyber attacks	Client-side implementation of a security system for an SDN architecture.
[10]	Traffic congestion issues at the controller	To prevent the incidence of DDoS assaults, mean entropy and the rate of percentage drop were introduced.
[11]	DoS attack detection and mitigation issues with OpenStack Cloud	An effective paradigm for safeguarding OpenStack cloud infrastructures is the newly announced firewall security mechanism.
[12]	issues with detecting and responding to DDoS attacks in content-oriented networks	To spot DDoS assaults, the frequency and pattern of content requests are analyzed.
[13]	The challenge of detecting and responding to DDoS attacks	Based on the capacity of the traffic flow, identify DDoS traffic using OpenFlow and drop it.

F. Authentication as a Step to Prevent Attacks

In the modern world, network managers put in a lot of effort to protect corporate networks, which frequently store significant data and resources. Sadly, despite the guidelines and safety measures implemented, these networks are nevertheless vulnerable to abuse, insider attacks, and inadvertent application flaws. Making sure that network connections are simple but uncontrolled is the responsibility of the Network Access Control. IEEE 802.1x standard technology describes a network access control system based on Ethernet ports. The IEEE 802.1x specification provides a technique for encapsulating communications using EAP (Extensible Authentication Protocol) sent across a LAN (Local Area Network).

This is termed as EAP over LAN (EAPOL). When network accessibility through switch port is required user credentials are essential. Direct network connections are not practical. The IEEE 802.1x EAP protocol provides

EAP-TLS, EAP-IKE MD5, EAP-V2 and other authentication methods. The source (host), authentication server and authenticator are the three components that make up the 802.1x standard specification. Figure 2 shows a typical authentication process.

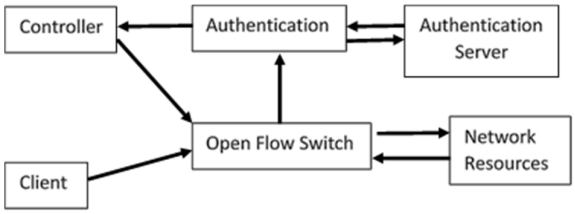

Figure 2: Typical Authentication Process in SDN open flow networks

G. Brief Discussion on various DoS/DDoS detection methods

With the emergence of SDN, a hierarchical authentication mechanism is offered by Xiao Liang et al. [14] for the IPv6 source address (SDN). This tool integrates the evaluation of the three entry organize, between space components and intra-area. Additionally, it can provide an extremely fine-grained level of security assurance for IPv6-capable devices.

In 5G HetNets based on SDN, Jin Cao et. al. [15] synchronization's of client capability and SDN process also offers a security assurance handover which is capacity-based verification mechanism. Our suggested method can greatly reduce the cost of verification handover while achieving critical understanding between BSs and User Equipment's (UEs) in 5G HetNet. Authors demonstrate that suggested method can provide a strong security guarantee through the use of a few security evaluation tools. The tools are used such as BAN and Scyther. Additionally, the evaluation results for the presentation demonstrate that our technique works better than other recent strategies.

For cloud radio over fibre and 5G, Hui Yang et al. [16] suggest a blockchain-based anonymous access (BAA) technique and a blockchain-based trustworthy authentication (BTA) concept. On an improved SDN testbed, the viability and productivity of using blockchain as support are evaluated.

A 5G heterogeneous network powered by software-defined radio (SDN) is provided with physical layer quick authentication by Ting Ma et al. [17]. (HetNet). Authors propose to implement the handover authentication in the plan using the Kolmogorov-Smirnov (K-S) theory test. The quick and efficient authentication is seen with the use of K-S method.

Cong Wang et al. [18] present an overview for a unique and successful authentication in SDN-based handover mechanism. This is for MEC in CPS. The SDN controller uses an authentication handover module (AHM) for key distribution and board confirmation. The AHM obtains a key from the active AP in order to get ready for an ECN handover. The one-time session key (OSK) is requested by AP, from the AHM during a handover. The shared authentication is achieved by the OSK-established three-way handshake procedure between AP and ECN. A potent enemy of attacking capability is validated by utilizing formal check via Internet security protocols and applications (AVISPAs) automatic validation process. The simulation results demonstrate that the SHAS conspiracy has less computational postponement and utilizes less correspondence resources. The practical validation of our approach is completed by the widely used NS-3 replication.

The hidden authentication (HiAuth) method, developed by Osamah Ibrahiem Abdullaziz et al. [19], safeguards the SDN controller. Bitwise operations are used by HiAuth which combines the characters from sender into the control packets. DoS attacks prevention by data covering is done firstly by company HiAuth in OpenFlow network. In two independent confirmation processes, HiAuth makes use of the exchange distinguishing proof field in OpenFlow and the IP ID field in IPv4. The test results demonstrate that HiAuth may significantly increase attacker imperceptibility while successfully reducing trespasser DoS attacks.

SDN Authentication and Attack Detection Methods with Machine Learning:

Managing the IoT devices is becoming difficult due to the enormous amount of data being generated. One of the major problems in the digital age is IoT security. IDSs have been developed utilizing a variety of approaches and strategies to defend and protect IoT networks [20]. As a response to numerous IoT-related challenges, an SDN-based IoT framework has recently been developed [21]. In SDN controller software programs manage the IoT devices [22–24]. The control related tasks and administration tasks are carried out in the underlying IoT network. These notable intrusion detection models were created recently to solve security issues in SDN-based networks.

Deng et al. [25] have described the many invasions that use the SDN-based IoT system. Authors also discussed detection and preventative measures. The accessibility, confidentiality, and integrity of IoT security have all

been studied by the writers. A research viewpoint is provided based on an evaluation of how various intrusion detection systems operate.

The principal component analysis and suppressed fuzzy logic for SDN-IoT intrusion detection have been introduced by Liu et al. [26]. There are two sorts of traffic. To comprehend the elements influencing the algorithms employed in the suggested strategy, simulated experiments are conducted. The experiment's findings show that the suggested IDS loses efficiency and accuracy as data volume increases.

The outcomes are superior to two other methods presented in the research, though. By combining SDN and machine learning, the IoTIDM model by Nobakth et al. [27] creates a network Intrusion detection system (IDS). IoT-IDM notifies the network devices of the attack. As a module for the SDN's lighting controller, IoT-IDM is being developed. For use with IoT networks in smart homes, IoT-IDM was developed. Hossien et al. developed a minimal Artificial Immune System (AIS)-based IDS for the Internet of Things. [28]. Three categories-cloud, fog, and edge-have been used by the authors to categorize the Internet of Things. In the cloud layer, training for detection is carried out. The concept of smart data is used in the fog segment's work on incursion notifications. The detectors are put into use on edge computing systems. Kalis is a knowledge-driven, self-adaptive intrusion detection system created by Midi et al. Kalis gathers network features before automatically customizing the detection method for the network. To accommodate IoT devices with limited resources, the suggested approach can also be implemented on a standalone device. For evaluation, the ICMP flood attack and Smurf attack are taken into consideration.

In their suggested IDS, Hassan et al. [30] used the Nave Bayes algorithm to categorize the traffic for intrusion detection. The Weka tool was employed by the authors to process assault data and other information. The device or the administrator receives notification of the attack.

An IDS for IoT that incorporates a more recent dataset and seeks to identify recent assaults was proposed by Kumar et al. [31]. According to the research, the suggested method outperforms several modern IDS and even guards against malicious internal attacks. An IDS for IoT based on SDN and with the use of machine learning is presented by authors in their earlier work [7]. The classifier makes use of the backward propagation technique. For the purpose of assessing how well the model works, the ICMP flood assault has been simulated.

Jagtap et al [33] used long shrt term memory (LSTM) and Grded rated Unit (GRU) for development of attack mitigation model. The model shown 96% efficiency for mitigating different types of DDoS attacks. The LSTM Fuzzy model is given in [34] by Mathus et al. the model uses fuzzy rules and LSTM model for attack mitigation which shows 88% efficiency. The deep learning based intrusion detection system is designed by Han et al [35]. The efficiency of model is seen around 89% for mitigating the DDoS attacks.

III. COMPARATIVE ANALYSIS

The comparative analysis is performed for various methods which make use of CIC2019 DDoS attack dataset [32].

TABLE II: COMPARATIVE OF DIFFERENT TECHNIQUES FOR THEIR CAPACITY TO DETECT ATTACKS

Paper	Method Used	Number of Stages	Types of DDoS Attacks Mitigated	Number of requests blocked	Update of model feasible?
Jagtap MM et al [33]	LSTM-RNN	2	7482	96%	Yes
Matheus et al [34]	LSTM-FUZZY	1	7466	88%	No
Han et al [35]	DL-IDS	1	7336	89%	No

A. Important points from study

1. Authentication can be the first step towards selective access for the services provided which may prevent introduction of malicious node in the network.
2. The SDN platform has wide range of risks associated during services allocation in which server has to perform various tasks to provide responses to the requests.
3. The request based DDoS attacks is the important factor of concern in which variety of attack types can be observed. (e.g. dataset [32])
4. The attack records based on packet in depth analysis can be used for machine learning based algorithm development for SDN security.

5. The machine learning conventional classifiers such as Support vector machine, naïve bays, decision tree, artificial neural network, random forest can be used for classification. The feature extraction in conventional methods will be dependent on hand crafted methods.
6. The deep learning based dense network have shown better results especially use of RNNs. The LSTM and GRU combinations show improvement in results.

IV. CONCLUSION

The advancement in network technology these days make use of software defined networks (SDN). Though SDN has variety of advantages, the SDN platform is exposed to a wide range of risks, some of which are brought on by authorization and authentication weak processes and others which are brought on by the SDN design. In SDN, one attack vector must be the only focus of the construction of a secure cloud networking architecture. The security concerns affecting SDN's dependability, availability, and security were the main emphasis of the study presented in this paper.

The goals of the security design and security countermeasures have been extensively discussed for OpenFlow protocol and for the SDN data and control plane. The controlled architectural configuration is also dependent on a number of other parameters, such as the effects of a certain secured configuration on throughput and latency, in addition to the techniques detailed in this section. But since they are outside the purview of this study, they must be considered before the survey's recommendations are put into practice.

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Sentiment Analysis on Multilingual Tweets using XGBoost Classifiers

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***Abstract*—Twitter is a free social networking microblogging service that allows registered users to send short messages or post so-called tweets. Twitter members can tweet and follow other users' tweets. These tweets are persistent, searchable, and public. Anyone can see tweets on Twitter regardless of whether they are a follower or not. The tweets posted are either good tweets or bad tweets. Sentiment analysis uses natural language processing and computational linguistics techniques to automate the classification of sentiment generated from tweets. In this work, multilingual tweets are collected and these tweets are divided into positive and negative tweets. First, preprocess the tweets to remove unnecessary content from the tweet. Then extract the adjectives that make up the feature vector and then perform sentiment analysis by classifying the tweets using algorithms such as logistic regression. The polarity scores for the multilingual tweets are also calculated. The XGBoost classifier gives better results for the Twitter dataset than the logistic regression model.**

***Index Terms*— Semantic analysis, classifications, multilingual, sentiment analysis, polarity score.**

I. Introduction

Twitter is a social networking service on which users post and they interact with messages known as tweets. The growing popularity was unexpected in the increasing formation of opinion. But the opinion thus formed remains in the lack of proper strategic analysis, tweets can be opinionated and misleading. Sentiment analysis is currently the most significant field in the development of an organization and hence many machine learning technologies have been applied to automate the work. Sentiment Analysis identifies the sentiment expressed in the tweets and detects the polarity value. The social network acts as a medium for users to post their opinions and these sites are used to disseminate the information. Social media plays a significant role in the level of marketing and people's changing needs. The semantic analysis of the sentence increases the meaning and necessity of the information.
In current years, a variety of functions and methods for training classifiers have been explored, with varying results. The aim of this work is to extend the data set for sentiment analysis by adding semantics as an additional feature by including the corresponding semantic concept as an additional feature for each extracted entity. This approach could result in better accuracy of the classification model.

II. Literature Survey

In the past, many researchers have discussed sentiment analysis of tweets using machine learning methods. This

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section discusses some of the existing work. Initially, tweets were classified based on Naive Bayesian Maximum Entropy Sentiment and Negation [1]. Each tweet received a score against which it was classified.
The sentiment analysis of tweets was analyzed using the Hadoop framework with the aim of efficiently analyzing the huge amount of existing data [2]. It was successfully shown that the Hadoop framework is immensely effective in classifying particularly large amounts of data. The machine learning methods used in semantic analysis is to classify the sentence and product ratings based on Twitter data were performed [3]. To analyze a large number of reviews using Twitter datasets that are already labeled. The Naive Bayes technique shows a better result than maximum entropy. The polarity score function and the n-gram function are the sentiment feature set of tweets that integrates into Support Vector Machines (SVM) model training and predicts a sentiment classification label [4].
The most effective combination of features for a Chinese microblogging site is identified [5]. Sentiment analysis of tweets using TextBlob, a NLP library, was performed in [6]. A unique method for detecting Twitter communities by improving the quality function of modularity and a Constant Potts model further contributed to further expand the scope of community detection in social networks [7]. Semantic analysis of interpersonal interaction correspondence based on the semantic analysis of food reviews [8]. The first feeling polarity dictionary with a translator and a dictionary consisting of about 159,876 Turkish words was created in [9]. The idea of adding semantically similar words and contextual identities to the feature vectors to increase the accuracy of the prediction was successfully identified [10] [11]. The push into multilingual classification continued as Indonesian Twitter sentiment analysis using Word2Vec [12]. An aspect-based fuzzy logic sentiment analysis on big data in social media was conducted to analyze customers' problems in purchasing quality products [13].
Multilingual representations of words with similar meanings in multilingual [14]. Language recognize common points of view from multilingual comments [15]. Hybrid sentiment classification model using ensemble machine learning methods [16]. Classification model with different text features analyze sentiment polarity [17]. Sentiment analysis is performed for tweets on different domains [18]. Various classification models for sentiment polarity [19]. Graph neural networks are used to extract the information from the tweets and make a prediction based on the extracted graph [20]. The ensemble classifier helps in determining sentiment analysis [21]. The classifier predicts the location of the tweets based on the KNN sentiment analysis [22-24]. Semantic similarity between the comments directly identifies emotional polarity and lexical polarity [25-27]. User-generated sentences contain the sentiment information using the hybrid model classification techniques [28-30]. Sentiment analysis to determine opinions using a lexicon-based algorithm [31].

III. System Design

The system consists of simplified modules and the architecture diagram shown in Figure 1. The Twitter data is pre-processed to convert data into an appropriate format. Then the transformed data is passed through a semantic analyzer to remove and lemmatize stop words. In the feature extraction model, the feature vectors are extracted from the processed tweets. Then the data's split into training and validation data. Then the training data is passed to the training model. The testing data performs in classifier model. These help predict the output of the senti-strength score, based on which tweets are classified as positive and negative. Finally, the polarity score or degree of positivity or negativity is calculated for the tweets dataset based on the four categories such as strongly positive, weakly positive, weakly negative and strongly negative.

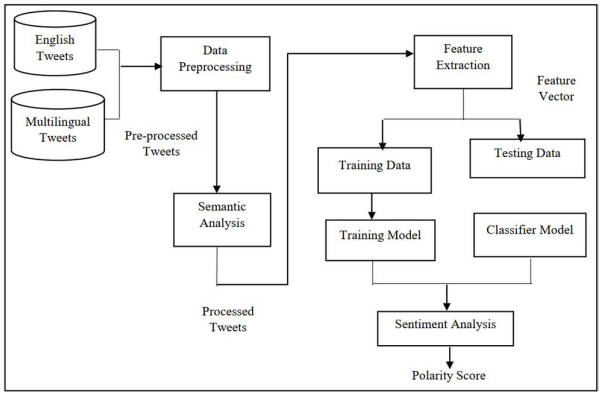

Figure 1. Architecture Diagram

A. Data Preprocessing

Data pre-processing is a technique that allows raw data to be converted into a suitable format. Data collected from different platforms is often unstructured, incomplete, contradictory or lacking specific characteristics and is likely to contain ambiguities. Data pre-processing makes it easier to solve these problems. It prepares pre-processed data for further processing.

B. Semantic Analysis

In this phase, the data is cleaned in terms of the following aspects: stop word removal, word stemming, punctuation, lowercase data, and repeated word/character removal. Remove stop words and lemmatize. The process of lemmatization is to translate a word into its base form. This filtering is more valuable, meaning only those with actual and relevant content are retained. This process plays the main role in tokenizing words. Finally, after removing those useless words, the remaining data is tokenized.

C. Feature Extraction

The main purpose of feature extraction is to reduce model complexity, improve model accuracy and train the machine learning algorithm faster. In sentiment classification, the features are most often the terms or phrases that influence the sentiment of the tweets. The post-processing of the filtered dataset has many distinctive properties. The feature extraction process extracts the part of speech from the data set. TFID feature vectorization is used. It converts text into feature vectors that can be utilized as input for estimators. The vocabulary is a dictionary that converts each token into a feature index in matrix form.

D. Training / Testing Model

The selected functions are divided into training set and test set. In the training set, 80 percent of the actual data set is used as the trained model. In the test set, the 20 percent data sample is a trained model that is evaluated as a final fit.

E. Classification Metrics

The classifier used is a logistic regression classifier. The purpose of classification is to find out whether the tweet is positive or negative. The logistic regression classifier used to identify four classification labels as strongly positive, weakly positive, weakly negative and strongly negative.

F. Sentiment Analysis

The tweets are separated after classification as positive or negative tweets. A sample data set of 15,000 tweets is tested without a sentiment label (0 or 1) and it is found that the model correctly predicts the output and stores it in the output file as shown in Table I.

TABLE I. SAMPLE TWEETS

S. No.	Tweet	Sentiment
1	@user when a father is dysfunctional and is a…	NEGATIVE
2	@user @user thanks for #lyft credit. I can't us…	NEGATIVE
3	bihday your majesty	POSITIVE
4	#model i love you take with u all the time in…	POSITIVE
5	Factguide: society now #motivation	POSITIVE

IV. RESULTS AND DISCUSSION

A. Datasets

The dataset contains 160K tweets extracted using the Twitter API, an open-source dataset. The tweets were commented (0 = negative, 1 = positive) and used for sentiment detection. It contains the following 6 fields shown in Figure 2.

	target	id	time	query	user	tweet
0	0	1467810369	Mon Apr 06 22:19:45 PDT 2009	NO_QUERY	_TheSpecialOne_	@switchfoot http://twitpic.com/2y1zl - Awww, t...
1	0	1467810672	Mon Apr 06 22:19:49 PDT 2009	NO_QUERY	scotthamilton	is upset that he can't update his Facebook by ...
2	0	1467810917	Mon Apr 06 22:19:53 PDT 2009	NO_QUERY	mattycus	@Kenichan I dived many times for the ball. Man...
3	0	1467811184	Mon Apr 06 22:19:57 PDT 2009	NO_QUERY	ElleCTF	my whole body feels itchy and like its on fire
4	0	1467811193	Mon Apr 06 22:19:57 PDT 2009	NO_QUERY	Karoli	@nationwideclass no, it's not behaving at all....

Figure 2. Sample Dataset

Data distribution is used to check whether the data set is balanced or not. The conclusion of the data distribution shows that the data set is equally balanced, with the number of positive tweets and negative tweets being equal. The distribution data is presented visually in Figure 3.

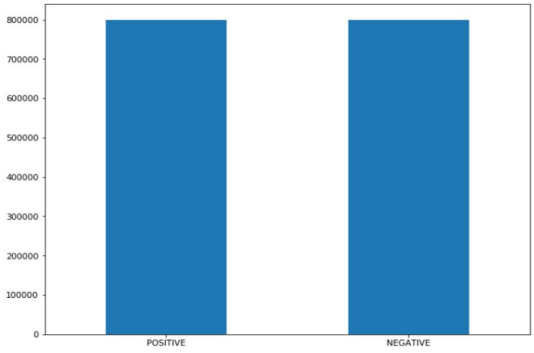

Figure 3. Data Distribution

B. Senti Strength

Sentiment strength estimates the strength of positive and negative sentiments in texts, including for informal language. Polarity scores are used to find Senti strength. Polarity values range from -1 (strongly negative) to +1 (strongly positive). Based on the polarity of each tweet, the Senti strength classifications are shown in Table II. The calculation of polarity scores or values for the processed tweets, is shown in Table III.

TABLE II. CLASSIFICATION OF SENTI-STRENGTH

Senti-Strength	Polarity
Strongly Positive	Polarity ≥ 0.6 to 1
Weakly Positive	Polarity ≥ 0.1 to 0.5
Weakly Negative	Polarity ≤ - 0.1 to -0.5
Strongly Negative	Polarity ≤ - 0.6 to -1

TABLE III. POLARITY SCORES

S. No.	Tweet	Senti strength	Polarity
1	@user when a father is dysfunctional and is a…	Weakly Negative	- 0.500000
2	@user @user thanks for #lyft credit. I can't us…	Weakly Positive	0.200000
3	bihday your majesty	Strongly Negative	- 0.70000
4	#model i love you take with u all the time in…	Strongly Positive	0.978882
5	Factguide: society now #motivation	weakly Positive	0.40000

C. Multilingual Testing

This also applies to a new approach to finding the sentiment analysis of foreign languages. Some of the languages used are Tamil, French, Spanish, Italian, Arabic, Chinese, Hindi and many more. Some of the examples shown below.

- ARABIC:
  الجميع من فضلك لا تطير مع. كان لديه تجارب قليلة رهيبة. لديهم
  خدمة سيئة للغاية ورحلاتهم الجوية تتأخر دائما فدب سفر رجاء الجميع لا يطير مع الخطوط الجوية. كان لديه تجارب قليلة رهيبة.
  لديهم خدمة سيئة للغاية ورحلاتهم الجوية تتأخر دائما
- THAI:
  เจนไน ทำได้ดีมากในวนนี้โ แซม ดยเ เล่นเตะที่ยอดเยยมเพื่อเอาชนะทีม เอ้ย ทุกคนโปรดอย่าบินกัสายการบิน มีประสบการณ์ที่แย่มาก พวกเขามีบรการที่แย่มากและเที่ยวบินมักจะล่าช้า- เสมอ โอ้พระเจ้า
- FRENCH:
  Csk se débrouillait très bien aujourd'hui, surtout que Samcurran a joué un excellent coup de pied pour gagner l'équipe. Oh mon Dieu Tout le monde, s'il vous plaît, ne volez pas avec @airways. J'ai eu quelques terribles expériences. Ils ont un service très médiocre et leurs vols sont tou- jours retardés fedup travelwoes
- ENGLISH:
  Today's Performance by @csk was great especially @samcurran played an amazing knock to get the win for the team. winningstreak. Everyone please dont fly with @airways. Had a terrible few experiences. They have very poor service and their flights are always delayed.

By using a multilingual Tweets dataset for this module, which is an open source dataset. The foreign language is changed to English and then a semantic and classifying task is performed and finally the sentiment and Senti strength of the tweets are predicted as shown in Table IV.

TABLE IV. MULTILINGUAL TESTING SAMPLE DATA

S. No.	Tweet	Sentiment
1	Bugun bulusmami lazimdii	POSITIVE
2	Volkan konak adami tribe sokar yemin ederim :D	POSITIVE
3	Bed	POSITIVE
4	I felt my first flash of violence at some fool…	NEGATIVE
5	Ladies drink and get in free till 10:30	POSITIVE

D. Performance Metrics

In this section, a comparative analysis using the XGBoost classifier and the logistic regression model on iterated random projections is performed to find a suitable machine learning algorithm for the classification component of the framework. The results obtained from the XGBoost classifier and the logistic regression are discussed and the comparison with relative performances based on four parameters: accuracy, precision, recall and F1 score are chosen as classification metrics to compare the performance results of different models in relation to four classes such as strongly positive, weakly positive, weakly negative and strongly negative are shown in Table V.

- Precision:

Precision is defined as the proportion of correctly predicted positive observations to the total of predicted positive observations, as in (1).

$$Precision = \frac{TP}{TP+FP} \quad \square\square\square\square$$

- Recall:

Recall is defined as the proportion of correctly identified positive observations, as in (2).

$$Recall = \frac{TP}{TP+FN} \quad \square\square\square$$

- F1 Score:

F1 score is the harmonic mean (HM) of precision and recall, as in (3).

$$F1\ Score = 2\ x\ \frac{Precision\ x\ Recall}{Precision+Recall}$$ □□□

TABLE V. COMPARISON OF THE XGBOOST CLASSIFIER AND LOGISITIC REGRESSION MODEL

Metrics	XGBoost Classifier	Logistic Regression
Precision	0.81	0.78
Recall	0.84	0.80
F1 Score	0.83	0.79
Accuracy	0.80	0.76

The performance of the model comparison of the XGBoost classifier and the logistic regression is shown in Figure 4.

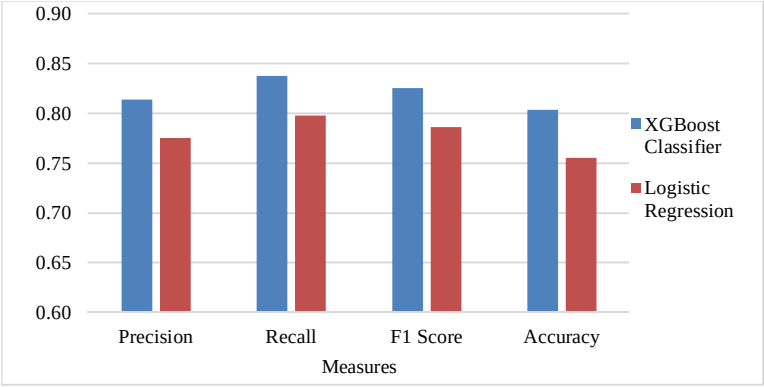

Figure 4. Performance Measure

The logistic regression classifier validated to be the best performing classifier as it had a good accuracy of 81%. Since this is a balanced dataset, the focus is more on accuracy. A confusion matrix is shown below in Figure 5 to show TN, TP, FP, FN.

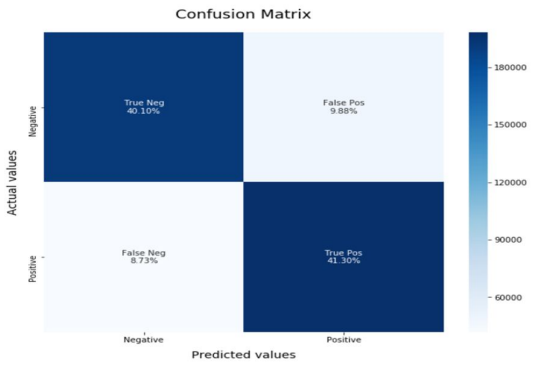

Figure 5. Confusion Matrix

V. CONCLUSION

In this paper, the proposed method uses a set of machine learning methods with semantic analysis. Based on the Tweet Sentiment Score, the words from each sentence are rated, which can be utilized to determine positive or

negative intention behind the tweet. Then the tweets were categorized into four different classes, based on the sentiment identified in the tweets such as strongly positive, weakly positive, weakly negative and strongly negative, based on the sentiment identified in the tweets. The sentiment strength is also defined for the tweets using polarity scores. Finally, foreign languages were included for sentiment analysis, showing good results. The experimental result of this study illustrated that the XGBoost classifier algorithm performed well compared to the logistic regression algorithm in terms of the applied evaluation metrics. Future work includes comparing the performance of other more powerful models such as the Inception models for sentiment classification and using different semantic analysis techniques to process the data.

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MDOLC: Multi Dialect Odia Song Lyric Corpus

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***Abstract*—This paper presents MDOLC, a multi-dialect Odia song lyric corpus. The corpus contains 230 Odia song lyrics in two different dialects (standard Odia or Odia and Sambalpuri). The lyrics are segmented into more than 8033 sentences (song verses) with 42,287 words. The corpus is available in annotated plain text (txt) format with metadata. We perform the dialect detection experiment on this corpus. Also, we performed a linguistic analysis of this corpus. The MDOLC is the first multi-dialect Odia song lyric corpus as per our best knowledge and will be freely available for researchers.**

***Index Terms*— Lyric Corpus, Dialect, Multilingual, Language Classification.**

I. INTRODUCTION

Odia belongs to the Indo-Aryan language family. Odia is a low-resource language spoken by 37 million speakers[1] in the Odisha state of India. Odia has proven its ancient classical legacy to have more than 1500 years of continuous history due to its rich antiquities, inscriptions, and available scriptures [1]. Odia has been heavily influenced by the Dravidian languages as well as Arabic, Persian, and English [1]. Borrowings have enriched its lexicon from these languages as well as from Tamil, Telugu, Marathi, Turkish, French, Portuguese, and Sanskrit[2].

The lyrical journey of the Odia language traces back to the origin of the Jagannath cult in Odisha [2]. Through theaters, folk songs, folk dance, and folk theaters (Pala, kirtan, bhajan, gitinatya, etc.), mythological-social stage plays have flourished through the centuries. However, cinematic representation of Odia lyrics started with the talkative movie "Sita Bibaha" (Sita's marriage") which was a drama written by Kamapal Mishra and directed by Mohan Sundardev Goswami in 1936 [3].

Odia has many regional dialects like Sambalpuri, Berham-puri, Baleswari, Koraputi, Desia, and Sundargadia[3]. Sambalpuri (ISO 639-3)[4] is the western dialect/variety of Odia language spoken in the western part of Odisha state and has a significant contribution to lyrical songs in Odia language apart from standard Odia [4].

[1] https://censusindia.gov.in/2011Census/Language_MTs.html
[2] https://www.britannica.com/topic/Odia-language
[3] https://glottolog.org/resource/languoid/id/oriy1255
[4] https://www.ethnologue.com/language/spv

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In this paper, we collected various categories of Odia songs and Odia songs with Sambalpuri dialects from different song websites to create a corpus of Odia song lyrics. The frequent words in Odia and Sambalpuri dialects are shown in Figure 2. As the collection of songs is modern, it includes words from Hindi and English as well such as the Hindi word “dil (heart)”, and the English word “love” as shown in Figure 1, and Figure 2.

Figure. 1. Word cloud of Odia dialects

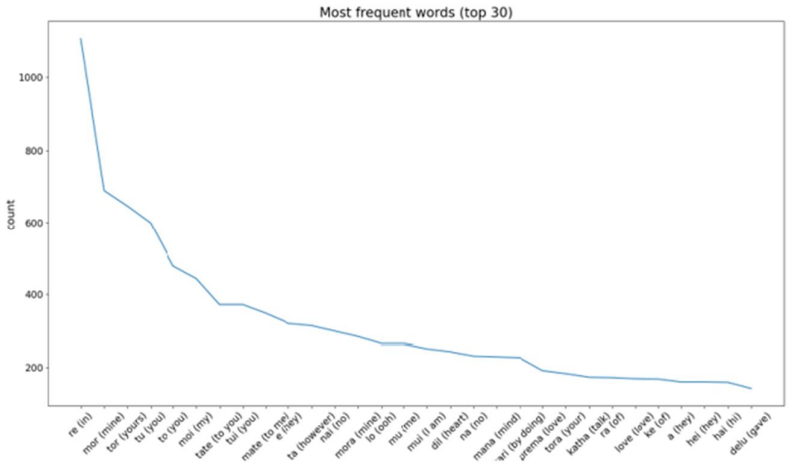

Figure. 2. Most frequent Odia dialect words with English translation (top 30)

II. Related Work

Although there exists corpora of song lyrics in other languages including Indian languages (Hindi, Tamil, Punjabi) for Natural language processing (NLP) research [5]–[10], the availability of song lyric corpus for the low-resource Odia language is limited. There has not been much attention made to compiling Odia songs of different categories and dialects into a corpus suitable for NLP research and our work is one of the first of its kind in this direction. A collection of 730 Odia poems (named “Kabithaa”), annotated and released for NLP research, particularly for sentiment analysis [11] - [12].

III. Data Description

The statistics of the Odia song categories are shown in Table I.

TABLE I. SONG CATEGORIES

#	Songs categories	Count
1	Odia modern songs	142
2	Odia songs with Sambalpuri dialect	88

IV. DATA PROCESSING

We collected Odia songs mainly from the Odia song lyrics websites (see Table II) and preprocessed them for the experiment and release the corpus. The collection of song lyrics data and metadata from the web (e.g. lyric wiki, lyrics websites) was already followed by many researchers in multiple languages which we followed [5], [13], [14]. The preprocessing includes:

- Removal of unwanted characters.
- Avoid repetition of sentences.
- Convert to lowercase.

TABLE II. SONG LYRIC SOURCES

#	Website
1	https://allodialyrics.com/
2	https://odia-lyrics.blogspot.com/
3	https://odialive.com/

We collected the metadata along with the songs and include this data in the corpus as well. In the case of unavailability of metadata, we annotated with "Not Available (NA)" (e.g.<Song Writer>NA< /Song writer>). The metadata collected are shown in Table III and their statistics are shown in Table IV. The corpus is available as annotated plain UTF-8 text files (txt). The plain text (txt) format contains HTML-like annotation tags to identify the song and singer details as well as the lyrics of each song. Figure 3 shows a txt annotated sample, the format is consistent across the corpus with a separate file for each song.

TABLE III. SONG META DATA

1	Song Title
2	Dialect
3	Period
4	Singers
5	Gender of Singers
6	Music Director
7	Gender of Music Director
8	Lyrics Author
9	Gender of Lyrics Author
10	Director
11	Gender of Director
12	Producer
13	Gender of Producer
14	Movie or Album
15	Year

TABLE IV. MDOLC CORPUS STATISTICS

Songs	230
Song Title	230
Sentences	8033
Words	42,287
Singers	90
Dialects	2
Period	1990-2021

V. DIALECT DETECTION

We performed a dialect detection experiment on MDOLC. The reported experiment was conducted at the sentence level where each sentence is a verse from a song, those surrounded with the sentence tags (< s >< /s >) as shown in Figure 3. Each sentence is labeled with the dialect ("ori" for Odia and "spv" for Sambalpuri as per ISO language code). We used both classical and deep learning models for the dialect detection task.

```
<Song ID>1</Song ID>
<Title>mushkil hai jeena</Title>
<Dialect>odia</Dialect>
<Period>after year 1990</Period>
<Singers>babushan & diptirekha</Singers>
<Gender(Singer)>male & female</Gender(Singer)>
<Music Director>prem anand</Music Director>
<Gender(Music Director)>male</Gender(Music Director)>
<Lyrics Author>subrat swain</Lyrics Author>
<Gender(Lyrics Author)>male</Gender(Lyrics Author)>
<Director>ashok pati</Director>
<Gender(Director)>male</Gender(Director)>
<Producer>binni samal & nihar samal</Producer>
<Gender(Producer)>female & male</Gender(Producer)>
<Movie_Album>ajab sanjura gajab love</Movie_Album>
<Year>2017</Year>
<lyrics>
    <s>otha tora madusala</s>
    <s>mitha mitha mahu jhara</s>
    <s>mahu bina prajapati rahi parena</s>
    <s>mushkil hai jeena tere bina</s>
    <s>akhi tora swapana jhara</s>
    <s>tofa tofa janha tara</s>
    <s>janha bina rati jama soi parena</s>
    ...
    ...
    ...

<lyrics>
```

Figure. 3: Odia song corpus sample

VI. EXPERIMENTAL SETUP

As part of the dialect detection experiment, we used the classical Support Vector Classifier (SVC) as a baseline and deep supervised autoencoder (SAE) as a deep learning model.

A. Baseline

As a baseline system, we implemented a binary linear Sup-port Vector Classifier (SVC) using as a form of representation of the documents a traditional bag-of-words (BoW) strategy with a tf-idf weighting scheme.

B. Baseline Deep Supervised Autoencoder

We used the SAE with bayesian optimizer for the dialect detection task which was already found effective in language and dialect detection tasks [15], [16]. We followed the approach by [15].

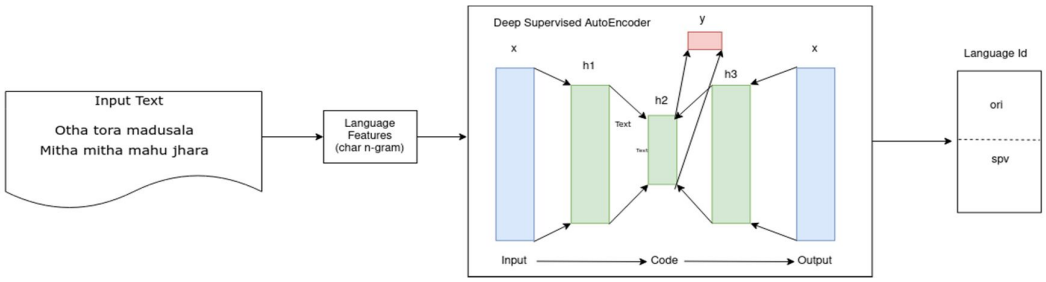

Figure. 4: Proposed model architecture. The extracted features of the text are input to the supervised autoencoder. The target "y" is included. The classification output is the language id for the classified languages (ori: Odia, spv: Sambalpuri).

C. Textual Features

Character n-grams are input to the SAE. In comparison to word n-grams, which only capture the identity of a word and its possible neighbors, character n-grams are better and additionally capable of detecting the morphological makeup of a word [17], [18]. The extracted n-gram features are input to the deep SAE as shown in Figure 4. The deep SAE contains multiple hidden layers. The hyperparameters were optimized using Bayesian Optimizer (BO).

D. Hyperparameters

The range of values for the hyperparameters search space is shown in Table V. During training, BO chooses the best hyperparameters from this range. The overall configuration of the SAE model is shown in Table VI.

TABLE V. SEARCH SPACE HYPERPARAMETER RANGE

Hyperparameter	Range
number of layer	1-5
learning rate	10^{-5} - 10^{-2}
weight decay	10^{-6} - 10^{-3}
activation functions	'relu', 'sigma'

TABLE VI. SAE MODEL CONFIGURATIONS FOR THE DATASET

Parameter	Odia-Sambalpuri
n_gram range	1-3
number of target	2
embedding dimension	300
supervision	'clf'
converge threshold	0.00001
number of epochs	30

E. Datasets

For the experiment, we divided the total number of sentences into an 80:10:10 ratio for the train/dev/test set as shown in Table VII.

TABLE VII. DATASET STATISTICS (NUMBER OF SENTENCES)

Dataset	Training	Development	Test
Odia-Sambalpuri	6426	804	803

VII. RESULTS AND ANALYSIS

The SAE and SVC model's performance in terms of classification accuracy is shown in Table VIII. Both models perform equally on the test set.

TABLE VIII. OVERALL PERFORMANCE OF THE PROPOSED APPROACH

		Accuracy	
Model	Dataset	Dev	Test
SAE (char-3gram)	Odia-Sambalpuri	90%	92%
SVC (tf-idf)	Odia-Sambalpuri	93%	92%

The SAE model performance (Precision, Recall, and F1) score for each class on the test set is shown in Table IX.

TABLE IX. MODEL PERFORMANCE FOR EACH CLASS (PRECISION, RECALL, AND F1) ON TEST SET

Model	Class	Precision	Recall	F1
SAE	Odia (ori)	0.90	0.93	0.91
	Sambalpuri (spv)	0.93	0.90	0.92
SVC	Odia (ori)	0.92	0.91	0.92
	Sambalpuri (spv)	0.92	0.92	0.92

As many words are shared between Odia and Sambalpuri, the classification models (SVC and SAE) failed to classify A few instances as depicted in the confusion matrix in Figure 5 and Figure 6.

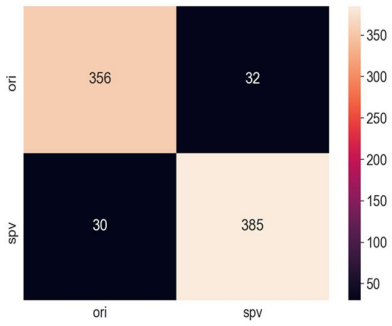

Figure. 5: Confusion matrix (Support Vector Classifier)

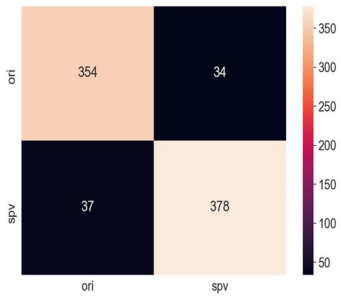

Figure. 6: Confusion matrix (Supervised Autoencoder)

VIII. Availability

After the paper's acceptance, the Odia song lyric corpus will be released for non-commercial research purposes.

IX. Conclusion and future work

In this paper, we propose a multi-dialect Odia song lyric corpus for the low-resource Odia language suitable for NLP research, particularly i) lyric analysis [19], ii) dialect detection el2020habibi, iii) lyric code-mix [20], iv) topic modeling [21], and iv) Sentiment analysis.
The future work includes i) Extending the dataset with more song lyrics of multiple dialects (Berhampuri, Baleswari, Koraputi, and Sundargadia), and ii) experimenting with other similar dialects of Odia for performance evaluation.

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SC-JBR22 based Method to Secure the Analyzed Data

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***Abstract*—The current global is very important is internet for each and every people for every work mandatory. With the help of internet every people used many social media, because social media is mandatory for people life. The people decided to do the any new work before analyzed that work in "social media". This analyzed "data not have good security" in the people systems. In this paper, proposed the new method SC-JBR22-01. This method has 3 stages; 1st stage is to convert the matrix format from analyzed data; 2nd stage is apply the Salsa operations in the matrix; and 3rd stage is apply the ChaCha operations in the matrix.The new SC-JBR22-01 method has provide the good security and performance while compared to ChaCha method.**

***Index Terms*— ChaCha, Encryption, Security, and SC-JBR22.**

I. INTRODUCTION

A significant increase in the amount of information being stored, sent, and managed has resulted from the widespread use of the Internet, virtual entertainment, and other applications. for capacity, "transmission" and to handle by the individual and "industry", in particular. Therefore, new cryptographic computations ought to be made in order to investigate the various "symmetric and asymmetric encryption" decoding methodologies. The productivity of conventional AES calculations has been compared to several chacha [2] calculation types, and it has been examined how much opposition was given and how much time occupied by these computations.
A four layer approach known as SC-JBR22-01 (named after the SalsaChaCha creators JaichandranBagathRajaprakash-01) has been proposed to address the "upcoming new challenges" and to provide compelling insurance to vast amounts of dissected information from "various sources such as the Internet, bank," interpersonal organisation, PDA, and private facts. with improved defences against many conventional attacks and confirmation. The suggested method is tested against a number of known "cryptographic techniques"

II. RELATED WORK

This creator looks at the "ChaCha family," which discusses the ineffective assault of more turns [1]. They developed a cunning method called Freestyle that made use of a few code texts and offered a revolutionary idea known as hash-based halting conditions and key speculation [2]. To distinguish releases linked to attacks, AlexandreAdomnicai et al. "suggested chacha side chanel" investigation [3]. In order to attack the "ChaCha and Salsa20" for lacking infusion, "Kazuhide Fukushima et al" are introduced. They create a "key" and "count the blocks" [4]. They discussed "Abdullah Issa et al."'s A [5]. An expansion turn XOR (ARX) is examined by BodhisatwaMazumdar et al. [6].

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A thorough examination of the "Double A" hash computation has been conducted [7]. "BodhisatwaMazumdar et al." examined the power evaluation assault and associations power assessment before proposing Salsa20's flaw. The best investigation attack is "Power" attack [8]. Conrad Watt et al. discovered that "secure" calculations may be carried out quickly [9]. Probabilistic nonpartisan vectors (PNV), which were proposed by "Z. Shi et al.," are an idea of "probabilistic" impartial parts. On "Chacha20 and ChaCha [10]" weakened rounds, it is utilised to discover and "refine" significant recovery attacks.
The SRB21 technique was introduced by "Somasundaram, Rajaprakash, and Bagahbasha21" and it focuses on the indivisible amounts of the mystery key [11]. How social media data was analysed [12]. The author contrasts CBB21[13], CBB20[14], and SRB21-P2[15] with the conventional approach. How to use the SRB18 method to determine runtime efficiency[16]. The RBJ25 approach [17], RB20 method [18], and CBB22 method [19] are contrasted with the AES and ChaCha by the author. How to compare several algorithms to the data from movies [20]. How to store and process the vast amounts of data according to RBJ20 [21] and RPBB31[22].

III. METHODOLOGY

The forecasting analyzed data is used to apply the novel method SC-JBR-22-01 has 3 stages. The first stage has convert the "matrix format". The second stage is apply the Salsa operations. The third stage is apply the ChaCha operations.

Algorithm

- To get the input data from the analyzed matrix data.
- To apply the Salsa operations using Equation(1) in the given matrix S.

$$S_{ij} = S_{ij},$$
$$S_{(k+1)j} = S_{(k+j)j},$$
$$\text{if } i > N \text{ Then} \qquad \text{Equation (1)}$$
$$i = K - N$$
$$\text{where } k = 0,1,2,\ldots N.\ j = 1, 2, 3\ldots N.$$
$$N \text{ is the order of the matrix.}$$

- To apply the ChaCha Operations in the converted S matrix.

IV. RESULT AND DISCUSSION

$$\text{IPM} = \begin{bmatrix} TN1 & DL2 & MH3 & PU4 \\ KL5 & AN6 & TE7 & GO8 \\ KA9 & AC10 & OR11 & PY12 \\ GU13 & HP14 & KM15 & AS16 \end{bmatrix}$$

Where IPM is input data matrix

Using Equation (1)

- Process 1: First diagonal value move to the first row in first column.

$$S = \begin{bmatrix} TN1 & DL2 & MH3 & PU4 \\ KL5 & AN6 & TE7 & GO8 \\ KA9 & AC10 & OR11 & PY12 \\ GU13 & HP14 & KM15 & AS16 \end{bmatrix}$$

where S is Salsa matrix

- Process 2: Second diagonal value move to the first row in second column.

$$S = \begin{bmatrix} TN1 & AN6 & MH3 & PU4 \\ KL5 & AC10 & TE7 & GO8 \\ KA9 & HP14 & OR11 & PY12 \\ GU13 & DL2 & KM15 & AS16 \end{bmatrix}$$

- Process 3: Third diagonal value move to the first row in third column.

$$S = \begin{bmatrix} TN1 & AN6 & OR11 & PU4 \\ KL5 & AC10 & KM15 & GO8 \\ KA9 & HP14 & MH3 & PY12 \\ GU13 & DL2 & TE7 & AS16 \end{bmatrix}$$

- Process 4: Fourth diagonal value move to the first row in fourth column.

$$S = \begin{bmatrix} TN1 & AN6 & OR11 & AS16 \\ KL5 & AC10 & KM15 & PU4 \\ KA9 & HP14 & MH3 & GO8 \\ GU13 & DL2 & TE7 & PY12 \end{bmatrix}$$

- Now, apply to the ChaCha operations in the converted S matrix.

- Process 5: First diagonal value move to the first column in the first row.

$$C = \begin{bmatrix} TN1 & AN6 & OR11 & AS16 \\ KL5 & AC10 & KM15 & PU4 \\ KA9 & HP14 & MH3 & GO8 \\ GU13 & DL2 & TE7 & PY12 \end{bmatrix}$$

where C is ChaCha matrix

- Process 6: Second diagonal value move to the first column in the Second row.

$$C = \begin{bmatrix} TN1 & AN6 & OR11 & AS16 \\ AC10 & KM15 & PU4 & KL5 \\ KA9 & HP14 & MH3 & GO8 \\ GU13 & DL2 & TE7 & PY12 \end{bmatrix}$$

- Process 7: Third diagonal value move to the first column in the third row.

$$C = \begin{bmatrix} TN1 & AN6 & OR11 & AS16 \\ AC10 & KM15 & PU4 & KL5 \\ MH3 & GO8 & KA9 & HP14 \\ GU13 & DL2 & TE7 & PY12 \end{bmatrix}$$

- Process 8: Fourth diagonal value move to the first column in the fourth row.

$$C = \begin{bmatrix} TN1 & AN6 & OR11 & AS16 \\ AC10 & KM15 & PU4 & KL5 \\ MH3 & GO8 & KA9 & HP14 \\ PY12 & GU13 & DL2 & TE7 \end{bmatrix}$$

The proposed algorithm SC-JBR22-01 compares ChaCha's encryption performance. All diagonal values migrate to the first column in the ChaCha concept. According to Table 1, The 3x3=>24 bytes , 6x6=>76 bytes, 10x10=> 312 bytes, 15x15=> 812 bytes, 20x20=> 1531 bytes, 40x40=> 6580 bytes.

TABLE I. SC-JBR22-01 ENCRYPTION PERFORMANCE

File Size	ChaCha	SC-JBR22-01
24	1.69	2.6
76	1.29	2.8
312	2.73	4.2
822	2.64	4.6
1531	3.4	6.2
6580	2.27	6.7

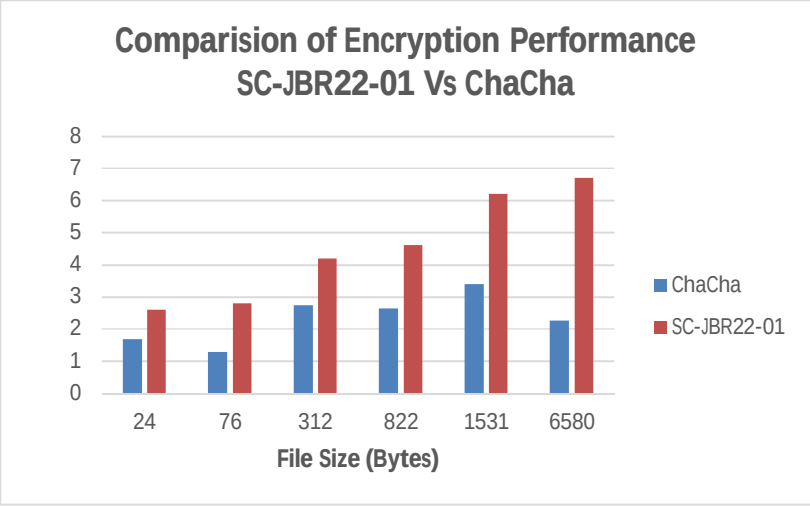

Figure 1. Performance comparison for SC-JBR22-01 and ChaCha

The SC-JBR22-01 method has “compared the encryption speed” in seconds based on Figure 1. The SC-JBR22-encryption 01's performance was 2.6 (s), 2.8 (s), 4.2 (s), 4.6 (s), 6.2 (s), and 6.7 (s). When compared to current methods, the SC-JBR22-01 offers more data protection.

IV. CONCLUSION

In today's world, the internet plays a crucial role in people's daily lives. Every person's work requires access to the internet, particularly several social media sites. Before beginning any new company task, the individuals desire to undertake a "social media" analysis of that work. This analysis found that the systems used by users lacked adequate data security. We suggested the new approach SC-JBR22-01 to address this security problem. This method consists of three stages: the first stage involves converting studied data into a matrix format; the second stage involves applying Salsa operations to the matrix; and the third stage involves applying ChaCha operations to the matrix. Comparing the new SC-JBR22-01 approach to the "ChaCha" method, it offers better security and performance.

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The Outlook of Food Industry: Effectual Traceability Practice in Supply Chain Management using Internet of Things

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***Abstract*—Traceability can be used to improve processes, increase productivity, and ensure the quality and safety of perishable foods. But it's frequently seen as unnecessary red tape and a financial bur-den. Small and medium-sized businesses frequently exhibit this. Since they make up the majority of the food industry, the adoption of traceability systems is relatively sluggish and primarily done to meet legal requirements. In this paper, we propose effective food traceability techniques using the Internet of things and derive a solution for data communication. The improved Naïve Bayes Classifier is developed for food traceability using the enhanced prediction data. The purpose of the food traceability is used to maintain the computerization, reduced cost and reasonable system complexity. The most important parameter for this system is the food transportation from the manufacturer to the consumer. The Internet of Things is developed to connect the manufacturer to the consumer with an efficient transportation system. An economical solution is achieved using the IoT based food traceability. The Naïve Bayes Classifier is simulated and the investigational results proved that the proposed algorithm is more efficient for food traceability techniques compared to the SVM and KNN methods.**

***Index Terms*— Naïve Bayes Classifier, Traceability, supply chain management, KNN, Classification, SVM.**

I. INTRODUCTION

The capacity to follow a product batch and its history through all or a portion of a production chain, from harvest to transport, storage, processing, distribution, and sales, or internally at one of the steps in the chain, is known as food traceability. The issue of traceability is universal and unrelated to the nature of the product, its manufacture, or the control system it supports. A traceability system that tracks information about a product's movements should be developed as a result of systematizing the implementation of traceability as a quality control tool [1].
Customers' trust in the supply chain has suffered greatly in recent decades as the nutritional value of items has deteriorated throughout transportation from manufacturer to customer. As an effect, further rising consumer concerns over the protection and quality of food have tense more and more courtesy from intellectual and

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industrial areas. In reaction to increasing food safety issues, many Internet of Things (IoT) technologies, such as RFID, sensor, barcode and wireless network technology are useful to supply chain traceability and monitoring the system [2,5-8]. In recent years, there has been an increase in interest in the IoT, smart connected things in directive to implement the different perspectives of the supplier, manufacturer, and customers and come up with a standard that not only supports product performance and quality, but also estimates the benefit of smart connected equipment's [3].

At the moment the diverse communication technologies are used to interconnection for the transport of information, more number of issues in the quality precision. IoT discovers its application in the all the fields, since new form of communication between the different systems and devices. In increasing aspect and demands of modern cities, the association of supply chain in food has turn into enormous difficult exceptional for quality of foods using the IoT based food traceability. Supplementary concerns also happen from this dilemma regarding loss of quality accuracy due to time and performance of tracing scheme [4]. Fig.1 illustrates the applications of IoT in the recent years; the IoT has the interconnectivity with all the day to day life.

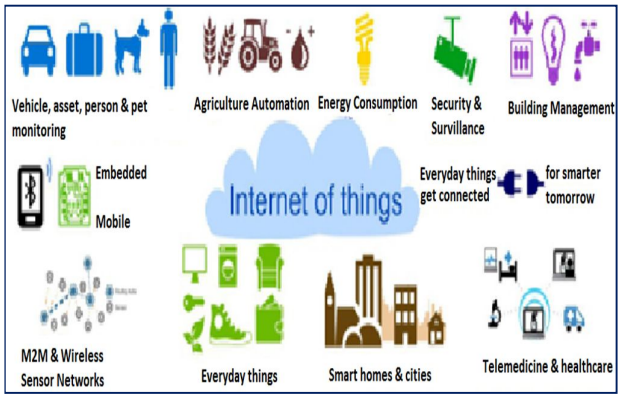

Fig.1. IoT applications

Research in various technologies like RFID system is developed to meet the particular requirements of live fish processing. The RFID tag is on all live fish and is called the mediator that links the live fish, retail and consumer logistics centre. The PLC-controlled sensors are used to collect agricultural data and computerized transport processes. The information on traceability is intended for farmers and consumers to be shared on a web network. RFID and Blockchain technology play an important part in the agro-food supply chain. [9]. Examined the advantages and inconveniences of developing the traceability system for agro-food supply chain using RFID and IoT technologies, and explained the method of implementation of this system. Based on that, it can traceability with reliable evidence across the agrifood supply chain, which effectively safeguards the quality of consumers, through the processing, storage and sharing of correct agrifood data in the production, import, inventory and sale relationships[10].

The traceability takes part in the health of the people and the social development. The main measurement of food related management is to operate the entire supply chain. If any problem occurs in the production of food safety then it can be easily identified with the effective management [11].

II. Literature Review

Several papers were examined using Elsevier's Science Direct, Mendeley, Scopus, and IEEE Xplore. Key terms like "food traceability" were initially utilised as search criteria. As can be seen in Fig. 2, this search yields thousands of results, and the quantity tends to raise over time as the importance of food traceability rises.

Food is the most important provider of economic grows in rural areas. It is crucial for farmers to perform well-organized and technological process to raise productivity diminishes the contamination [12] and nutrient-related problems. The progress in work process and data storage has afforded huge quantity of information. This system designed to measure [13] the IoT techniques and concerns them to Food database to launch significant associations. This learning centres on the Naive Bayes Classifier to categorize the food sensing data. Food accomplishes each and every person around the world.

Traceability systems can significantly improve productivity, logistics, and sustainability, as has been shown in Fig.3. Correctly implementing traceability systems is required to get these benefits. Even while the systems

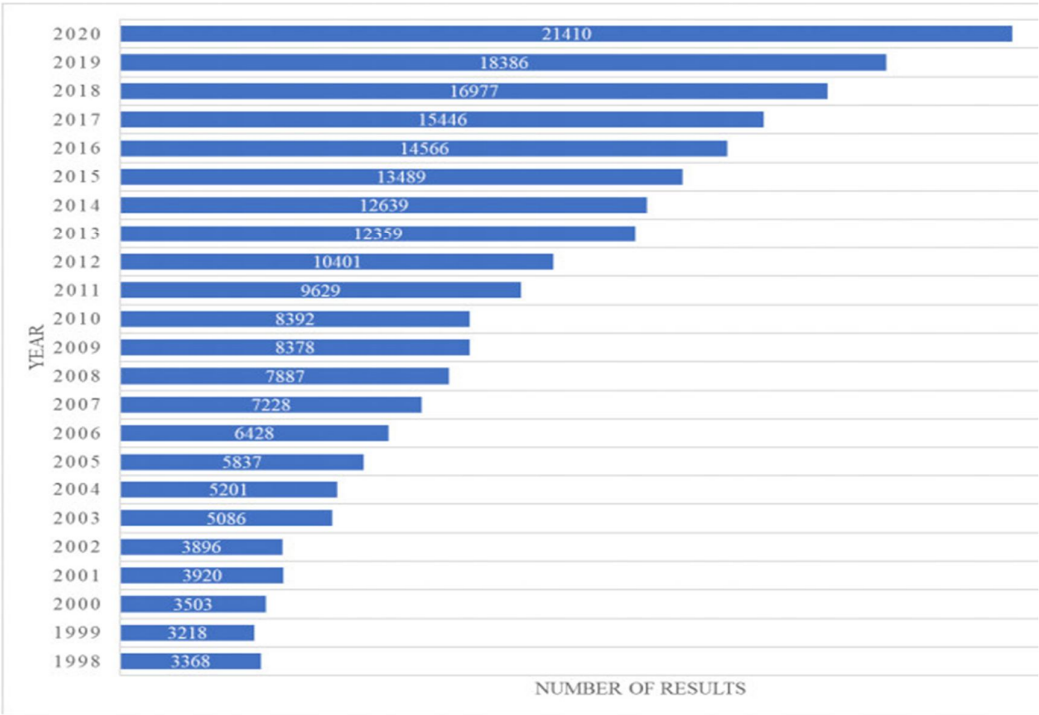

Fig.2. Evolution of the number of results of the search term "food traceability" from 1998 to 2020

being provided accurately serve the purposes for which they were designed, they occasionally lack comprehensiveness, are only useful for a particular organization in its current circumstances, or are too onerous for SME's. As a result, it becomes necessary to create a traceability model that can be used throughout the whole food supply chain, is adaptable enough to allow any company to change the level of detail, requires little up-front cost, and can be improved upon over time.

For last years, consumer faith in the food related production was ultimately scratched due to conserve the nutritional characteristic [14] of goods during the shipping from supplier to consumer. As an effect, further rising consumer concerns over the protection and quality of food have tense more and more courtesy from intellectual and engineering areas. In response to growing food safety trouble, several IoT knowledge's, such as Radio Frequency Identifier, bar-code and WSN technology are useful to supply chain [15] and supervise the system.

In the past years an amplified interest in the IoT, smart linked things in instruction to execute the dissimilar attitude of the provider, maker and consumers and finalize a criterion which ultimately supports accuracy and worth of the product sustain on the approximate the advantage of smart connected things [16].

Sensor and barcode-based Internet of Things (IoT) data is life form useful to food supply chains from their list of basis to their procedures principle in dispensation plants, storage space warehouses, allocation points, and in the retail stores [17]. The laterally monitoring and traceability that barcodes and sensors offer facilitate accumulate chains, food brands, and commodities contribute networks to quickly recognize direct of source and delivery if it's exposed that food is disfigured.

Traceability in food supply chain has been used to deliver the high quality of food globally in complex situations. Blockchain concept has been implemented to provide the traceability in food supply chain with trust. The boundaries are identified to categorize the quality of traceability to effective independent governance [18]. Security in the Eco system has been maintained by utilizing the natural resources and Food supply chain management.

The food supply net-works may cover the food components and to maintain the eco system with safety. The optimized mathematical modelling has been generated to utilize the Internet of Things [19]. The food supply chain with the traceability functionality has been developed to maintain the confidence to the customer. The grey related methodology is utilized to identify the relationship with the customers and supply chain management [20].

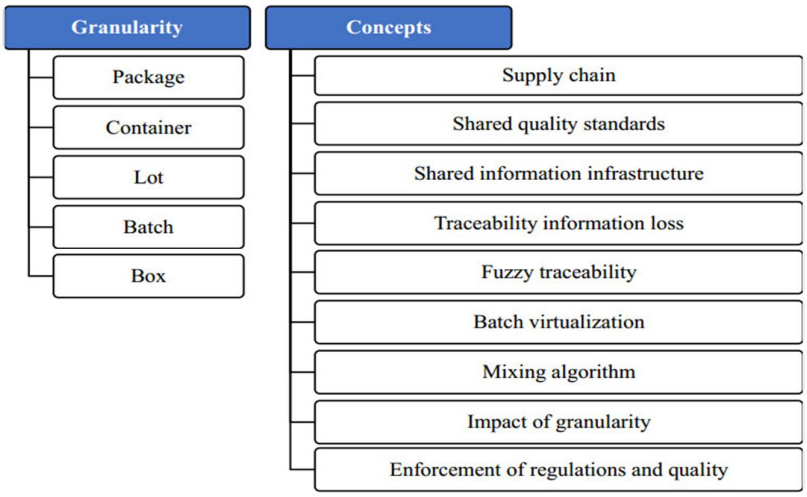

Fig.3. General Structure of concepts of traceability systems

III. Problem Formulation

The Naïve Bayes Classifier is the way which can forecast the upcoming possibilities from the existing data. Clustering and classification are used in the approaches. The method for the food manufacturer is evaluated in the literature review, and the dataset is gathered from various online sources. This forecast analysis of this model is based on the Internet of Things. The clustered data is provided as a contribution to the classification algorithm, which is capable of dividing the dataset into two parts: training data and testing data. The SVM classifier is used to divide the data into a set of categories.

The centered points are considered in the k-mean clustering technique by taking the arithmetic mean of the total dataset, which might lower the accuracy of forecast analysis. It is difficult to establish a link between the dataset's properties when the dataset is diverse. The KNN classifier is useful in this study effort, and it can categorize food production into a set of classifications. The KNN classifier may be used with numerous different classifiers to improve classification accuracy.

In general, for events A1 and B1, where A1 depends on B1, than P (B1) $\neq 0$,

$$P(A1 \mid B1)=(P(A1)P(B1 \mid A1))/(P(B1)) \qquad (1)$$

In several circumstances event B1 is fixed P(B1) = 1 and consider the impact of probability of other possible events A.

Initially, we require keeping the study for traceability of the entire simulation of the supply chain and scheme the entire improvement. At the current, it is a chance to put a suggestion to the standard of the Bayes, which is, among the features, self-rule. So now, we are divide verification into the novel parts. Now if these two X and Y incidents are divide,

$$P(X, Y) = P(X)\, P(Y) \qquad (2)$$

Consequently, we enter the result:

$$P(y|(x1, x2..., xn)) = P(x1|y)\, P(x2|y) .....P\,(xn|y)\, P(y) / P(x1)\, P(x2).... P(xn) \quad (3)$$

this can be translated as

$$P(y|(x1, x2..., xn)) = P(y) \prod_{i=1}^{n} P(xi|y) / P(x1)\, P(x2).... P(xn) \qquad (4)$$

Now, the denominator for a effort leaves constant, we can remove that term:

$$P(y|(x1, x2..., xn)) \quad \propto \quad P(y) \prod_{i=1}^{n} P(xi|y) \tag{5}$$

Now, for the entire possible standards of the class variable y, we require to construct a food model to learn the possibility of standard position of contributions and wish the yield with the maximum probability. That can be logically expressed as:

$$y = \text{argmaxy } P(y) \prod_{i=1}^{n} P(xi|y) \tag{6}$$

Finally, the manipulation of P(y) and P(xi), where P(y) is also known as probability of class and P(xi) is known as probability of condition. The recommendations made by the various Bayesian networks differ significantly when it comes to the P(xi) distribution. It means that if the changeable has a wide circulation, customers are more likely to get it. The food data for the Bayesian network may be forecasted using shared data, which is a dependency function be-tween two random variables. Meaningfulness is linked to a reduction in uncertainty, and vice versa. The data is between 2 variables and is given by:

$$D(A, B) = \sum_{a,b} p(A, B) \log \frac{P(A,B)}{P(A)P(B)} \tag{7}$$

P(A, B) is the combined probability distribution's object, and P(A) and P(B) are the A and B probability distribution functions' bounds, respectively. The stronger the influence of A on B, the more well-constructed the relevance of P (A,B).

The volatile outcome would then be ranked according to the value of P (A, B). And the element that plays the most important function in the production process should be given particular attention and order in real time. Create a food prediction model to determine the probability of the reported input location for all possible class vector y values, and wish the yield with the highest probability. This can be objectively described as:

$$B = \text{argmaxy } P(B) \prod_{i=1}^{n} P(Ai|B) \tag{8}$$

To prove that the classification regulation's attribute tuple X corresponds to one of the class mark attributes (R1,R2,... Rn), we must show that A belongs to Rx. It's possible only if, and only if,

$$P(Ra|X) > P(Ri|X) \; 1 \leq i \leq n, i \neq a$$

Evaluating all class mark attributes possibility P(Rk) and probability of P(X|Rk):

$$P(Rk) = |Rk,D| \; / \; |D|, \text{ where } k = 1,2,.....i \tag{9}$$

where s(k = 1,....,n) is the class mark attribute, which has n types of classes that define n types of classes, Rk,D is a set of tuples in training set D that belong to class Rk, where |D| is the number of training set D and |Rk,D| is the number of Rk,D. With the help of data set D, the value of P(X|Ra) may be computed.

Using Bayes theory,

$$P(Ra/X) = P(X/Ra) * P(Rx) \; / \; P(A) \tag{10}$$

Only if the value of P (X|Ra) is maximum may attribute tuple A be categorized into class Sx. This signifies that you shouldn't prune this branch. The branch should be trimmed if this criterion is not met.

IV. Research Methodology

The stages of the research process are as follows:-

1. **Pre-Processing**:- Pre-processing is the initial step in the research process, during which a dataset is imported from the UCI repository. This step cleans the input data, removing any missing values from the dataset.
2. **Feature Extraction**:-The feature extraction approach is used in the second phase to build a link between each property of the data and the target set. It is simple to find essential qualities when the feature extraction approach is used.
3. **Classification**:- The data is then sent to the Nave Bayes classifier in the last phase. The out-put of the forecast is generated by the classification findings. Nave Bayes is a subset of Bayesian decision theory that has recently

gained prominence. Because it takes less storage and has a quick training phase, this method is used in essential applications. The goal of this algorithm is to provide a rule for allocating future items from a set of objects to a class based on the vectors of variables that identify the future objects.

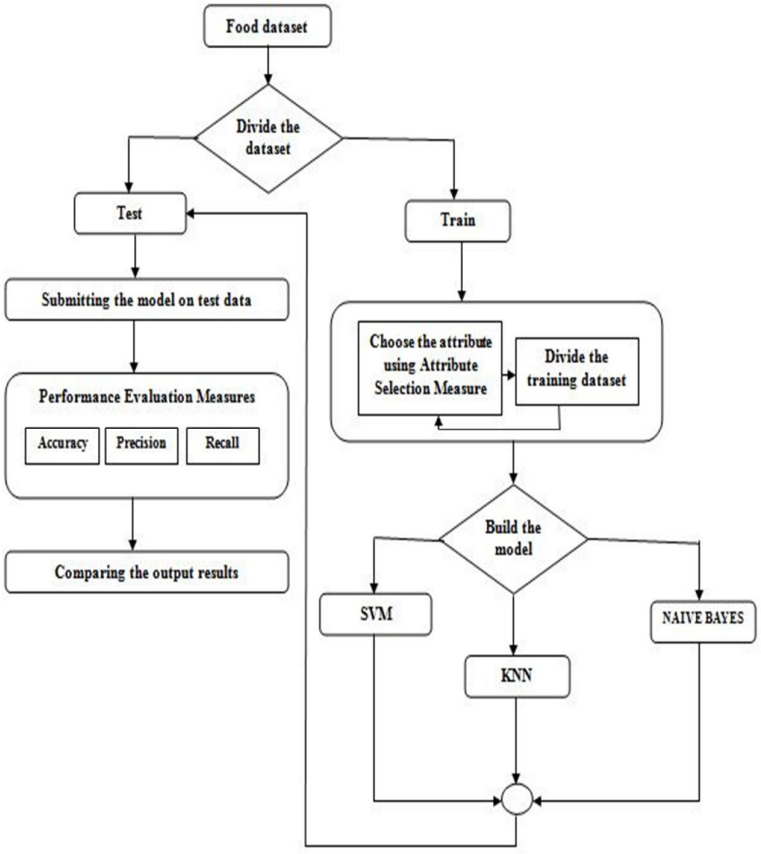

Fig.4. Steps of work

A supervised classification problem is quite frequent, and various approaches for constructing such rules have been developed. This technique does not require any sophisticated repeated parameter estimation mechanisms, allowing it to be used to large data sets. Because the classification process is simple to grasp, even inexperienced users who utilize the classifier approach may understand it. Fig 4 represent the stages of work.

V. Food Safety Monitoring Process

In spite of creating the optimized solution for the food supply chain management system, the container is connected with CPU and the temperature and the humidity is measured by the sensors. The prime usage of the proposed work is the enhancement of the supplementary sensors with the constraint of the connecting devices is illustrated in Fig. 5.

The entire system is attached to the devices for Bar code reader and RFID is connected to the Bluetooth. The Web service is maintained with the Internet and GSM. The sensor is responsible for identifying the RFID communication range. Whenever the vehicle is in travelling, the sensor will scan the details about the RFID. After the available detail is scanned, the details could be read from the Monitoring system. The customers who are inside the CAR can be easily connected to the supply chain in Internet of Things using the communication media. The GSM is used to connect the customer with the producer or the retailer in the proposed model.

The Processing system finds the database connectivity by identifying the necessary constraints for the measurement of the sensors. The fuzzy-based neural network model is used to monitor the system. The real-time food traceability management modelling is adapted to check the product is damaged or not. The entire system is

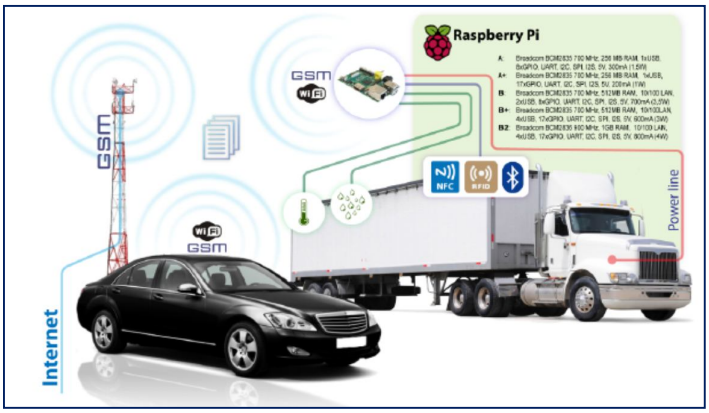

Fig. 5 Food Safety monitoring process

powered using the independent power system. The proposed work is implemented using the sensor networks with the connected vehicular system.

VI. Performance Evaluation

In this section, we argue the statements of the study and the investigational to get the outcome. The objective is to model wine quality based on physicochemical experiments. This can be used for business purpose. Wine Quality Dataset [20] is used for the performance evaluation. The projected model is qualified using the classifier and the training dataset has the limitation of variable selection and validation process. It is used to generate the proficient outcome. It contains 1599 instances which split into two parts train 1071 and test 528 and includes 12 attributes itemized below:

TABLE I: SIMULATION PARAMETERS

Simulation parameter	Meaning
Software	Google Co laboratory
Output	Naive Bayes Classifier
Libraries	Pandas, Numpy, Matplotlab and Sklearn
Data Set Characteristics:	Multivariate
Attribute Characteristics:	Real
Associated Tasks:	Classification
Number of Instances:	1599
Number of Attributes:	12
Missing Values:	N/A
Area:	Business

Fixed acidity {Real}, volatile acidity {Real}, citric acid {Real}, residual sugar {Real}, chlorides {Real}, free sulfur dioxide{Real}, total sulfur dioxide {Real}, density {Real}, pH {Re-al},sulphates {Real},alcohol {Real},Output variable (based on sensory data) , quality (score between 0 and 10).

The dataset is divided into training and testing sets. The proposed Enhanced Naïve Bayes classifier is used to implement the training of the dataset and produced the output. The simulation parameters are demonstrated in Table1. Experiments have been carried out on food's data using SVM, KNN and Naïve Bayes algorithm. This study is about using wine quality dataset to predict food quality. In this study, the Nave Bayes method is used to forecast food manufacture. The KNN approach is utilized in the present work to analyze food quality.

The food production data was gathered from a variety of online sources. In terms of performance, the SVM, KNN, and Nave Bayes algorithms are compared. As demonstrated in Fig. 6, the accuracy of the three classifiers,

SVM, KNN, and Nave Bayes, for predicting food quality is compared. When compared to other classifiers such as SVM and KNN, the Nave Bayes classifier has the highest performance depicted in Table II.

TABLE II: PERFORMANCE EVALUATION

Parameters	Classifiers		
	SVM	KNN	Naïve Bayes
Accuracy	76.58	90.53	94.21
Precision	71.58	89.53	93.34
Recall	79.81	93.93	96.32
F-score	76.81	92.93	94.32

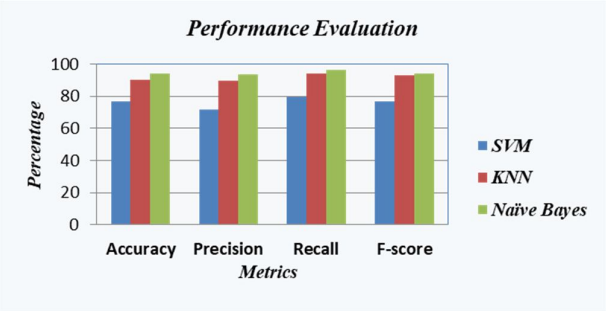

Fig.6. Comparison of efficiency for SVM, KNN and Naïve Bayes classifiers

The performance of the SVM, KNN, and Nave Bayes is statistically compared in the above tables. When compared to other classifiers for forecasting food production, the Nave Bayes provides the highest level of efficiency. The sensitivity of the Food Supply Chain management is experimentally evaluated that the proposed method has improved sensitivity according to the normal value. Fig. 7 illustrates the food supply chain management with sensitivity.

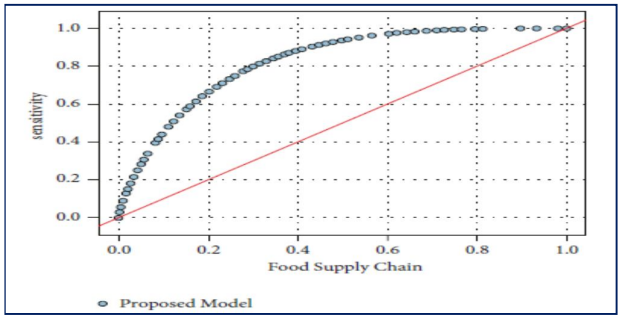

Fig. 7 Sensitivity of the food supply chain management

VII. CONCLUSION

This paper is to investigate the comparative analysis between three classification algorithms using IoT. Improved Naïve Bayes classifier is performed well compared to the KNN algorithm and SVM. The Nave Bayes classifier is used to forecast food quality in this study. The Nave Bayes algorithm predicts food quality with a maximum accuracy of 94.21. The enhanced Nave Bayes are implemented to produce the efficient food traceability management using Internet of Things. The quality is maintained from the producer for the needs of the customer with effective transportation. The proposed methodology has been implemented in an abnormal food condition. The unwanted data has been removed to enhance the health of the customer with economic growth.

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A Novel Adaptive Unclonable Utility Model for Secure Communication in Internet of Things Environment

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***Abstract*—The security of Internet of Things (IoT) has fascinated more researches on their research endeavor because of the widespread of the implementation of IoT in real-time applications. However, the uniqueness management is considered to be the basic core to formulate a security mechanism. From a fundamental point of loss and identifying the fake, the traditional centralized identity management system continues. This study proposes a new secure communication paradigm based on Blockchain to address IoT's privacy and security concerns. The proposal work includes a secure IoT model taking advantage of Blockchain as the primary framework with Adaptive Unclonable Utility (AUU) recognizing the sensors in a unique way. The major objective of the suggested system is to enhance the Identity Authentication mechanism. The performance result evident that the suggested approach was very powerful and more secure over various attacks.**

***Index Terms*— IoT; Blockchain; Identity management; Adaptive Unclonable Utility.**

I. INTRODUCTION

The IoT, which connects a large number of actuators and sensors, has significantly changed the world. According to a recent Juniper Research, there will be 83 billion IoT interconnections worldwide by 2024, up from 35 billion in 2020 [1-3]. It also hikes a major province about security even though it can be considered as technical improvement. Access control is explored from a realistic angle to design safe IoT. The conventional centralized Internet access control system, however, which depends on Certificate Authority (CA) or extra authenticated servers, runs the danger of having a single point of failure, consumes a lot of resources, and is not scalable. As an alternative, it's essential to explicitly identify the terminating node. Long established product's unique number based on identity is difficult from identity forgery. The smaller number of resources, extensive nodes, and lively topology is complex to achieve from Identity authentication in IoT. On the other hand, authors in [4] separated the identification of items into inherent and imposed characteristics. As with a human thumbprint, the fundamental identification of things would be determined by AUU, a variable and unpredictable

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but a repeatable response component [5].
To confirm identification, the AUU-based induced authentication apps, however, employ a Star architecture and single point authentication servers. This structure is not scalable and suffers from a centralized failure. As a result, the notion of a self-sufficient identity is maintained [6]. A decentralized self-reliant identity can be created using blockchain, which is seen as a reassuring technology. The Blockchain gateway, despite being a crucial part of IoT Uniqueness management, is hardly ever addressed in collected works.
The authors of [7] designed a device registration using AUU, method certification, and protocol for secure communication as the protocol for communication between two IoT nodes. Furthermore, authors in [8] enhanced it and proposed a unique strategy for communication involving two nodes. Nonetheless, the crucial framework examined now is the exchange of data between the Blockchain gateway and IoT gadgets. These dual nodules don't take part simultaneously. The secure communication protocol and verification protocol are made clear to fix in the gateway-node communication mode in expectation of reducing the nodes' evaluating load without sacrificing security.
The following are the crucial contributions of the suggested research:

- The blockchain is regarded as the fundamental architecture for identity management in the proposed IoT system.
- A blockchain gateway is established and developed using Raspberry Pi 4 platform.

The proposed work is implemented with the improved AUU-based identity registration and authentication strategy to strengthen the security level and mitigate the Replay and Denial of Service (DoS) attacks.

II. Proposed Blockchain-based IoT Model

The four layers of the IoT system framework focused on blockchain are the implementation layer, gateway clustering layer, terminal junction layer, and blockchain layer according to Figure 1.

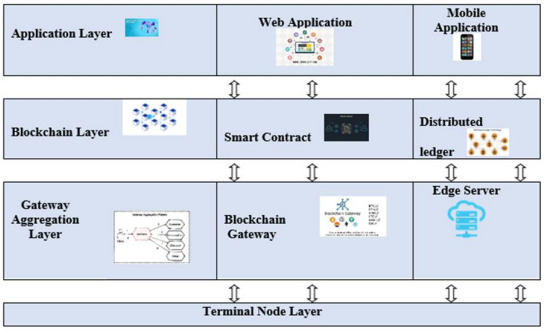

Figure 1: Proposed Blockchain- Based IoT Framework

The sensors and actuator nodes are placed in the terminal junction layer. Various blockchain IoT gateways are included in the layer that clusters gateways. From the viewpoint of the blockchain, the gateway is a full node that keeps a complete backup of all block data. Referring to the blockchain layer, the accord algorithm-based tamper-proof distributive evaluating and cache architecture, which clarifies the negative effects of trust between nodes and the data sent across IoT devices. The web and mobile applications are part of the implementation layer. The blockchain gateway and AUU in junction nodes are two essential components that are highlighted in the proposed architecture.

A. Blockchain Gateway

The blockchain gateway is in charge of caching data in the blockchain and clustering terminal node data in its broadcasting area. Figure 2 illustrates the function blocks that include node enrollment, self-acknowledgement, data decoding, data ownership validation, and data upload block. Since the variety of IoT station nodes, the blockchain gateway might remain adaptive to a wide range of communication protocols, including cabled Ethernet, mobile WiFi, LoRa, and Narrow Band IoT. Utilizing WiFi and LoRa technology, the Raspberry Pi is used to create the blockchain gateway. It is connected with the IoT terminal nodes through the LoRa connection. Additionally, its draughts the node's personality, decodes the data, groups varied data into a substantial message set, emblems the message set by means of the individuality of the node's owner, and sends the message set towards the blockchain.

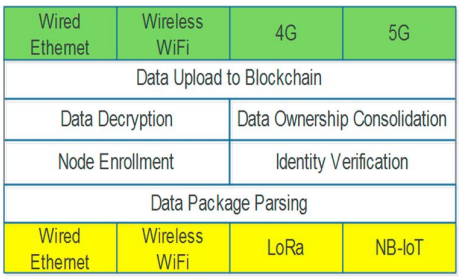

Figure 2: Blocks in proposed method

B. Junction Nodes with AUU

The indisputable identity of the IoT terminal nodes can be created by AUU, but AUU is not with all of the nodes. Currently, only a part of microcontrollers have AUU blocks. The following procedure are adopted to the implementation of AUU based identity:

- Maxim's Max32520, an AUU function is chosen as a secure microcontroller at the stage of designing a device.
- DS28E38, an AUU chip, can be selected as an identity co-processor to increase the device's dependability while the circuit is being designed.
- There are a lot of gadgets that might not have an AUU feature. The Micro Control Unit (MCU) General Purpose Input/output (GPIO) and Analog Digital Converter (ADC) can be utilized to imitate AUU for those devices [9].

III. Proposed Identity Management Protocol Centered on Auu

The device registration conventions and the device confirmation conventions are included in the aforementioned protocols. Beneficial to suit the server-node communication outline, the certification and key swapping protocol in [8] is tolerant and enhanced by including initial encipher to get profit in high safety. In the system architecture, the server referred to in forthcoming conventions representation be able to view as the blockchain gateway. The six tuple parameters (q,b,c,B,n,k,l) [10] over measurable domain Dq are employed in Elliptic Curve Cryptography (ECC), where base point is B. In the preferred conventions, we designate H as a hash function, followed by the symbols || for merging two messages and the whole -or operation is represented by the icon $\oplus$. The conventions use elliptic curve point arithmetic for the summation or repetition.

A. Registration

The model must have several nodes for communication. Each of these nodes must register to the corresponding server underneath the power of its holder previously allotting in the communication network. The registration procedure ought to handle in confident and reliable circumstances. The server arbitrarily selects the private and public key. Here $ds \in Dq$ as taken as its private key and $Ps=dsB$ as its public key. Throughout the registration process, the server gathers several Challenge-Response Pairs (CRPs) from the device, saves them in the databank, and then transmits the public key Ps to the device. This involves a series of the following actions, in that order:

- When a node directs a registration request, registration begins.
- The node stores the key while also receiving Ps from the server. A random challenge (rc) is produced by the server and sent towards the node.
- Following receipt of the challenge, the node obtains the AUU response, R= AUU (rc). The node then transmits to the server (ESN, rc, R), where ESN is the node's eccentric serial number.
- The server adds the database with the parameters (ESN, rc, R)
- Repeat steps 2-4 k times, where k depends on the system's control over the repository area and the security's degree of difficulty. If k is mapped to a larger value, the CRPs repository will need a lot of storage space and the system will have more candidate CRPs, making it harder for attackers to identify the real CRP.

B. Creation of Keys and Certification

(a) Node 1 transmits the communication request to the server with the individual serial number ESN1 and the current timestamp CTS, both encrypted with Es, to initiate the certification process.

$$R = F(ESN_1||CTS, Es) \quad (1)$$

Where E(n,l) represents the ECC encipher among the plaintext n with the key l. Meanwhile, Node1 stores ESN1 and TS for future use.

(b) When the request arrived at the server, it establishes a session, initially it decodes the message with SK:

$$ESN_1 \,||\, CTS = C\,(R, d_s) \quad (2)$$

Where C (a, b) symbolizes the ECC decipher above the cipher text c through the private key k. Additionally, the server extracts the message's ESN1 and CTS. The CRPs database is then searched for elements whose key equals ESN1 there. It then searches CTS in reference with the SN1 only if the result is not equal to null. n an earlier session. As a result, the request needs to be refused because it is a replay attack. In the absence of it, it randomly selects two CRPs from its node, (x1, y1) and (x2, y2). Later, it evaluates

$$x_2' = x_2 \oplus H(R||CTS \,||\, ESN_1) \quad (3)$$

Additionally, a hash value is required to insert to confirm the consistency of the message. The rate for Node1 is evaluated as given below:

$$H1 = h(x1 \,||\, x2 \,||\, CTS) \quad (4)$$

The message x1, x, H1 will be transferred to Node1. The parameters ESN1, R1, R2, TS will be sent to the Server for further use.

(c) Node1 wType equation here.ill try to parse the message once the message is obtained. The message will be consisting of x1, x', H1 parameters with the required size.

Now, Node1 evaluates R1 for x1 with AUU immerged in the node. x2 can be evaluated as follow:

$$x = x_2' \oplus h(R \,||\, CTS \,||\, ESN_1 \quad (5)$$

x1 and x2 can be used to confirm the H1. If h(x1||x2|| CTS)=H1 is false, the message may be copied by the attacker for this reason. In the event that the outcome is accurate, Node1 extracts R2 and arbitrarily selects the p1Dq to evaluate P1=p1G. Later, H2=h(R1||R2||CTS||P1) is calculated. In addition to saving R1, R2 in the session, the message (H2, P1) is also sent to the server.

(d) The server directly confirms H2 for Node1's identity when the message contains (H2, P1) of the predicted length. If not, the node appears to be an unapproved provider. Consequently, the transmission will be intermittent. Else, the server saves P1 and applies it to compute the transmission encode the cipher T:

$$T = d_s \times P_1 = (x_k, y_k) \quad (6)$$

Here, the node and xk, yk are used to encrypt communication while T is the distributed key.

(e) At the node phase, the distributed key also be computed as:

$$T = d_1 \times P_1 = (x_k, y_k) \quad (7)$$

As a result, the key xk, yk is used to encipher the texts communicated amongst the server and node

IV. Results and Discussion

A blockchain network has been built using the Hyper ledger Fabric. The first network of four nodes and the blockchain's genesis block were built using 2 CPU cores, 8 GB of RAM, a 40 GB high-performance cloud storage, and a 5 Mbps network speed are all features of a cloud server. With the aid of the internal Fabric Client module constructed on a 32GB TF-card with 8GB of RAM for the Raspberry Pi 4b, the suggested architecture is integrated into the blockchain through Wi-Fi. The DS28E38 AUU authenticator and STM32L5RBT6 processor are developed for the AUU-enabled terminal node

A. Performance Analysis

The efficiency of the proposed framework has been accessed via two essential metrics such as detection accuracy and average end-to-end delay. The detection accuracy states that the percentage of the suggested methods detect the various attacks accurately [10-12]. Figure 3 depicts the detection accuracy computation. It is noticed from the figure that the proposed framework outperforms fine as compared with the traditional IoT communication models. This is because the AUU algorithm has been established in the suggested model. Typically, the AUU algorithm allows the authorized users to access the cloud environment. It also detects the various DoS attacks with the aid of the proposed model. In contrast, the traditional IoT communication models lagged to provide the secure communication over data transmission. It also failed to detect the DoS attacks which cause lesser detection accuracy than the proposed model.

Figure 4 demonstrates the comparison of average end-to-end delay. It is observed from the figure that the proposed framework achieves reduced delay as compared with the traditional IoT communication models. This is due to the AUU algorithm's incorporation into the suggested model. The AUU algorithm provides quick

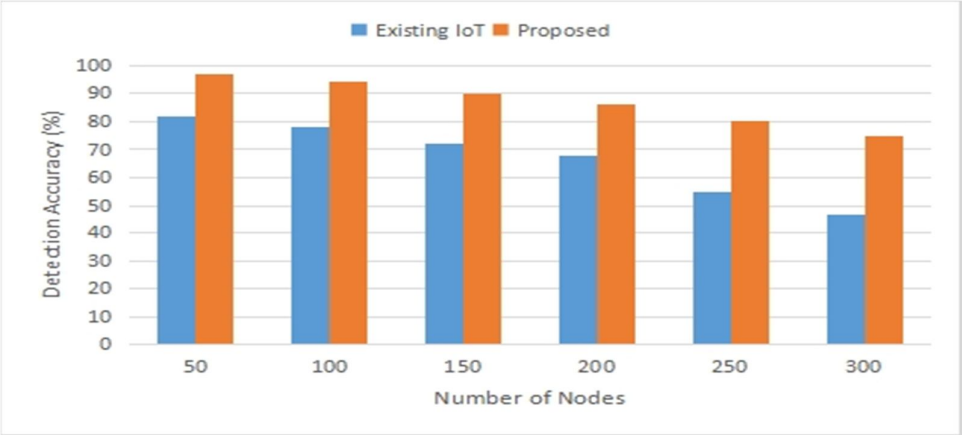

Figure 3: Comparison of detection accuracy for different methods

access to various IoT users. It overlays a way to attain lesser delay in the network. Alternatively, the traditional IoT communication models failed to offer the secure communication and privacy to transmitted data. This cause higher delay than the proposed model.

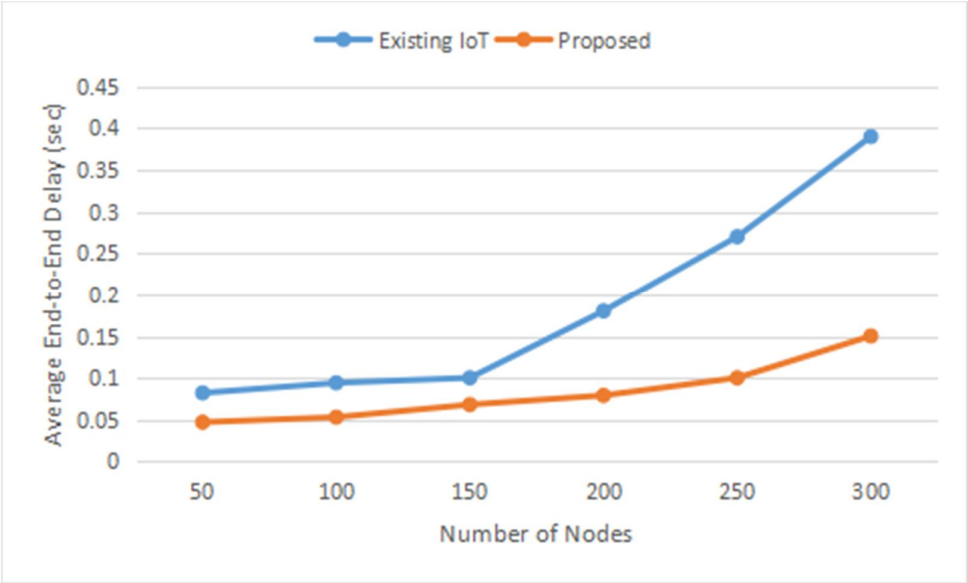

Figure 4: Average end-to-end delay computation

V. Conclusions

The proposed work suggested an IoT system architecture established on blockchain as the evaluating arrangement, with the help of AUU as the identity module for nodes. The proposed blockchain gateway would assist to enhance the registration and certification protocol. This will be done by involving the initial encoding strategy. At last, it also found that the offered scheme is more essential in the certification phase and highly secure by removing the various DoS attacks. The outcomes demonstrate that the recommended structure outperforms the existing IoT design.

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WEB 3.0: Role of Blockchain and dApps in its Working

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***Abstract*— The internet's progress has been continuous, providing us with several opportunities and problems. We have progressed from the read-only internet of web 1.0 to the third version, web 3.0. We begin with a broad overview and description of the internet, followed by a discussion of the necessity for this updated version in today's world. Following that, we have looked at some of the features of this new and the future edition as well as how some of these features play a critical part in the architecture of web 3.0, the main being the role of Blockchains. Then we have shed some light on how various apps operate with Web 3.0 and, ultimately, what the future holds for Web 3.0.**

***Index Terms*— Web 3.0, Blockchain, dApps, Decentralized, Security.**

I. INTRODUCTION

In 1989, the internet was first made available to the general public and it could be described as a huge dictionary with hyperlinks to various pages present containing information. The pages were read-only with no interaction whatsoever. This was the Web 1.0 era where the user was the consumer of the product which was the Internet.
The second iteration of the internet, known as Web 2.0, was released in 2004. The web pages were made more interactive than in the previous version thanks to the integration of flash and JavaScript. In this time period, user information was also collected in order to give each user a customised experience. With their dominance over the internet, large corporations like Google, Facebook, and others became the consumers and the user became the product in this situation. This made the internet more of a distributed centralised network with the majority of the control with the dominating companies.
Web 3.0 on the other hand is the incorporation of blockchain with the internet to make it decentralised and more secure. With no proper definition now, Web 3.0 can be seen as a hatchling that needs a lot of nurturing to properly flourish into something amazing.[1]
With the decentralisation and the ownership of content with the creator, web 3.0 could lay a path for a new era of the Internet which is the need of the hour.
About Web 3.0, Tim Berners Lee says: *"People keep asking what Web 3.0 is. I think maybe when you've got an overlay of scalable vector graphics - everything rippling and folding and looking misty-on Web 2.0 and access to a semantic Web integrated across a huge space of data, you'll have access to an unbelievable data resource."*

II. NEED FOR WEB 3.0

The internet today is broken by design, with the majority of it under the control of a few major companies, data is overall centralised and the need to rely on a middleman for every tiniest thing is absurd. With no anonymity and all our data up for grab, change is imminent. OpenNet initiative in 2010 had documented Internet filtering by

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governments in over forty nations [2].
Web 3.0 is crucial because it enables organisations to expedite processes by removing the intermediary and connecting computers directly. This makes it easier for workers, partners, and customers to communicate and work together, which improves corporate efficiency. One can have a whole different identity on the internet which will not be so easily traceable as it is today.[3] With the smart contracts and ledgers, everything will be open-sourced and the trust issues will reduce greatly. Users will be able to verify each and every contract on the blockchain and decide on their actions.
Modern society faces a serious privacy problem because our data is sold to different businesses so they can target us with adverts that they think would suit us best. We must accept the terms and conditions of certain applications in order to use them, and we are essentially handcuffed in this scenario because those apps are necessities of the standard of current living.

III. Features of Web 3.0

Key features that define web 3.0 are:

1. Semantic web: one can say that the semantic web is the upgraded version of the current WWW. It's the addition of IoT, Automation, and ML into the web pages describing items of Web-based information and their inter-relationships.[4] The Semantic Web will give Web pages a meaningful content structure, fostering a setting in which software agents can easily perform complex activities for users while roving from page to page.[5]
2. Artificial Intelligence: Computers can comprehend information on a par with humans in order to deliver quicker and more accurate results by merging semantic capabilities with natural language processing. By doing this, they develop greater intelligence and enhance consumer satisfaction.
3. 3D-Graphics: The outdated, text-based HTML standard was created for narrowband networks. Both new formats and new HTML advancements are being considered. For a variety of context usage, including Web 3.0 and video games, we want to propose a multimedia presentation system, format, and use cases. The system is small and supports 2D and 3D graphics with good performance. Use examples include head-up displays in video games, online gaming, and 3D creation for Web 3.0. Museum guides, eCommerce, geospatial contexts, and more are all common examples of this.
4. Edge computing: The Edge computing paradigm has experienced significant growth in both academic and professional circles in recent years. By linking cloud computing resources and services to the end-users, it acts as a crucial enabler for several emerging technologies, including 5G, the Internet of Things (IoT), augmented reality, and vehicle-to-vehicle communications. Applications that require low latency, mobility, and location awareness are supported by the edge computing paradigm. Significant research has been done in the field of edge computing, which is examined in terms of recent advances like mobile edge computing, cloudlets, and fog computing. This has allowed academics to gain a deeper understanding of both current solutions and potential future applications. Web 3.0 relies on edge computing.[6]
5. Blockchain: Perhaps the main feature and the backbone of web 3.0, blockchain technology encrypts and protects user data. This stops big businesses from having access to and/or using consumers' personal data for their own gain. Decentralised data storage is possible. Users are able to log in securely and anonymously over the internet while maintaining ownership over their data and digital assets.

IV. Blockchain and its Incorporation in Web 3.0

Blockchain is defined as 'a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An asset can be tangible (a house, car, cash, land) or intangible (intellectual property, patents, copyrights, branding).'
The term "blockchain" refers to a chain of blocks formed when a newly created block is linked to a prior block. Since blockchains are decentralised, no one party or individual has authority over them, and the data contained in the blocks is visible to everyone. It is a peer-to-peer network where every decision is made with consensus and once a decision is made and a block is added to the blockchain then it can't be modified.
The goal of a blockchain is for information to be added and distributed but not edited hence it is also known as Distributed Ledger Technology (DLT).[7] This way the blockchain will serve as the foundation of distributed ledgers, immutable records, and more.

Blockchain is fundamentally changing how data management and storage are currently done. In plain English, blockchain provides a distinct data set or universal state layer that is managed by a group. The potential to create a value settlement layer on the internet is made possible by the unique state layer. The state layer facilitates copy-protected file transmission to support efficient P2P transactions without any middlemen.
Third-generation web networks display interoperability, automation through smart contracts, seamless integration, and censorship-resistant P2P data file storage. Therefore, it is obvious that blockchain would be a significant factor behind the development of Web 3.0.
The establishment of new social infrastructures that adhere to the fundamental principles of the internet is another focus of web 3.0 development. Blockchain eliminates the need for reliable middlemen while also allowing networks to collectively recall previous user interactions or occurrences. Therefore, blockchain is unquestionably a major driver in expanding the opportunities for the internet with greater decentralisation.

V. dApps on Web 3.0

dApps stand for decentralised apps and they are the applications that we have today but instead of a central server, they run on blockchains or decentralised networks. There is no involvement of any third party.
dApps can eliminate the power of a single business having complete control over its users. Decentralised apps also eliminate the dangers of centralised governments invading user privacy. In dApps, end users have full ownership and control over their data in addition to the power to choose whether to share it with others.
Decentralised apps also include a permissionless design and censorship resistance. As a result, consumers might access any decentralised application's services without facing any bias. Additionally, dApps have a high degree of trustlessness and openness, assuring real decentralisation.
These applications will be intelligent because Web 3.0 will include 3D graphics, allowing developers to fully leverage recent advances in artificial intelligence and machine learning in addition to 3D graphics to create applications that are intelligent and immersive for the end-users.[8]

VI. Future of Web 3.0

As time goes on, an increasing number of businesses are choosing decentralisation and moving their websites onto a block. Web 2.0 will eventually become obsolete as web 3.0 takes over and nearly all of the internet switches to a blockchain oriented network.[9]
Some of the reasons why web 3.0 will be dominant and important are:

- Prioritising decentralisation: Web 3.0 will work to diversify the Internet's sources in order to prevent hackers, data leaks, and dependence on centralised repositories. Users may be able to own their own data and digital footprints using certified data scarcity and tokenized digital assets. There would be no accountability for data usage on any platform.
- Enhanced Personalization: As long as most users continue to value tailored and unique web surfing experiences, Web 3.0 will grow more and more significant in 2022.
- AI Powered surfing**:** As semantics, blockchain, and AI play a significant role in the design of web 3.0, there will be an increased demand for humanised digital search assistants that are significantly more intelligent, omnipresent, and powered by these technologies.
- Elimination of middlemen**:** Eliminating middlemen can help organisations disintermediate, get rid of rent-seeking agents, and transfer value straight to network members like customers and providers. By sharing ownership and governance of these new decentralised intelligence structures, network users will cooperate to address issues that were previously difficult to control. As a result, prices will decrease and object value will rise.
- Peer-to-peer connectivity will show a rise: Peer-to-peer connectivity will increase as a result of new Internet developments, but the relationship between members and organisations will always be strong in order to support more flexible peer-to-peer interaction and governance. Peer-to-peer networking will allow for more secure and private data sharing between individuals, organisations, and machines. The byzantine general issue could exist, but it can be solved with the more trustworthy peers in a network.[10]

VII. Conclusion

This study focused on the continued growth of computer technology from Web 2.0 to Web 3.0, and the major role that blockchain and its technology will play in its uprising and its need to overcome the loss of democracy in the Web 2.0. Web 3.0 promises to combine Internet data in such a manner that Internet searches will become more focused and tailored in order to gather and present information from many forms of media in a style that is relevant and meets user demands. This transformation will be dependent on careful coding of website material utilising Web 3.0 markup languages, which introduce code into website content that connects bits of data and makes this information available.

Web 3.0 will transform a disorganised group of web materials into a systematic and ordered set of web contents. The essential elements of Web 3.0 include the capacity to use unstructured content on the web more intelligently by deriving meaning from the context in which it is presented. The advent of new technology prompted the adoption of new ideas and inventions to reform old items with current science and technology in order to keep up with the stage of development. Although more development is needed, the community is working at its best to completely decentralize the net and achieve the lost democracy.

The smart applications that will be created on this new version of the internet will cater to the need of many sectors but as they are new, only a niche section of the society is able to create and work on them but that is surely going to change as the Web 3.0 is more familiarized and its features and need is educated amongst the people.

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Virtual Trail Room using Haar Cascade Classifier

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***Abstract*—In-store shopping experience continues to be the primary thing that involves mind for many people after they consider shopping. Although customers can wear clothes in real time, this process is simply too time consuming whenever there are queues lined up ahead of the trial room. This project VTRHC can change the way an individual tries out clothes and shop for the right one. Customers can assume a good range of clothes without having to physically wear them due to the concept of" Virtual Reality." Our goal is to create a virtual room environment that may be useful in the long term in order to increase time efficiency and improve accessibility to clothing. Various research groups have implemented the concept using various approaches. One of the research groups used a Kinect sensor and therefore the other used clustering for clearing the background and getting the border lines of the body. The best point of this strategy is that it saves time and work when it involves physically fitting items. The Open-CV is employed to enable the camera and take a user's live video then the garments onto the customer's body. We have used Haar Cascade Classifiers and Flash web framework.**

***Index Terms*— Object Detection, Haar Cascade Classifiers, Flask Web Framework.**

I. INTRODUCTION

In recent days everything became online like we are able to get the things that we would like through online. And also because of growth in technology we are heavily tormented by smart systems. Online marketing helps the producers to bring out their kinds of products to a mass within the simplest way. Online shopping expanded quickly, and more people are becoming accustomed to using it to buy their desired products, engage in auctions, etc.[1]. For purchasers, online shopping would give more information and availability of every kind of product in every stream. So here the biggest problem for the purchasers online is that they can't try the garments while buying it. Shopping centers and the retail sector have grown as a result of rapid urbanization. Despite being a weekday, there is more congestion in the malls today. Shopping is hindered by large crowds, especially when purchasing clothing. Despite the advantages of purchasing online, there are some drawbacks that prevent customers from purchasing items online[2]. The most common issue that online customers face is being unable to do things, particularly for clothing. The majority of them want to see if the clothing fits them because sometimes the clothing purchased does not match the scale provided by the vendor. Offering a return policy or free shipping for returns aims to catch up on incorrect fitting and sizing content, but it will cause the vendor a lot of trouble. Customers can try their clothes online and can select their clothes as they need. They can try virtually and might decide if it's good for them or not. So, after getting the dress and trying it at that point they won't have any regret because they're going to know before only how the dress looks on them[3]. The customer can see the dimensions, style and fit of overlaying an item on a live video feed of a customer. This all can be done before they have bought it. As we know from the important world example Lens kart as an example[4], we will actually

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try clothes which might be helpful for humans to scale back time and productivity of industries. Therefore, the purpose of this paper is to virtually dress without having to go to the trial room. We'll accomplish that by utilizing

i. Haar Cascade Classifiers and this may be done by installing the necessary libraries. To search out these points we use adaboost classifier and this identifies the basic important points[5]. The most objective of the proposed system is to reinforce customer experience in clothing fitting by enabling customers to virtually try clothing on as to test for size, fit or style. The customer's concern of adapting the garment to fit their own figure or complexion, which prevents them from touching the fabric when purchasing from a distance, is the key hindrance on the contrary[6]. This results in a higher return rate than in other e-commerce industries. Since refunds can account for up to 60% of transactions, e-sellers are considered as the major practical issue.

II. Related Work

They used the OpenCV and TensorFlow lite technologies to create an android-based mobile application. Using computer vision, which first identifies the customer's body and then maps the garments onto it, the mapping of the clothes is carried out. They used a three-tier architecture, consisting of a database, a main logic layer, and an app interface[7]. To locate important points on the body and detect it, TensorFlow Lite is employed. The mapped image is then obtained by use of OpenCV. They located the points of intersection in the image and used them to map a particular set of clothing items onto the user. Shoulders and hips are the POIs for clothes on the upper torso[8]. They also need to locate the POIs on the garment in order to map the clothing item. On the majority of garment photos, pose estimation fails. Therefore, they should be marked by hand. They utilized OpenCV's homograph feature to map. When two matrices are used, holography determines a transformation matrix between the two of them. The four POIs from the apparel garment and the user picture would constitute the two matrices[9].

In this paper they used Laplacian filter and edge detection for detecting the contour of both lower and upper body. After then they extracted feature points based on the basic structure of humans with these points of reference, they used to map the cloth of the body[10]. But the main disadvantage is that this application is only for men. They designed this application only for men’s wear. They started by extracting the foreground, then the human silhouette, then the feature points, then the warping of the shirt, and finally the virtual fitting[11]. They described a Microsoft Kinect Sensor-based virtual changing room application in their article. The location of users in front of the Kinect sensor array is provided via the Skeleton API, together with precise position and orientation data[12]. These skeletal data are used for GUI control and measurement of various user parts.

In the application described in this paper, Haar Classifiers are used. The techniques and technologies employed are based on static augmented reality, in which the subject must adjust itself to the outfit that automatically appears on the screen[13]. The difficulties this paper has are as follows: Our body's measurements are not taken into consideration, and the lack of body detection leads to much less results[14]. Using Deep Neural Networks, they have enhanced the virtual trial room application where they have used two webcams in order to capture the human body and Stereo Vision Concept was used to measure Body Measurements with this basically formed a 3D avatar model[15] . Here the limitations were GPU used are low if they have used high performance one the accuracy would be high. This kind of virtual technology is also useful in order to perform kind of operations using virtual mouse[16].

III. Methodology

Collecting Pictures of Clothes: Figure 1 shows the system design. Since we are using classifiers to perform the training, we simply need a limited quantity of images. We therefore only collected 20 photographs of clothing, of which a few will be used for men's T-shirts and a few for women. These pictures are essential for mapping the product to the human body. More different Images from the collection offer greater accuracy in a variety of intricate backgrounds. Google was used to collect this series of images.

Identification of a Person: For the identification of the person the object detection is used which is done by using Haar Cascade Classifiers. Actually, the Haar Cascade Classifiers are used for detecting the body parts . For our project we need to identify the upper body part of the human so we classified and used the above method. We have trained our model to identify humans rather than objects . As the testing process we kept objects also in order to detect only the human body. The Process starts when the user opens the website and selects the particular website that the user wants to try on. There are six stages we conduct in order to provide selection of cloths to the user for checking purpose.

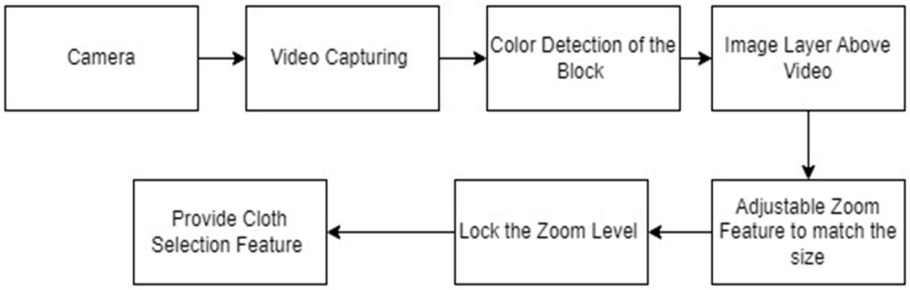
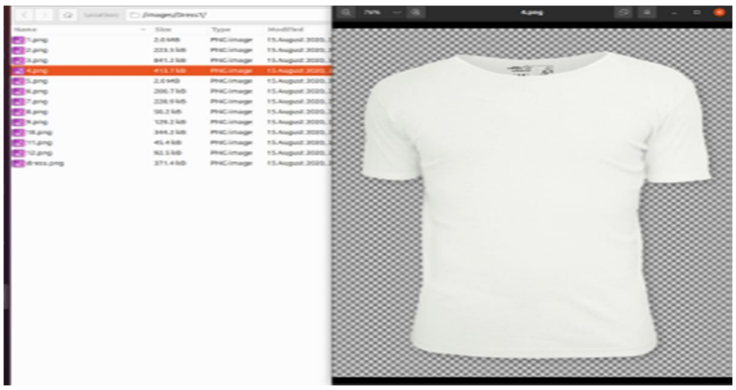


Figure 1: System Design

In these we have used Haar Cascade Classifiers. First of all, we need to detect body parts of the target human body and we need to transfer things according to suitable body parts. So, for body part detection we used a haar cascade dataset. Haar Cascade classifier is basically a machine learning based approach where a cascade function is trained from a lot of images both positive and negative. Here the positive images mean the images we want and negative images mean the images which are not necessary. Based on the training it is then used to detect the objects in other images. We have different feature sets to detect full body, lower body, eye frontal face. After training the classifier with lots of positive and negative images then it extracts features from it. Features like Haar Features. Edge Features, Line Features, Four-rectangle Features comes under Haar Features. They are just like convolutional kernel. Each feature is a single value calculated by subtracting the sum of the pixels under the white rectangle from the sum of the pixels under the black rectangle. Many features are now calculated using all possible sizes and locations of each kernel. (Can you imagine how much computation is required? Even a 24x24 window yields more than 160000 features). We must find the sum of the pixels under white and black rectangles for each feature calculation. They used the integral image to solve this problem. Whatever the size of our image, it reduces the calculations for a given pixel to a four-pixel operation. However, the majority of the features we calculated are irrelevant. To know the appropriate features, we use Ad boost. The flask microframework served as an interface between the python backend and the front end (html). And for GUI we used the tinder library which was written in python for design user interface.
@app.route("/") it means whenever the home page is found invokes the function below it and under that function in the end of that function you are returning a function render template("html file") and whatever html file is given in the argument that html page will be shown in the browser for that this html file should be available in template folder.
@app.route("/success",methods=["POST"]it means whenever the route is successful then invoke the function below it post shows that we are sending data to server.

IV. Results and Discussion

To provide a facility to the end user we have developed a web-based application through which user can view things. A sample dataset with image is showed below.



We have developed a web application for easy access to the user. Like any E commerce webpages are easier for user to interact and choose the necessary items for purchasing. A sample home page is shown in Figure 2.

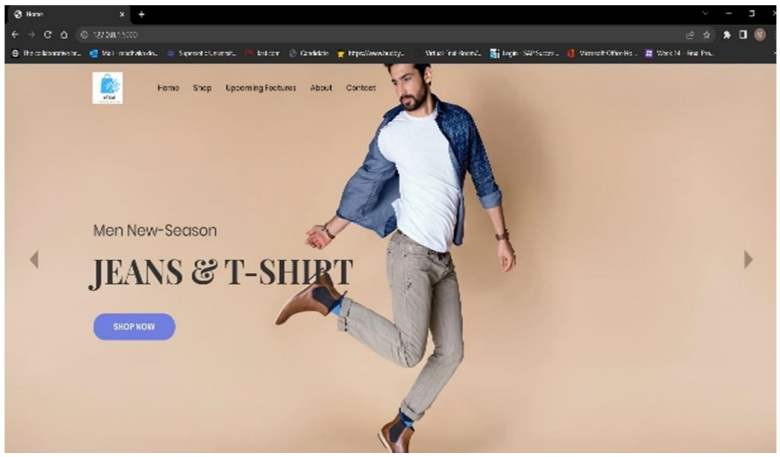


Figure 2: Home Page (Web page)

Address http://127.0.0.1:5000/ the website will be opened as shown above. As we move further the user gets to choose the clothing between the men and women and below products are displayed as showed in Figure 3.

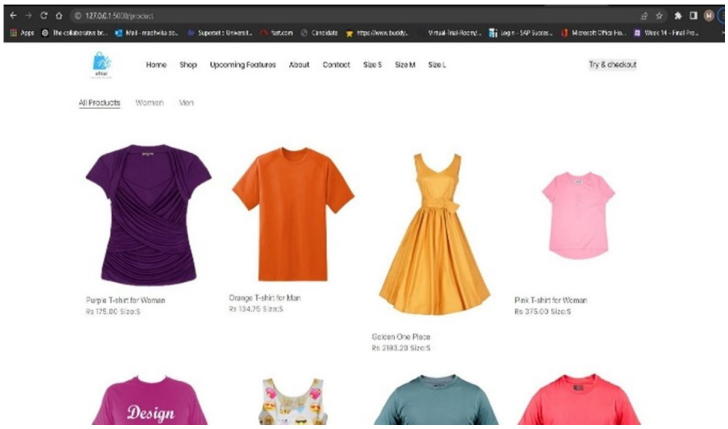


Figure 3: Different Types of Items Displayed to the User

The user can select the product and they can add to cart and they should click try and checkout then one GUI will be opened and then the cloth will be mapped to the body as showed in Figure 4.

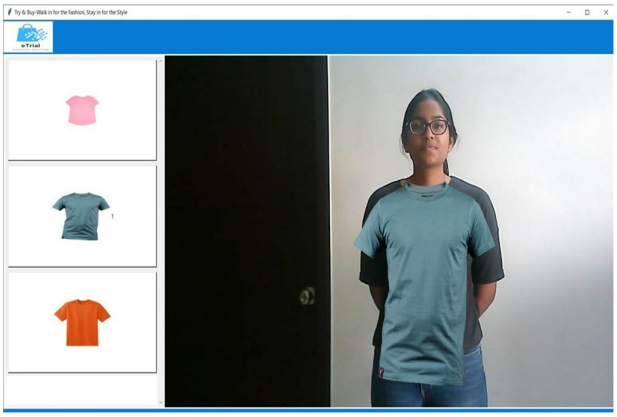


Figure 4: Mapping of selected T Shirt to user

When it comes to multiple users and their mapping, we are able to map the respective selected item to the body of a user. The mapping part is showed in Figure 5 where two users are standing and selected items are mapped to their body. The classifier detects the human body and map the chosen item to them in such away based on the human body dimensions it detects and map the respective item to them.

Figure 5: More than one object mapping

We also experimented to test weather model detects only a human body or any object and it won't recognize the other objects but only human body. It is showed in Figure 6. So, the proposed approach is more useful to the public specially to save time by not visiting the shop.

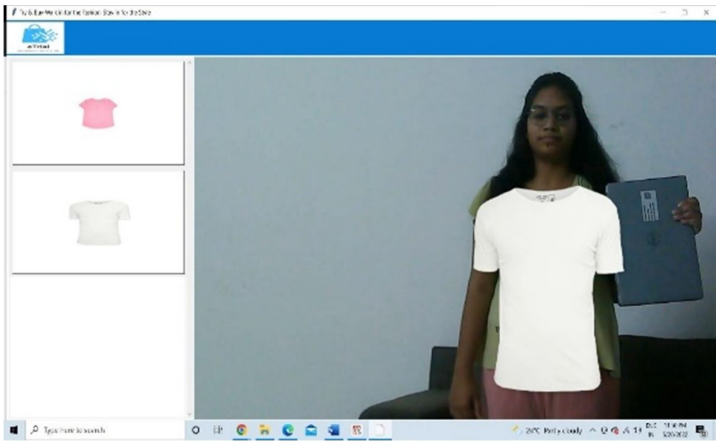


Figure 6: detecting Human than object

V. Conclusion

With the Proposed physical body detection and recognition and GUI Automation we expect to produce an easy-to-use tool with better accuracy and map the garments to the person where someone can choose his / her clothes in a very website which is ready using Flask Web Framework. Virtual dressing Rooms are a stepping stone to revolutionizing the E-commerce world. Here, we obtained a technique to map the garments on the user body using the technologies of OpenCV like using Haar Cascade Classifiers and mapping them and displaying them on console applications. This prevents customers from lining up in long lines and allows them to easily and quickly engage in different types of clothing. These are a perennial favourite in the industry as people get busy over time and don't have time to line up in front of the rehearsal room. In these situations, the

application is reassuring and provides the customer with a quick solution. Considering the covid situations, there have been some shopping complexes which refused the customers to try on. This virtual assumption would be a good opportunity during this pandemic.

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A Novel Approach for Cross Xchange in Blockchain Technologies using Secure Authentication Protocol

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***Abstract*—Cybersecurity is the application of technologies, processes, and controls to secure systems, networks, programs, devices, and data from cyber threats. Cybersecurity aims to protect information from being stolen or compromised. We have 3 fundamental goals of security i.e., CIA Triad (Confidentiality, Integrity, Availability). It is said that Blockchain will alter the Cybersecurity of any business, making it possible to record the information without the possibility of damage, theft, or data loss. Blockchain is a decentralized technology containing information about all the actions performed through peer-to-peer networks. Many Cryptocurrencies like Bitcoin, Ethereum, Litecoin, etc.., are using Blockchaintechnology for a decentralized network. Cryptocurrency is a digital currency that there is nocentral authority to control. The Cross-Chain transaction isthe exchange between different Cryptocurrencies among multiple Blockchains. For a Cross-Chaintransaction to happen, a third party must be involved. Our proposed work is to remove the third party in the middle and let the Cross-Chain transaction happen between only the participants for better authentication.This paper proposes an Authentication protocol to perform the Cross-Chain transaction without the involvement of a third-party.**

***Index Terms*— Blockchain, Cross-Chain, Cryptocurrency, Third-party, Authentication.**

I. INTRODUCTION

Blockchain is a decentralized networkthat stores information about all actions ortransactions that are performed through the peer-to-peer network. Many Cryptocurrencies like Bitcoin and Ethereum are using this Blockchain Network as a decentralized registry. In Blockchain, every transaction is stored in the form of blocks.

In Cross-Chain transaction is one in whichthe different Cryptocurrencies exchange among multiple blockchains. Assume that two parties are exchanging their cryptocurrency from different blockchains. That transaction is done with the involvement of a third party.

The third party which is in the middle of thetransaction of both parties will verify all the details of both parties whether they are authenticor not and process the Cross-chain transaction. Through this process, the third party is getting some benefit. Fig. 2(a) represents a cross-chain transaction in which 'H' is sending 3 Ethers to 'P' and 'P' is sending 2Bitcoins with 'J'. In return 'J' is sending 3 Ethers to'P' and 'P' is sending 3 Ethers to 'H'. It is

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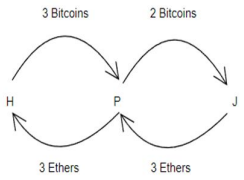

Fig.2 (a)-CC transaction

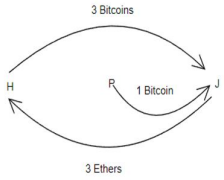

Fig.2 (b)-CC Transaction Showing P as a third party

representing a Cross-Chain transaction between 'H' and 'J' where they are exchanging Bitcoins andEthers. Here 'P' is the third party. Fig. 2(b) represents 'P' as a third party.

Our proposed work is removing the third party and making the Cross-Chain transaction much stronger without any involvement of any unauthorized person in the transaction.

Authentication is a procedure for recognizing the end-user's identity. Authentication elements can be divided into three groups "a password or a personal identification number", "a token like a bank card" and "biometrics like fingerprints".

Authorization is a method of permitting to do or have something. It is a security mechanism that is used to determine user rights or access levels to system resources, along with computer programs, files, services, data, and application characteristics. Authorization is before Authentication.

Authentication and Authorization play an important role in any transaction.

II. Literature Review

In 2017, Muhammad et.al [1], explained theuse of blockchain bitcoin in the transactions zone on the growth of today's emerging in the financial zone of the blockchain bitcoin transaction. They discussed How a Bitcoin Blockchain transaction works, and how the base58check encoding works. They also discussed the sending transaction process, transaction status, transaction record process, and transaction confirmation.

In 2017, Iuon-Chang Lin et.al [2], has discussed Blockchain, and how it works. The structure of blockchain, proof of work, proof of stake, and types of blockchains. They also gave the applications of Blockchain technology like Bitcoin, Ethereum smart contract, Hyperledger, other applications, and also the Security issues andchallenges.

In 2018, Jameela Al-Jaroodi *et.al* [3], has surveyed Blockchain technologies. They discussed the opportunities, benefits, and challenges of including the blockchain in various industry applications and also the different industrial applications and domains where the working of Blockchain technologies has been proposed like Financial Industry, Healthcare Industry, Logistics Industry, Manufacturing Industry, Energy Industry, etc.., are analyzed.

In 2018, Suman Ghimire *et.al* [4], has discussed some topics of Bitcoin such as Blocks, Blockchains, the mining process, and the proof-of-work. Theydescribed the working of Bitcoin, mining, and Rewards. They compared the Hardware mining rateand Hardware power. They also gave the mining difficulty of Bitcoin overtime.

In 2019, Varun Amruthiya et.al [5], have introduced a novel process to make secure authentication even safer. Their work does not need any third party between the applicant and verifier for authentication purposes. The functionalities of 2FA are as follows:

- User authentication.
- System Administration
- Saving secure access tokens
- Granting access to the system
- Abrogating access to the system in case ofseveral incorrect attempts

In 2020, Sandhya Pasala *et.al* [6], gave a structure of security and insurance of blockchain. They described the security characteristics that are maintained as the fundamental requirements, building discourages of Bitcoin such as advanced cash structures,drawn by describing the advanced security and insurance properties that are used in various blockchain applications. They also discussed the security and assurance systems for fulfilling the security characteristics in Blockchain-based structures.

In 2020, Narges Shadab et.al [7], has proposed a 3-phase protocol that includes the following three steps:

Step-1: Contract creation

Step-2: Secret Release and propagationStep-3: Secret Replay and propagation

Their work includes a Hash-time-lock protocol that is used to generate a contract connecting the Cross-Chain participants and this contract is locked with a secret hash value created by them by using a Hashfunction.
In 2020, Xiaohui Yang et.al [8], have exploited smart contracts and zero-knowledge proof(ZKP) algorithms to enhance the available claim identity method in blockchain model to notice the identity unlinkability, effectively preventing the revelation of the ownership of the attributes. They carried out a protocol "BZDIMS" which is including a challenge-response protocol that permits the end-users to acknowledge their ownership of attributes to service providers to safeguard user behavior privacy.
In 2020, Daniel Maldonado-Ruiz et.al [9], have implemented a framework named "Three Blockchains Identity Management with Elliptic curve Cryptography (3BI-ECC)". It is a decentralized identity management system in which the end-users identities are self-created without any third party involved in it. Their framework involves CoreBlockchain initialization, Identity storage, Identity Revocation, and Identity searching.
In 2020, Liang Zhang et al. [10], has proposed a framework for signing and verifying the contract for a transaction without the involvement ofa third party. A fair contract signing scheme is implemented which is said to be a "Verifiable Encrypted Signature" (VES). VES is a fair exchangemethod used for digital signatures, where the sender creates a Signature and adds it to the contract,and sends the contract to the receiver. The receiver can extract the Signature of the Sender using the Verification mechanism. They proposed a robust Authentication mechanism for transactions.

III. Proposed Methodology

We are proposing a model with an Authentication protocol for a strong and secure Cross-chain transaction without the involvement of any outside party in the transaction. The previousworks of Cross-Chain transactions are including thethird party to make the transaction happen. But involving a third party in the transaction is not a safe part. For a more secure and safe transaction of Cross-Chain exchange, the third party must be removed and the transaction must be held by involving only the sender and the receiver with an Authentication protocol that proves the sender andthe receiver as authorized persons.
Identity will be created for the senderand the receiver among themselves and those identities can be used later on for any cross-chain transaction. After the identity is created, the Transaction will take place through the contract.

IV. Authentication Protocol

Our Proposed Authentication Protocol Consists Of the following processes:

A. Signature process

In the Signature process, the parties willing to do the transaction will have to create a signature bythemselves which is verified by the other party who is transacting with them. This Signing and verification process is done to prove themselves Authorized. The Signing process consists of:

1) *Key pair generation*: In which the Key pair for the parties is generated.
2) *Creating verifiable form:* In which a Verifiable form is created which includes a VF-ID (Verifiable form ID) which is used to create the Signature.
3) *Signature Creation:* Using the VF- ID created above, a Signature is created.

B. Announcement

In this process, the Announcement of the transaction is made. After the Announcement is done, the one who is willing to participate in the Crypto Exchange will be accepting it.

C. Verification

In this process, the parties whoever is exchanging the cryptocurrency will be verifying the Signature by themselves and will be creating a CC-ID themselves to prove themselves Authorized for a Cross-Chain transactioni.e., Party A will be verifying Party B's Signature and create a CC-ID for the PartyB and Party B will be verifying Party A's Signature and creating a CC-ID for Party A.

D. Transaction

The transaction process is done in two steps: They are:

1) *Contract locking:* Contract locking is done to lock the Cryptocurrency within thecontract using the

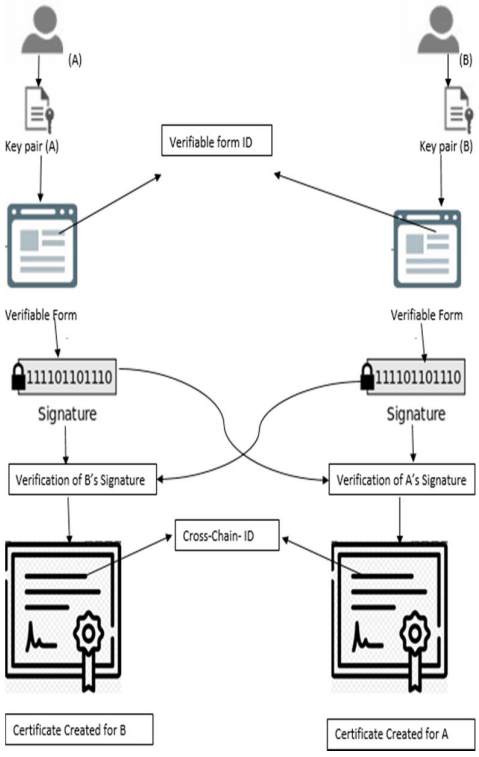

Figure 1-Cross-Chain ID Creation

Hash of the CC-ID of the other party and send thatContract to them.

2) *Contract unlocking:* Contract unlocking is done to unlock the Cryptocurrency using the Hash oftheir CC-ID and the transaction is done.

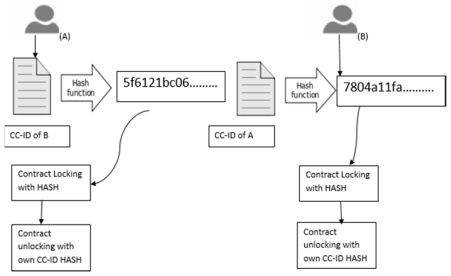

Figure 2- Transaction

V. Conclusion

A brief study on Blockchain technologies and Cross-Chain transactions is made. The Cross-Chain transactions are based on a third party, which acts as a representative of the whole transaction. Trusting a third party in a Crypto Currency exchange is not secure. So we proposed an Authentication protocol to make the Cross-Chain transaction safe and secure without the need of a third party to enter into the transaction.

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Kiswahili Extractive Text Summarization

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***Abstract*—Kiswahili is the language of the Swahili people, who are mostly found in Tanzania and Kenya (along the East African coast and adjacent islands). Although linguistically classified as a Bantu language, Swahili developed historically by borrowing a variety of words from foreign languages, particularly Arabic, around forty percent of the Swahili vocabulary consists of Arabic loan words, including the name of the language an Arabic word meaning ("of the coast"). The number of Swahili speakers is approximated to be around 200 million. In this paper, we have used two Extractive Text Summarization Techniques BERT-SUM and TF-IDF.**

***Index Terms*— Kiswahili Text Summarization, Term Frequency Inverse Document Frequency (TF-IDF), Bidirectional Encoder Representations From Transformers (BERT-SUM), Extractive Text Summarization.**

I. INTRODUCTION

Automatic text summarizing enables people to condense lengthy passages into concise sentences [1]. A language with a long literary history, Kiswahili is also lexically and morphologically abundant. In order to provide individuals with information or knowledge in a highly condensed amount of lines, we have tried to summarize large paragraphs of Swahili by using extractive method of text summarization.

We have applied two techniques on the text. 1) TF-IDF 2) BERT-SUM. Making a long text brief, allows you to appreciate the depth of the long text [2]. This is known as summarizing a text. To summarize a text, one of the many NLP principles that can be applied to many different types of techniques can be employed.

Therefore, there are two distinct approaches to summarize text: the abstractive method and the extractive method. In extractive text summarization, the keywords are taken from the original text and are summarized [3]. This method extracts the keywords without altering the primary source document. In abstractive text summarization, it produces new words and new sentences that provide us with a meaningful summarization like we obtain the summarization from a person. Grammar inconsistencies that exist in extractive approach is solved with the abstractive method.

There are different variations of Extractive Text Summarization techniques. In this paper we have used two methods namely, TF-IDF and BERT-SUM.

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II. Related Work

We explored to see if any prior work had been conducted on the Kiswahili language on this subject before deciding to start this research (Extractive Kiswahili Text Summarization). For a language that is spoken widely by a large population this was somehow alarming.
In order to create our own corpus and data set, we have been collecting enormous volumes of Swahili text from numerous sources.
In order to make this feasible for the Kiswahili language, we extended our study on Swahili text summarization. In our research, we found that in-text summarization a machine must first be created as supervised learning. After that, we can incorporate unsupervised learning and determine the response. As a result, it is pre-processed supervised machine learning. Due to the lack of thorough research over the past three decades, Swahili is already structurally and morphologically complex. Therefore, it is extraordinarily difficult for academics and researchers to carry out this kind of study. We have to start from scratch because we are the first researchers to do this research.

III. Experimental Setup

In our research we used 10 paragraphs from a well known Kiswahili novel entitled "JOKA LA MDIMU", all the paragraphs were summarized using TF-IDF and BERT-SUM techniques and then evaluated manually by five evaluators who understand the language. Below is a figure that shows the manual evaluation procedure:

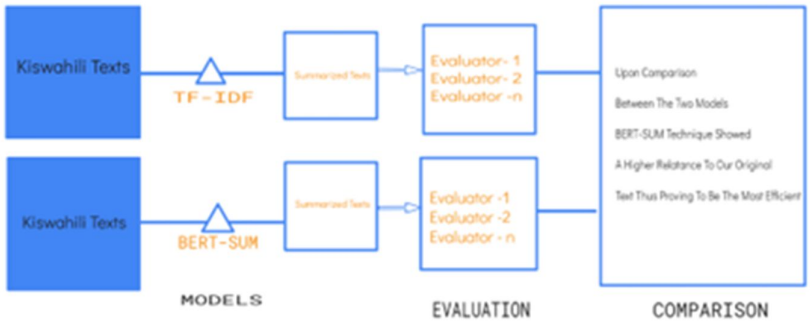

Fig.1 The proposed Model for the Kiswahili Text Summarization Using TF-IDF and Using BERT SUM

A. Original Text Paragraph 1

1) Zamani za miaka kumi sifa kubwa ya Sega ilikuwa uchafu, ulevi, ufuska, na ujambazi. Ilisemwa: Hukatishi Sega usiku. Baadaye wafanyabiashara wakamaizi kuwa idadi kubwa ya wakazi wa Sega wangeweza kuwa washtiri wazuri. Naam, ghafla yakaanza mashindano ya kutafuta nyumba za kufanyia biashara. Kwa vile nyumba za hadhi kama hiyo zilikuwa chache, vibanda vilinunuliwa kwa mamilioni na kubomolewa. Maduka makubwa yakachipua mithili ya uyoga pamoja na majumba ya kulala. Hivi sasa katika barabara kubwa ipitayo katikati ya Sega kila nyumba ni duka, liwe la nguo, nyama, vyombo vya ujenzi na kadhalika. Vichochoro ndani kabisa kuliporomoshwa majumba ya fahari ya kulala, mashine za kupasulia mbao na kusagia nafaka. Viwanda vidogo vikachipuka na kustawi. Ukiachilia hayo, hali ya hapo ikaendelea kuwa duni zaidi ya miaka kumi iliyopita. Kama wenyewe walivyosema: Akheri ya zamani!

B. Corresponding Summarized Text Using BERT-SUM

1) Zamani za miaka kumi sifa kubwa ya Sega ilikuwa uchafu, ulevi, ufuska, na ujambazi. Vichochoro ndani kabisa kuliporomoshwa majumba ya fahari ya kulala, mashine za kupasulia mbao na kusagia nafaka

C. Corresponding Summarized Text Using TF-IDF

1) Ilisemwa: Hukatishi Sega usiku. Viwanda vidogo vikachipuka na kustawi. Kama wenyewe walivyosema: Akheri ya zamani!

IV. Parameters for human evaluation

After getting the summarized texts from each technique ie.TF-IDF and BERT-SUM of every paragraph we held a manual evaluation of the texts using five native speakers of the language to ensure the accuracy of our results,

in doing so we had to establish parameters that will guide our evaluation process. The following are the parameters that were taken into account.

TABLE I: THE HUMAN EVALUATION TABLE OF RATING

Parameter No.	**Parameters**
1	How is the summarised text related to the given topic (%)
2	Was the name of the main character mentioned in the summarised Text (%)
3	Are the number of lines summarised meaningful and understandable (%)
4	Were the sentences produced grammatically correct(%)
5	Were the sentences produced grammatically correct(%)

TABLE II. TF-IDF MANUAL EVALUATION

Evaluator	Topic Name (in English)	Is the Summarization is related to the given topic ?	Name of the main character is verified by looking at the Summarization	Presence of the Bag of words is giving a relatable meaning	Is the total no of lines in the Summarization understandable and meaningful ?	Overall quality of the output
Evaluator1	Paragraph 1	100%	90%	57%	57%	Good (79%)
	Paragraph 2	100%	85%	89%	80%	Good (80%)
	Paragraph 3	100%	88%	67%	69%	Good (74%)
	Paragraph 4	100%	82%	56%	56%	Good (82%)
	Paragraph 5	100%	80%	87%	85%	Good (78%)
	Paragraph 6	100%	85%	89%	85%	Good (81%)
	Paragraph 7	100%	90%	78%	75%	Good (70%)
	Paragraph 8	100%	80%	66%	69%	Good (81%)
	Paragraph 9	100%	80%	80%	75%	Good (74%)
Evaluator2	Paragraph 1	100%	93%	67%	69%	Good (83%)
	Paragraph 2	100%	83%	69%	75%	Good (85%)
	Paragraph 3	100%	84%	77%	79%	Good (78%)
	Paragraph 4	100%	80%	56%	58%	Good (76%)
	Paragraph 5	100%	79%	77%	80%	Good (79%)
	Paragraph 6	100%	83%	79%	86%	Good (84%)
	Paragraph 7	100%	89%	77%	74%	Good (80%)
	Paragraph 8	100%	78%	60%	67%	Good (68%)
	Paragraph 9	100%	77%	76%	78%	Good (76%)
Evaluator3	Paragraph 1	100%	90%	59%	67%	Good (69%)
	Paragraph 2	100%	82%	65%	68%	Good (77%)
	Paragraph 3	100%	86%	75%	64%	Good (67%)
	Paragraph 4	100%	79%	64%	56%	Good (77%)
	Paragraph 5	100%	78%	67%	83%	Good (67%)
	Paragraph 6	100%	88%	76%	86%	Good (81%)
	Paragraph 7	100%	94%	86%	78%	Good (78%)
	Paragraph 8	100%	89%	57%	56%	Good (67%)
	Paragraph 9	100%	81%	72%	73%	Good (73%)
Evaluator4	Paragraph 1	100%	94%	70%	69%	Good (80%)
	Paragraph 2	100%	82%	78%	75%	Good (83%)
	Paragraph 3	100%	85%	70%	79%	Good (73%)
	Paragraph 4	100%	87%	65%	58%	Good (65%)
	Paragraph 5	100%	82%	80%	80%	Good (79%)
	Paragraph 6	100%	86%	82%	86%	Good (87%)
	Paragraph 7	100%	94%	76%	74%	Good (76%)
	Paragraph 8	100%	83%	66%	67%	Good (67%)
	Paragraph 9	100%	82%	76%	78%	Good (78%)
Evaluator5	Paragraph 1	100%	91%	63%	68%	Good (78%)
	Paragraph 2	100%	82%	76%	74%	Good (86%)
	Paragraph 3	100%	84%	78%	77%	Good (75%)
	Paragraph 4	100%	86%	68%	59%	Good (67%)
	Paragraph 5	100%	87%	87%	89%	Good (83%)
	Paragraph 6	100%	85%	84%	84%	Good (80%)
	Paragraph 7	100%	94%	72%	73%	Good (73%)
	Paragraph 8	100%	83%	68%	64%	Good (65%)
	Paragraph 9	100%	80%	70%	73%	Good (70%)
	Paragraph 10	100%				

TABLE III. BERT-SUM MANUAL EVALUATION

Evaluator	Topic Name (in English)	Is the Summarization is related to the given topic ?	Name of the main character is verified by looking at the Summarization	Presence of the Bag of words is giving a relatable meaning	Is the total no of lines in the Summarization understandable and meaningful ?	Overall quality of the output
Evaluator1	Paragraph 1	100%	95%	77%	70%	Good (85%)
	Paragraph 2	100%	85%	97%	84%	Good (85%)
	Paragraph 3	100%	70%	87%	76%	Good (83%)
	Paragraph 4	100%	69%	85%	58%	Good (76%)
	Paragraph 5	100%	90%	88%	88%	Good (83%)
	Paragraph 6	100%	88%	80%	89%	Good (84%)
	Paragraph 7	100%	90%	89%	68%	Good (77%)
	Paragraph 8	100%	69%	60%	64%	Good (73%)
	Paragraph 9	100%	72%	76%	80%	Good (79%)
Evaluator2	Paragraph 1	100%	93%	73%	75%	Good (86%)
	Paragraph 2	100%	81%	94%	75%	Good (83%)
	Paragraph 3	100%	66%	86%	79%	Good (80%)
	Paragraph 4	100%	62%	80%	68%	Good (74%)
	Paragraph 5	100%	93%	82%	80%	Good (81%)
	Paragraph 6	100%	85%	84%	76%	Good (83%)
	Paragraph 7	100%	89%	83%	70%	Good (78%)
	Paragraph 8	100%	73%	63%	69%	Good (70%)
	Paragraph 9	100%	69%	78%	70%	Good (76%)
Evaluator3	Paragraph 1	100%	98%	72%	77%	Good (84%)
	Paragraph 2	100%	86%	94%	88%	Good (86%)
	Paragraph 3	100%	60%	88%	54%	Good (76%)
	Paragraph 4	100%	59%	86%	76%	Good (74%)
	Paragraph 5	100%	90%	82%	79%	Good (85%)
	Paragraph 6	100%	83%	76%	85%	Good (83%)
	Paragraph 7	100%	86%	84%	79%	Good (72%)
	Paragraph 8	100%	70%	61%	63%	Good (75%)
	Paragraph 9	100%	67%	75%	70%	Good (74%)
Evaluator4	Paragraph 1	100%	89%	71%	69%	Good (83%)
	Paragraph 2	100%	78%	92%	75%	Good (80%)
	Paragraph 3	100%	64%	83%	79%	Good (81%)
	Paragraph 4	100%	66%	86%	58%	Good (71%)
	Paragraph 5	100%	90%	89%	80%	Good (84%)
	Paragraph 6	100%	82%	83%	86%	Good (85%)
	Paragraph 7	100%	91%	88%	74%	Good (73%)
	Paragraph 8	100%	70%	64%	67%	Good (72%)
	Paragraph 9	100%	62%	69%	78%	Good (69%)
Evaluator5	Paragraph 1	100%	93%	76%	68%	Good (84%)
	Paragraph 2	100%	82%	92%	74%	Good (87%)
	Paragraph 3	100%	65%	86%	77%	Good (86%)
	Paragraph 4	100%	57%	88%	59%	Good (74%)
	Paragraph 5	100%	87%	89%	89%	Good (89%)
	Paragraph 6	100%	82%	78%	84%	Good (89%)
	Paragraph 7	100%	87%	84%	73%	Good (78%)
	Paragraph 8	100%	69%	68%	64%	Good (75%)
	Paragraph 9	100%	61%	74%	73%	Good (78%)

V. METHODOLOGY

Using BERT-SUM (Bidirectional Encoder Representation from Transformers) and TF-IDF (Term Frequency-Inverted Document Frequency) our paragraphs were put into summary .Each paragraph was then broken down in terms of independent sentences and later tokenized into words . Stop-words were employed to cut out phrases that weren't necessary or unique.

After this procedure TF-IDF and BERT-SUM approaches were used corresponding formulas are provided below.

TF = Total Appearance of Word in the Document/Total Words in the Document.

After the TF is calculated, the IDF will be calculated by using the below given formula.

IDF = log (All Document Number/Document Frequency)

TF-IDF = TF*IDF.

Following the completion of the aforementioned calculation, the TDF algorithm arranges the words in the texts in ascending order before determining the rank of each phrase in the document.

VI. Result

One can sum up by saying that a workable output was obtained after implying both of the methods to our Swahili paragraphs however the result was not satisfactory due to the limitations of the structure of the Swahili text facilitated by poor or lack of universally accepted, correctly documented stop words, and constraints in the Kiswahili text's framework.

We used human Evaluators to check whether our summarized text had matched the original paragraphs, our evaluators had an excellent understanding, reading and writing knowledge on the Kiswahili Language.

VII. Conclusion

The BERT SUM has given better result in the Kiswahili language. In future interactions, we intend to use abstractive tactics to further our study on Kiswahili Text Summarizing Techniques. Other Languages can easily adapt our methods to create summaries for their texts. The Evaluators had to assign percentages of accuracy based on a number of provided parameters see Table 1 and Table 2. In comparison between the two approaches BERT-SUM seemed to be more accurate than TF-IDF approach.

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Light Fidelity (Li-Fi): A Wireless Technology

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***Abstract*—Wireless communication is the need of the hour, there is a huge demand for improvement in the means of communication. The brewing crisis of the radio frequency (RF) spectrum demands the need for a system like light fidelity (Li-Fi) which relies on the aspect of visible light communications (VLC). Li-Fi technology offers a variety of effective solutions to problems faced in recent years. This technology utilizes data transmission by light, and the unique properties of the white light emitting diode (LED) lamp switching comes into play. In the proposed system we transmit an audio signal generated by a mobile phone. The signal is modulated and then transmitted by LEDs in form of a light signal which is read by the solar panel and the received signal is transformed into an electrical signal. The signal is demodulated and read by the speakers. Li-Fi is a fast, upcoming, and growing technology, it's a better alternative to Wi-Fi in wireless communication. In the present paper, the authors have focused on the pros of Li-Fi, its applications, and its fundamental working. Li-Fi is greener, safer, and more economically feasible in the future of communication.**

***Index Terms*— Li-Fi, VLC (Visible Light Communication), LED, RF (Radio Frequency).**

I. INTRODUCTION

One of the fundamentals of the wireless communication domain is transmission of information. when we consider transmission as an aspect we need to take into account its features like speed forms etc. The existing system for data transmission ie wired data transmission system has aged and slowed down. The introduction of wireless technology for data transmission has been proven to be revolutionary. Li-Fi (Light Fidelity) is one such technology which provides a faster channel for data transmission via light.

A. Goals and Features

The main aim of the research is to design a communication system to explain the working of Li-Fi (Light Fidelity) technology. In this system an audio signal is transmitted via LEDs.

B. Review of literature

Professor Harald Hass the original founder of data transmission through light devised the term Li-Fi. In October 2011 a union was formed between industries for the promotion of technology that would overcome the drawback of limited radio based wireless systems, thus in turn paving a way for Li-Fi technology.
In April 2014, a Russian company called Stins Coman developed a local network based on the idea of Li-Fi wireless, named Beam Caster. [4] describes how their current module transfers data at 1.25 GB/sec. but foresee boosting speeds up to 5 GB/sec.in the near future.
In [3] the author has indicated that the wireless networks have a promising future both as standalone systems and

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as a component of the wider networking infrastructure, as seen by the rapid expansion of wireless systems combined with the widespread use of laptop and palmtop computers. The construction of reliable wireless networks that provide the performance required to enable future applications still faces numerous technical obstacles.

II. TECHNOLOGY WORKING

Li-Fi technology is said high speed communication network which functions to and fro that is bidirectional mobile communication network. It comprises of LEDs which form one of the wireless end of the network. The LEDs emit a series of streams of photons when electrical current is passed through it. LEDs feature of functioning as a semiconductor proves to be advantageous as the brightness of the light can be varies based on the high electric power applied. LED lights can be modulated at different rates before sending the signal using this property. At the other end of the system a detector is set up to receive the signal and to interpret the different variation of intensities in the light signal received as data.
The intensity of modulation enables the communication to be seamless as intensity of modulation isn't visible to the naked eye. This allows the individuals to use the Li-Fi enabled light communication.

III. WI-FI

One form of wireless technology is Wi-Fi. Wi-Fi is a local area networking (LAN) technology that is based on the IEEE and intended to give in-building broadband coverage. Current Wi-Fi systems typically offer indoor coverage over a 100-foot radius and support a peak physical-layer transmission rate of 54 Mbps. For last-mile internet access in homes, workplaces, and public hotspot areas, Wi-Fi has taken over as the de facto norm. System coverage normally extends no more than 1,000 feet from the entry point.
NCR (National Cash Register) and AT&T (American Telephone and Telegraph) established the Wi-Fi in the Netherlands in 1991. We can exchange information between two or more devices utilising this technology. Wi-Fi was initially designed for mobile computing devices like laptops, but it is now extensively used for consumer electronics like televisions, DVD (Digital Video Disc) players, and digital cameras as well as for mobile applications. Both client to client connections and access point to client connections should be options for communication over a Wi-Fi connection. Local area networks may function without cable and infrastructure thanks to Wi-Fi. It is a popular option for both residential and commercial networks.

Figure 1. Wi-Fi technology

C. Advantages Of WI-FI

- wires and hardware inconveniences will be eliminated.
- Setting up and configuring Wi-Fi is simpler than running cables.
- It is 100 percent secure and won't disrupt any networks.
- Hot spots are another way for us to access the internet.
- wireless broadband access is possible

D. Disadvantages of WI-FI

- Data transmission is sensitive to some restrictions; long distance transmissions aren't possible.
- Wi-Fi emits radiation that could be harmful to human health.
- Wi-Fi connection is comparatively costlier than traditional connection.

IV. LI-FI

A unique wireless communication technique called Li-Fi is appropriate for transmitting data via LEDs for illumination. Instead of using the RF range of electromagnetic spectrum, it makes use of the visible spectrum. Li-Fi technology combines wavelengths of 1 mm to 10 nm and frequencies of 300 GHz to 30 PHz. There are 100 times more electromagnetic waves than radio waves in this range.
Li-Fi is not just a technology; it also serves as the foundation for all future capabilities as services, applications, and end users.

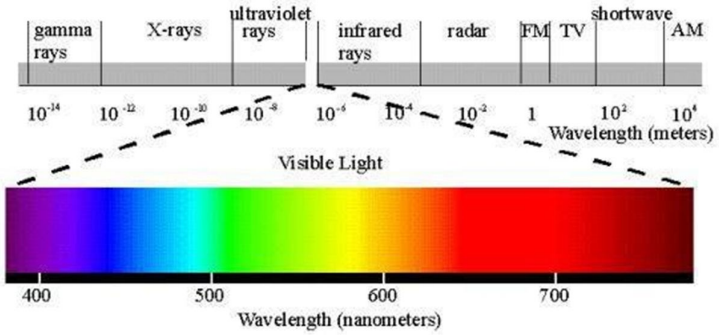

Figure 2. Location of visible light and RF at electromagnetic spectrum

In the Technology Entertainment Design (TED) global talk on Li-Fi, Professor Harald Hass, the inventor of Li-Fi technology, states: "At the heart of the technology is a new generation of high brightness LEDs," adding: "Very plainly, if the LED is on, you transmit a digital 1, and if it's off, you transmit a 0. They can be switched on and off very quickly, which provides nice opportunities for the data that's transmitted".
By altering the pace at which the LEDs flicker on and off to produce different strings of 1s and 0s, it is feasible to encode data in the light. The idea of data transmission utilizing light is seen in the figure below. Additionally, more advanced techniques could significantly boost Li-Fi data rates by using an array of LEDs, where each LED transmits a different data burst to provide parallel data transmission. The LED intensity is modulated so rapidly that the output appears constant to the human eye. Other concepts include altering the light frequency to encrypt a new data channel by combining red, green, and blue LEDs.

Figure 3. The idea of data transmission using light

E. Comparison between Li-Fi and Wi-Fi

Li-Fi is term that describes visible light communication (VLC) technology that is used for high speed wireless communication. Contrary Wi-Fi is employed regularly in day to day general wireless coverage for an area of building. Li-fi is suitable for high density wireless data coverage that is confined to an area and eliminates radio interference, wire hardware issues etc. But in conclusion the two technologies can be said to be complimentary to each other.

F. Li-fi Applications

- Traffic control: Li-Fi can assist in improving traffic management and decreasing the number of accidents. To control street traffic, traffic lights can interact with each other and with vehicles
- Airways: To avoid mobile phone signals interfering with aircraft navigation and control signals, smart phones must be turned off inside of aircraft. In [5] the author mentions how Li-Fi doesn't interfere with RF, it can be used in airplanes without risk. We could also use the lights above the seats in the plane as hotspot.

- Disaster management: In times of disaster, such as earthquakes or hurricanes, Li-Fi can be used as a powerful means of communication. For instance, locations like subway stations and tunnels, which are typically dead zones for most emergency communications, don't cause harm for Li-Fi, so it can be used there as an emergency communication.
- Medical applications: One of Li-Fi's most significant advantages is that it can be utilized in hospitals and other facilities where RF transmissions that could damage medical equipment are prohibited. For instance, Wi-Fi use is prohibited in OTs (Operation Theatres) due to radiation safety concerns because it interferes with signals from monitoring equipment. Consequently, it might be detrimental to the patient's health.
- subaquatic communications: Due to the significant signal absorption that occurs in water, using RF signals is not feasible. Li-Fi provides a short-range communication solution. With the help of their headlamps, submarines could communicate with one another, interpret data on their own, and periodically send their discoveries back to the surface in underwater remotely operated vehicles (ROV).

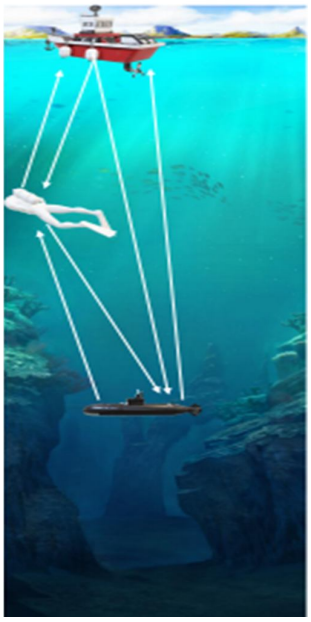

Figure *3*. The idea of data transmission

V. Design Approach

This segment will display and discuss the specifications required for the construction and working of the system, its components.

G. Functional Block Diagram

Here Fig. 3 demonstrates the Functional Block Diagram of the system.
Transmitter side : The transmitter side consists of a signal source and a circuit which employs the LEDs.
Receiver side: The receiver side contains a circuit which receives the signal, here we use a solar panel and a device which hold the ability to interpret the received output.

H. Components

Each component hold its own significance and performs a certain function in the given system. The components are listen below:

- Power Source
  Power source is required by both the transmitter and the receiver side. Every components requirement for power varies accordingly. The transmitter uses the same power source but converts that power into required divisions for different components. The output device that is the speaker uses a 120V AC output, here we connect it directly to AC power.
- Signal Source

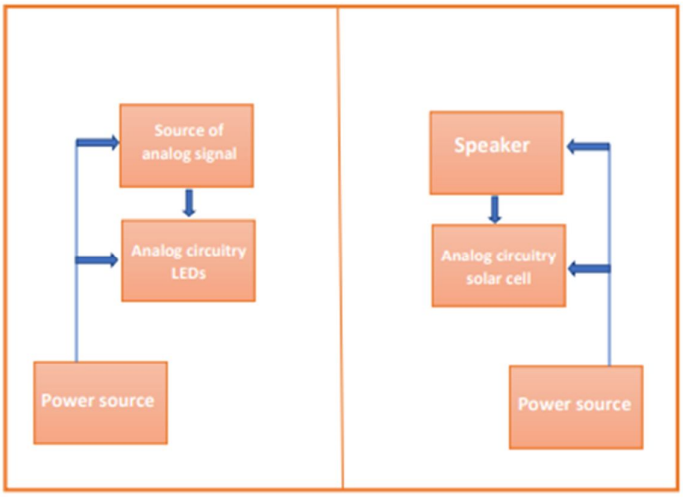

Figure 4. Functional Block Diagram

The signal used here is an audio signal. This signal will be introduced into the system through a cell phone or any other devices which can act as signal sources. The signal is then sent to the circuit. The receiver needs to be able to analyse the given signal and produce the required output in form of sound.

- 3.5mm audio jack
  Input from the audio source or cell phone gets converted from digital to analog signal by the 3.5mm audio jack. The structure of the audio jack is such that it is divided into 3 parts. Those are right left and ground. The left and right arts are connected to the resistor which further connects to the transistor. The ground part is connected to the negative of the power supply and to the transistor's emitter.
- Resistors
  The function of the resistor is to limit or resist the flow of current flow, for the division of voltages, to adjust signal levels and bias active elements.
- Transistor (BJT)
  Here the transistor behaves like switch. The transistor connects the input signal source to the light emitting source that are the LED. The LEDs would receive more current and power in this manner. As a result, LEDs would become brighter and achieve greater transmitting distance.
- LEDs
  The LEDs in this system are employed for imparting the sensory data from the transmitter to the receiver. Five red LEDs with the following standards are used in this circuit: 620–625 nm wavelength, 2000–3000 mcd luminance, 30° viewing angle, 2V forward voltage, and 20mA forward current. They used a transistor to control the conversion of the audio signal into light, which was then used to transfer data to the receiver. In reference to [2] which states that small variation of the density of LED light is transformed by the "receiver" to electrical signal. The signal is then transformed back to binary data stream that recognized as sound wave.
- Solar cell
  The solar cell on the receiver side would collect the transmitted light from the LEDs (3-6V DC). This signal would then be converted to an electrical signal by the solar cell. The solar cell receives irradiance with the best potential power density when the LEDs' transmitted light is perpendicular to the solar cell.
- Speaker (Computer speaker)
  The computer speaker, the final part on the receiver side, is connected to the solar cell to alter the electrical signal into an audio signal. Despite being directly linked to the AC power, this speaker includes an inbuilt amplifier and is output to a wall with a 120V AC output.

VI. RESULT

First, the audio signals that had been received at the receiver's end were evaluated. Because of the other light sources around the system, the signal was initially detected by the receiver as a sound with a significant amount

of disruption. The distance of 11 cm between the transmitter and the receiver produced the loudest and clearest sound, and the receiver could pick up the signal for almost 60 cm then after. The apparatus also may transmit and receive signals up to a distance of 1 metre in the experiment when there are less light sources around.

VII. Conclusions

Many wireless technologies are developing and growing as a result of the rise in high-speed data consumption, with Li-Fi holding the most promise. It is a technology that works well, quickly, and economically. Even the Indian IT ministry put life to the test in a collaborative project with IIT Madras and Philips Lighting. If Wi-Fi and many other broadband networks are replaced by Li-Fi technology, daily life will undergo a significant transformation. High-speed data transfer is this technology's main obstacle, yet new and developing technology is advancing recently and may someday explain the world's many mysteries.

Future Scope

Li-fi technology offers a lot of potential applications since it might result in communications that are cleaner, greener, safer, and have a bright future and environment. People will utilise technology more frequently if it gets developed and well-liked, and it may then play a significant role in the mob's ability to communicate more quickly. Li-Fi has the potential to eventually replace current unguided, quick, and secure data transmission technology. According to Neena Pahuja, director general of the Education and Research Network (ERNET), an independent scientific institution under the IT ministry, "Li-Fi might be employed in India's forthcoming Smart Cities — where IT will be the key infrastructure." Li-Fi could function as an internet hotspot in traffic systems.

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Management of Neurodegenerative Disease by Machine Learning: A Trending Approach

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***Abstract*—Machine learning and data mining techniques have been discovered to be critical for the investigation, retrieval, and analysis of any information created from any domain. Bioinformatics is a multi-dimensional strategy that incorporates the use of computer techniques for the collection of medicinal, healthcare or physiological evidence. These approaches are used to forecast patient prognosis in a variety of different medical domains, such as the risk for complications after already being hospitalized, cancer development, diabetic complications, sudden cardiac death, and so on. Furthermore, they may be utilized for breast cancer identification and treatment using mammography, brain tumor resection using magnetic resonance imaging, and brain cognitive state recognition utilizing functional MRI to identify neurodegenerative problems. As a result, the present investigation aims to exhibit the utilization of machine learning approach in management of neurodegenerative disorders.**

***Index Terms*— Machine Learning, Neurodegenerative disorders, Alzheimer's disease, Parkinson's disease, Algorithms.**

I. INTRODUCTION

Machine learning as well as data mining techniques [1] are found to be vital for the purpose of exploration, extraction, and interpretation of any data generated from any source. *Bioinformatics is a multifaceted approach that* includes the usage of computational means for medical, health, or biological data collected [2]. Over the last ten years, the total data has grown exponentially; moreover, the requirement to acquire modern knowledge with the aim of handling diseases makes bioinformatics a prominent research domain. Now, machine learning as well as big data methods has also been implemented for a better understanding of disease and fight against those diseases [3–6].

Machine learning techniques are found to be useful for the management of enormous amounts of data collected from the patient databases, which include medical records. These techniques are also capable of detecting the data patterns that cannot be defined by traditional statistical approaches [7–9]. These methods are employed to predict patient prognostication in several other medical areas, for example, the possibility of readmission after being discharged from the hospital [10], progression of cancer [11], complications in diabetes [12-13], cardiovascular mortality [14] etc.

Detection and diagnosis accomplished by the use of machine learning algorithms help a physician in the interpretation of medical imaging findings and also lead to a reduction in interpretation times [15]. These

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predictive analytic encryptions are utilized for a variety of difficult jobs including dismemberment of pulmonary embolism with computed tomographic angiography [16-17] and detection of a polyp with virtual colonoscopy or computed tomographic in the colon cancer setting [18,19]. Further, they can be used for detection of breast cancer, and diagnosis by using mammography [20], segmentation of brain tumor by using MRI [21], and recognition of the brain's perceptive condition by using functional magnetic resonance imaging to detect neurological disorder [22–24]. Diagnosis of several neurodegenerative disorders is now upgraded by employing advanced neuroimaging techniques [25], so it is now contemplated as a valuable, initial, and dependable means for the detection of neurological disorders because every neurological disorder leads to impairment of definite brain regions [26]. The foremost concern, which arises from the health, as well as economic perspective, includes the effect of the aging society on the current healthcare system. Neurodegenerative diseases tend to affect a large population of the elderly and, till now no cure has been found for these diseases. Researchers usually look to discover new treatments to decelerate the progression of a certain disorder and aim for perfection in life of the patients. Heterogeneity in genetic, pathological as well as the pathological attributes of a certain neurologic disorder affects the rate of success in clinical trials [27].

II. Neurodegenerative Diseases

Neurodegenerative diseases are considered a menace to mortal health. These disorders generally depend on age and are now turning gradually ubiquitous as an increase in the elderly populace has been observed in the last few years [28]. Some of the neurodegenerative disorders are Parkinson's disorder, Alzheimer's disease, ALS (Amyotrophic Lateral Sclerosis) spinocerebellar ataxias and frontotemporal dementia. These neurodegenerative disorders are found to be distinct in pathophysiology, for example, some of these cause memory or cognitive impairments whereas the restare disturbing an individual's capability to act, speak or even breathe [29-32].

In such neurodegenerative diseases, the two major death pathways for neurons are apoptosis and necrosis [33-34]. The basic differences between these death pathways, necrosis and apoptosis recline in the discrepancy of cell structure as well as the leakage of cell components all through the concerned pathway [34-35]. Apoptosis is considered programmed cell death. There are some cytomorphological aspects of a cell undergoing apoptosis, such as shrinkage and DNA fragmentation, as well as chromosomal condensation [36-38]. When a cell undergoes apoptosis, apoptotic bodies are formed in several cases and there is no leakage of cellular contents [39]. Necrosis is indicated by cell swelling leading to the deprivation of cell membrane solidarity and leakage of the intracellular contents. The breaking of DNA is found to be associated with the process of degradation. However, chromosomal condensation is not included in the necrotic pathway [40].

III. Alzheimer's Dementia

Alzheimer's syndrome ,the most prevalent dementia is specified as a gradually progressive neurodegenerative disorder having characterized features such as neuritic plaques and neurofibrillary tangles owing to the accretion of amyloid-β peptide in the brain, the medial temporal lobe as well as neocortical arrangements [41]. The German Psychiatric, Alois Alzheimer observed the existence of amyloid plaques as well as an enormous neuronal loss when he examined the brain of an individual who suffered from loss of memory as well as a change in personality before his death, Alios then characterized that condition as a severe disorder related to the cerebral cortex [42-43].

Memory loss in the individuals suffering from Alzheimer's disorder is linked with the loss of neurons occurring in the hippocampal region. The persistence of this massive loss of neurons is associated with the advancement of the disorder [44-47]. Initially, the motor function was considered to be spared until and unless Alzheimer's disorder reaches its later stages, but in recent studies, it has been concluded that motor deficiency is also present during preclinical AD [48].

Neuronal loss preceding the clinical signs of Alzheimer's disease takes place in the entorhinal cortex layer II, the locus coeruleus moreover in the nucleus basalis of Meynert [44]. When the disease progresses, neuronal losses occur in the frontal cortex as well as other cortical/subcortical regions that can come out to be very severe in some cases [46,47]. Apoptosis pathways or Necroptosis pathways are considered to be involved. In the case of apoptosis, it is proposed that the initiator or the executor caspases get activated in the disorder [49-53]. The amount of extrinsic apoptotic pathway protein i.e., Fas as well as its ligands are also raised in the brains of patients suffering from AD [54]. A recently concluded study suggests that necroptosis signaling is also increased dramatically in the case of AD as the RIP1-RIP3-MLKL axis protein levels are augmented and the interactions among them are also increased [55].

Structural MRI conducted for patients suffering from AD reflected uneven atrophy of the lateral temporoparietal, precuneus cortices, mesial temporal, as well as the hippocampus [56-58], out of these, the most peculiar discovery was atrophy of mesial temporal [59-61]. The extent of atrophy observed on the MRI contemplates the severity of the disorder as well as the aggregation of neurofibrillary tangles [62-63].

A. Models of Deep Learning Algorithms in Alzheimer's Disease

The technique of machine learning is related to artificial intelligence which is generally employed for classification, reversion, clustering as well as normative modelling. Algorithms in machine learning are classified as supervised models in which the generated data is labelled and unsupervised algorithms in which the main goal is to distinguish untagged information in the clusters of interrelated cases, the third class being semi-supervised algorithms that include both labelled as well as unlabeled data [65]. The algorithm in machine learning is considered to be an operation used to select the best model amongst a certain group of options available that suits a particular group of findings. These algorithms possess numerous advantages, which may include their nonlinearity, fault tolerance, as well as real-time operations, which make them appropriate for composite applications [66]. Many machine learning algorithm such as K-Nearest Neighbours, Naive Bayes, Decision Trees/ Random Forests, Support Vector Machines, Neural Networks etc. shave been developed until now. Significant research on biomarkers like CSF [t-tau/Aβ1-42] [67], p53[68], amyloid [69], tau [70], amyloid-β42 [71], D-glutamate [72] and Metabolites biomarkers [73] along with their prediction models of Alzheimer's disease have been performed.

B. Tau Protein, p-tau (Hyperphosphorylated Tau) and Aβ42 (Amyloid-β1-42) Amid Machine Learning

Numerous biomarkers for AD have already been considered till now comprising the accretion of tau and amyloid (Aβ) in the CSF [74], the metabolic changes in the brain developed from FDG-PET (fluoro-deoxyglucose positron emission tomography) [75], and MRI is exercised to measure the morphological changes in brain [76].

C. *PET - Based Tau Biomarker with Machine Learning*

Deep learning algorithms are employed in various operations in the quickly mounting massive and complex quantity of imaging data [77]. The prognosis of AD generally depends on deep learning techniques, which use neuroimaging data, which can be MRI or amyloid PET. The MRI scans are unable to anticipate molecular pathological indications of AD whereas amyloid PET is unable to anticipate the development of AD because of the deposition of amyloid-β earlier in the disorder development moving to plateau during advanced stages [78]. The existence and location of accumulation of tau in the brain have also been well-recognized [79]. Several researchers which examined neuropathology related to AD were able to generate a staging algorithm that describes tau's anatomical distribution [80]. Successive research has discovered that the tau's topography coincides with the accumulation of neurofibrillary tangle. The data obtained from the Cross-sectional autopsy shows that tau pathology concerned with AD initiates with accumulation of tau in the medial temporal lobe, which further expands to lateral temporal cortex as well as some parts in medial parietal lobe, moreover ultimately expands to the wider neocortical regions [81]. Choi et al. were successful in developing a deep CNN-based automatic image analysis strategy to correctly foresee prospective cognitive deterioration in individuals with MCI by means of FDG and florbetapir PET [68]. Jo and his colleagues were successful in developing a novel framework based on deep learning. They employed tau PET for detection of morphological phenotypes of tau accumulation [69].

D. NMDAR (N-Methyl-D-Aspartate Receptor) Intervened Biomarkers with Machine Learning

NMDA receptors are found to be vital in cognitive functioning [82]. Glutamate mediated by the NMDA receptor is a chief excitative neurotransmitter present in the CNS of mammals [83]. NMDA receptors and glutamate tend to have a significant role in synaptic plasticity along with molecular mechanisms of memory as well as learning [84]. Their critical involvement in excitative neurotransmission shows that there is an interruption in normal signalling via iGluRs in Alzheimer's disease [85-86]. L-Amino acids were found to be predominant in Nature. But it has been noted that D-amino acids influence protein folding, and the neuronal proliferation, as well as functional laterality of the brain.D- amino acids are also considered to be responsible for cognitive functions as well as the psychiatric disorders [87]. A study also brought to light that cognitive functions are affected by the levels of D-glutamate in patients suffering from AD or MCI [88]. Some previously conducted research also indicated that a decline in plasma levels of D-glutamate is responsible for the cognitive deterioration in the case of AD [88-89].

In some pilot studies, some machine learning models having NMDA receptor-mediated biomarkers such as D-amino acid oxidase activator, which is also identified as G72protein echelon for detection of schizophrenia are used. They enlisted 149 participants, out of which 60 were healthy controls whereas 89 patients were suffering from schizophrenia. The G72 rs1421292 and G72 protein are used in the naive Bayes model, which presented the finest model for susceptibility of disorder (sensitivity was found to be 0.7969, and the specificity was found to be 0.9372, whereas the total integrated area beneath the receiver functioning distinctive curvature was found to be 0.9356) [90]. The use of biomarkers in the NMDAR and tryptophan catabolic pathways is also helpful in the prognosis of schizophrenia [91].

E. Algorithms for Metabolic by product Biomarkers

Lately concluded preliminary researches were able to examine blood metabolic intermediates and products as possible AD biomarkers [92]. Stamate along with his colleagues [72] made use of the facts obtained from the EMIF (European Medical Information Framework) for the invention of the AD Multimodal Biomarker that is abbreviated as EMIF-AD [93]. They discovered 800 metabolites by employing algorithms from machine learning to detect those suffering from AD from a certain set of data. Stamate and his colleagues also correlated the efficiency of metabolites based on blood for the prediction of AD along with the cerebrospinal fluid markers. Deep learning and other artificial intelligence techniques; XGBoost, as well as random forest algorithms to distinguish AD from the CN were employed. The internal validation of these models was carried out by utilizing nested cross-validation. While working with the assessment records, Deep learning exhibited an AUC of 0.85 whereas XGBoost exhibited 0.88 and Random Forest exhibited 0.85.

IV. PARKINSON'S DISEASE

Parkinson's syndrome is known to be a progressive neurodegenerative disorder in which the loss of midbrain dopaminergic neurons occurs. Various evidences indicate that in most cases, the combination as well as the interaction of genetic risk variants, aging, along with environment results in the development of PD [94-95]. In Parkinson's syndrome, phosphorylated synuclein accumulates in the Lewy neurites and Lewy bodies. The pathology of the Lewy body is responsible for the neuronal loss in the pars compacta region of substantia nigra, it also spreads to subcortical as well as the cortical regions, thus leading to the motor as well as nonmotor manifestation of PD [96]. In the case of PD, up to 90% of individuals gradually develop a voice as well as speech disorders, generally termed hypokinetic dysarthria (HD) [97]. 15% of patients who were suffering from Parkinson's disease have ancestral record of this disorder, found to be induced due to genetic changes in the *PARK2*, *ARK7*, *LRRK2*, *PINK1*, or the *SNCA* genes [98]. *LRRK2* mutation is more prevalent in familial Parkinson's but has a late time of onset. Various autosomal dominant types of gene mutations comprise mitochondrial dysfunction as well as dysfunctional sort of gene products. The genetic changes occurring in the case of transmembrane protein 230 commonly known as the *TREM230* gene are associated with the Parkinson's familial form [99], whereas genetic changes in *PARK7* are found to be linked with familial forms of Parkinson's thus various studies aim to measure PARK7 in the CNS and plasma samples [100].

MRI is mainly employed for the evaluation of structural causes including vascular diseases, tumors, etc., and the neurodegenerative diseases. PD is also found to be comorbidity with any other diseased state, and hence physicians are recommended to be tremendously cautious not to decipher positive results found by structural neuroimaging as proof against the Parkinson's diagnosis if the clinical syndrome is indicative. SPECT imaging which involves the use of tracers that are radioactively labelled and bind with the presynaptic striatal dopamine transporter is found to be useful for the assessment of the dopaminergic nigrostriatal pathway integrity, which is initiated to be flawed in PD. A decline in SPECT signal inside the striatum indicates a flaw in the dopaminergic nigrostriatal pathway because DaT is declined in the presynaptic terminals due to neuronal degeneration [101]. Following are the studies based on machine learning for Parkinson's Early Detection

A. Dopaminergic Imaging

Machine learning is found to be helpful in dopaminergic imaging analysis for Parkinson's early detection. Prashanth et al. [102] examined the use of various support vector machine methods in categorizing SPECT images to detect PD. By the use of striatal-binding ratios in the striatal regions obtained from PPMI dataset, it was concluded that the support vector machine was effective in Parkinson's early detection, and the support vector machine with a non-linear kernel was found to attain higher detection rate that was found to be $96.14 \pm 1.89\%$ than the support vector machine with linear kernel. In a research, Oliveira et al. [103], adopted a support vector machine and some other classifiers for categorization of binding potential at every voxel in the

striatum of SPECT images meant for the Parkinson's premature recognition and stated that the support vector machine was able to achieve the highest detection rate that was found to be 97.86%. Thereafter, Prashanth et al. [104] also included the non-motor PD features comprising the measurement of cerebrospinal fluid for improving the early PD detection rate. Then, Prashanth et al. [105] also observed that the features based on shape and surface fitting were found to be more effective than striatal-binding ratios for Parkinson's premature recognition and feature classification with a support vector machine produced a classification accuracy of about $97.29 \pm 0.11\%$ when n was 427 [105]. As per observations made by Oliveira et al. [106] , the extent of the striatal area uptake at 96.5% rate of detection, was able to surpass the feature based on the uptake ratio for Parkinson's early detection when n was 443. These outcomes were sufficient to establish the role of the approach based on machine learning in investigation of dopaminergic image for the premature recognition of PD.

B. Structural MRI

The machine-learning-based approach was helpful in improving the diagnosis from an MRI. The categorization of combined MRI measurements which includes gray matter volume, and white matter volume along with the volume of cerebrospinal fluid with a support vector machine was useful in the early detection of PD accurately where the average accuracy was found to be about 80% ($n = 19$)[107]. The use of a classifier of linear discriminant analysis along with imaging features that was applied to the MRI images of early Parkinson's patients where 99% are in early stages and n was 374, produced a classification accuracy of approximately 81.9% that was found to be greater than that produced by support vector machine i.e. 69.1% [108]. In a study, Singh and Samavedham [109] established that in the case of early PD , structural changes can be identified by employing MRI along with a map approach that is unsupervised as well as self-organizing($n = 518$), which produced a classification accuracy of greater than 95%. This approach was then used for a larger database ($n = 1316$) from PPMI and ADNI and produced a classification performance of $95.37 \pm 0.02\%$ to differentiate patients with PD from the healthy individuals [110], which established the role of the approach based on machine learning in the detection of Parkinson's disease.

C. Functional MRI (fMRI)

In various studies, rs-fMRI has been found useful for Parkinson's early detection. Wu et al.[111] adopted efficient connectivity obtained by using rs-fMRI to inspect individuals with an indication of early Parkinsonism ($n = 16$) and then observed decreased connectivity of substantia nigra pars compacta with the striatum, and thalamus, as well as the cerebellum region, which was found to be negatively associated to the Unified PD Rating Scale scores. The rate of detection for early Parkinsonism by employing only the rs-fMRI imaging features is generally not found to be high i.e., about 74%[107]ª and improvement is required. The results obtained from two rs-fMRI studies conducted in asymptomatic LRRK2 mutation carriers indicated that disruption in functional connectedness precedes the existence of motor symptoms [112,113]. Rolinski et al. [114] used rs-fMRI to scrutinize patients who enter the rapid eye movement stage while sleeping ($n = 26$), as well as patients suffering from PD ($n = 10$) and observed that measures of functional connectedness of basal ganglia network dysfunction distinguished REM behaviour disorder and Parkinson's disease from healthy controls with high sensitivity of about 96% and specificity of about 74% for a REM behaviour disorder, 78% for Parkinson's disease which indicates that rs-fMRI can be used as a biomarker for identification of early changes in functional connectedness in the basal ganglia network in individuals who are at higher risk of Parkinson's syndrome and persons suffering from Parkinson's syndrome.

D. Multi-Modal Data

Multi-modal imaging when combined with clinical data is able to improve Parkinson's early detection. Long et al. [107] observed that combining the multi-modal features has brought significant improvement in Parkinson's early detection and multi-modal imaging (both MRI as well as rs-fMRI) along with combined multi-modal features (volume of gray matter, white matter as well as cerebrospinal fluid, along with the Regional homogeneity, the amplitude of low-frequency fluctuation and the Functional connectivity) produced higher classification accuracy of 87% in comparison to single-modal features where accuracy in case of MRI is 80% and in the case of rs-fMRI, accuracy is 74%. In a study, Oliveira et al. [106] studied the SPECT images of individuals with early indications of PD and observed that various data features were having greater classification accuracy i.e., 96.5%, 95.4%, and 93.9% for the length of the striatal region, the putaminal binding potential, as well as the striatal-binding potential respectively, whereas the classification accuracy obtained from the combined imaging features was about 97.9%. Afterward, Prashanth et al. [104] categorized non-motor clinical data features including the REM sleep behaviour disorder, and the olfactory loss, as well as

measurements of cerebrospinal fluid along with SPECT imaging markers by using classifiers like the support vector machine and random forests, thus observed that by combining the data features and the support vector machine classification produced the finest performance in the early detection of PD, the rate of detection was found to be $96.40 \pm 1.08\%$ ($n = 401$).

V. Conclusion

Machine learning processing is a artificial intelligence technique that allow for the rigorous probing of various datasets in order to detect previously unknown patterns and correlations in the data. Ml algorithms have been used to research neurological diseases, and they possess the potential in earlier detection, prediction, and the creation of novel therapeutics. There are several deep - learning strategies, and selecting the optimal approach to deploy to data from different sources is critical for obtaining accurate outcomes.

The very first region of neuroscience to profit from the implementation of computer approaches to perk up prognosis was neuroimaging; more lately, the development of computational methodologies to motor control and language specification assessment has shown commitment in reducing the time required to conduct clinical evaluation. Deep learning applications in longitudinal patient information gathering and digital medical records have the ability to improve prognostic forecasting and client classification. To fully integrate deep learning into predictive and therapeutic neurology practise, as well as the creation of prospective therapies, substantial quantities of controlled information and thorough evaluation of neural network models will be required.

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Deep Learning Framework for Edge Detecting and Classification in SAR Images of Oil Spills using CNN

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***Abstract*— Oil spills are a type of pollution that occurs when small or large quantities of crude oil or distilled oils, such as gasoline or diesel, pollute bodies of water and coastal lands. The spill contains toxic chemicals that can have serious short- and long-term health consequences for oil workers, nearby residents, marine life, animals, and the environment. There are numerous types of oil spills, the majority of which are minor, such as when oil spills from a ship while it is being refueled. Serious incidents, on the other hand, have long-term consequences. The most of major oil spills occur when a pipeline ruptures, a tanker sinks or runs aground, or when a drilling operation goes wrong. An oil spill is an untidy and risky occurrence that can harm people and animals in the surrounding area. The proposed work uses a Deep Learning model named MASK RCNN algorithm (MASK Region Based Convolutional Neural Network) to automatically detect the area or size of the oil spill to overcome the hazardous situation. Convolutional neural networks, a subset of artificial intelligence (AI), are trained on a visual dataset of oil spill images from various altitudes and geographical locations in this study. Experiments show that the proposed algorithm has a good ability to detect oil spills at a higher detection rate, with an identification rate greater than 80% and a false alarm rate less than 12%. The evaluation results show that the proposed algorithm performs well in detecting oil spills, with an overall detection rate of more than 80%.**

***Index Terms*— Oil Spill, MASK RCNN, Deep Learning, Resnet 101, SAR images.**

I. INTRODUCTION

An oil spill is an environmental hazard that harms bodies of water, land, and air. Additionally, it can pollute sea surfaces and harm bird species, fish, and other aquatic creatures. They are primarily caused by oil tanker, ship, and pipeline accidents in which crude oil, gasoline, fuel, and oil by-products are released into the water. Oil slick removal is critical for maintaining a safe and clean environment and protecting aquatic life. If an oil spill occurs in an area populated by wildlife, the consequences can be severe. Oil degrades the insulating ability of mammalian fur and reduces the water repellency of bird feathers; without insulation or water repellency, mammals and birds can die from hypothermia. Dolphins and whales can inhale oil, which affects their immune systems and reproduction. While fish and shellfish are not immediately affected, because oil floats on water, fish can experience impacted growth, enlarged livers, fin erosion, and a reduction in reproductive capabilities as the oil mixes and sinks. The impact on fish and shellfish can also be lethal; even if not lethal, they are frequently no longer safe for human consumption. Due to the sheer high oil consumption by various sectors, ocean exploration

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and transportation of oil have increased significantly over the last three decades. Oil spills, as one of the primary polluters of the ocean, have negative consequences for coastal and deep-ocean environments [1]. For example, OS causes seafood contamination and the extinction of marine life [2]. As a result, developing accurate and timely OS detection (OSD) algorithms is critical for preventing OS spread and minimizing its negative effects on the ocean and the ecological ecosystem [3]. Remote sensing (RS) systems provide valuable datasets in this regard [4]. Satellites, for example, collect data over large and remote ocean areas at a low cost and in a timely manner [5]. The rest of this article is structured as follows. A review of literature work is presented in Section 2, which is followed by a description of the dataset used and the suggested approach in Section 3. In Section 4, the experimental study's findings are discussed. Finally, Section 5 represents the conclusion and future ideas.

II. Related Works

Topouzelis et al. deployed a two artificial neural networks were shown for detecting oil spills [6]. Dark formation is accurately detected by the first network with a 1-3-1 topology 94% of the time. A further set of ten features was recovered from the dark formation, and when a fully connected multilayer perceptron with a topology of 10-51-2 was applied to the features, it was able to distinguish oil spills from similar-looking objects with an accuracy of 89%. Proposed combining two neural networks to detect oil leaks. Singha et al. proposed a second neural network with 14-14-5-1 topology is used to classify a pixel as an oil spill or lookalike, while the first network with 3-6-2 topology is used to segment the SAR images to a dark formation or backdrop. 91.6 percent of the oil spill pixels and 98.3 percent of the look-alike pixels were correctly categorized by the suggested network [7]. On a chosen set of totally polarimetric features taken from SAR pictures [8], Song et al. implemented an optimized wavelet neural network with an overall accuracy of 96.55 percent and 97.67 percent on two separate datasets. In order to detect instances of oil spills, Chen et al. proposed Stacked Autoencoder (SAE) and deep belief networks using polarimetric SAR features [9]. With a testing error below 1.4 percent when the SAE was utilized, the usage of the aforementioned deep-learning methodologies was found to be more promising than Support Vector Machine (SVM) and conventional artificial neural networks. The classification method used by the image segmentation algorithm is not uniform, and the choice of segmentation algorithm is heavily influenced by the shape of the image to be segmented, the characteristics of the pixel distribution, and other factors. These segmentation algorithms are primarily classified as threshold segmentation, clustering segmentation, region growth, and so on.

The OTSU algorithm was used by Xu et al. to monitor oil spills [10]. In order to extract oil spill dark patches from SAR pictures, Jin et al. used FCM [11]. To retrieve information about oil spills, Zou et al. employed the SVM supervised classification approach [12]. Japanese researcher OTSU proposed the OTSU algorithm, commonly referred to as the maximum interclass variance approach, in 1979. From the perspective of properties like geometry, grayscale, and texture in SAR images, an oil spill can be located [13]. Additionally, the features of distinct SAR remote sensing images are also highly different. Finding appropriate characteristics that can recognize oil spills is challenging. The practice of manually looking for features can be avoided by using convolutional neural networks. It reduces the need to spend time manually looking for suitable features and can increase the precision of detection. Coherent speckle noise in SAR remote sensing photos is a natural result of the imaging technology used for SAR, which is coherent microwave imaging. Coherent speckle noise makes it extremely challenging to analyze SAR images [14]. It is challenging to categorize each pixel in the SAR remote sensing image using semantic segmentation because coherent speckle noise exists. Therefore, the bigger picture is divided into numerous smaller pictures to lessen the influence of coherent speckle noise, and then the convolutional neural network is used to categorize the cropped smaller pictures in place of categorising each pixel individually in semantic segmentation. In essence, it conceptually segments the original image using the classification of small images. This technique increases the detection accuracy while also significantly reducing the interference of speckle noise on SAR remote sensing images. Because the input image is so small, the requirements have been met by employing a shallow network. The traditional network model AlexNet [15] is the one utilized in this study. The model is modified to fit the input smaller image given that the input image is a smaller image. Jiao et al. introduced the Otsu algorithm to reduce the false positive rate and the Maximally Stable External Regions (MSER) algorithm to locate the oil spill by creating a detection box [16]. They also introduced a pre-trained deep convolutional neural network based on VGG-16 for classifying oil spill instances. The VGG-16 scored an f-measure of 98.5 percent and a recall of 99.5%. While the oil spill was tagged using the MSER approach at the right threshold level, the Otsu algorithm was used to increase precision from 97.7 percent to 98.3 percent. For the purpose of classifying the thickness of an oil coating on hyperspectral remote sensing photos, Zhu et al. tested with SVM, fully connected neural networks, SAE, and CNN [17]. When compared to

SAE, CNN performed and delivered accuracy that was over 5% better. A pre-processed dataset of SAR images was created by Krestenitis et al. [18] using data from the Sentinel-1 satellites of the European Space Agency (ESA). Additionally, the dataset was used to train the networks UNet, LinkNet, PSPNet, DeepLabV2, and DeepLab3+, using MobileNetV2 as the foundation network. These networks generated modest Jaccard scores for the oil spill.

III. DATASETS

The oil spill dataset, oil slicks dataset, or just oil, a common unbalanced machine learning dataset is used for this work. Machine Learning for the Detection of Oil Spills in Satellite Radar Images was the title of a 1998 publication by Miroslav Kubat, et al. that first mentioned the dataset. Robert Holte, a co-author of the publication, is frequently given credit for the dataset. Starting with satellite photographs of the ocean, some of which show an oil leak and some of which do not, the dataset was created. Images were segmented into patches using computer vision methods, and the contents of each patch were then described by a vector of features. The test samples and training samples were not duplicated, and a total of 1,100 photos representing 10 percent were used as test samples. Before the image is input, the convolution kernel size is set to 3, and the median filtering method is used to remove the salt and pepper noise in the image in order to eliminate interference brought on by noise.

IV. SAR IMAGES

Synthetic-aperture radar, or SAR image, is a type of image that can provide both two- and three-dimensional reconstructions. To create a precise 3D reconstruction, the radar antenna is moved over the target area. UAVs with fixed SARs and sophisticated surround-sensing radars are frequently deployed. The complete synthetic aperture is produced by the distance that these microwaves travel in the time it takes for the radar pulses to return to the receiver. In general, the resolution of the image will be higher the larger the aperture, Oil spill image represented in Figure 1.

Figure 1. Oil Spill image

In order to “irradiate” the target area and create a SAR image, continuous microwave beams are propagated; the echo of each pulse is then captured and processed. Using just one beam-forming antenna, the pulses are sent out and the echoes are picked up. The relative location of the SAR antenna with regard to the target area changes over time when a SAR device-loaded spacecraft moves. The integration of the received data is made possible by processing these continuous received pulse echoes. The SAR aperture is created as a result of this technique. These photos can be produced using a variety of satellites, including RADARSAT-2 and RISAT-1, with Sentinel-1A being the most recent to be used.

V. PREPROCESSING

Speckle filtering will perform better at identifying various target situations and making image segmentation simple. The speckle noise is taken into account when using various analysis techniques. With only a little amount of information loss, an excellent speckle reduction filter can be applied. The filter can keep the edge and radiometric information in homogeneous areas. When it comes to textured areas, the filter can preserve the radiometric and spatial signal variability that make up the texture information. Based on mean and median, the non-adaptive filters can be further minimized. While moving the window around the sample, the intensity of each individual sample interval in the image is modified to the mean of the pixel values. This is the fundamental idea behind non-adaptive filters. The benefit of a mean filter is that while it blurs the texture region, it can maintain radiometry information. Better texture information can be preserved with this filter, however the homogenous area is altered. The rapid Fourier transform filter is an illustration of a non-adaptive filter. When it comes to minimized speckle noise, adaptive filters perform better than non-adaptive filters. The advantage of

using adaptive filters is that they take into account the local terrain backscatter and can adapt to local property changes.
In satellite photos, medical images, and synthetic aperture radar (SAR) images, the speckle noises are generally dispersed. A method of adaptive filtering based on bidimensional empirical mode decomposition (BEMD)[19] for despeckling SAR images. The initial BIMF level is filtered because it contains the high-frequency noise component after the noisy SAR picture is divided into several bidimensional intrinsic mode function (BIMF) levels using BEMD.

VI. Edge Detection

A. Laplacian of Gaussian (LoG)

A mathematical model was created by Marr and Hildreth [1980] using their knowledge of biological vision. The most crucial elements are local averaging carried out by applying a filter to smooth the image and looking for extreme values for an intensity change (representing an edge). The Gaussian filter is the most widely used smoothing filter. The function being convolved with the image is the two-dimensional Gaussian function.

$$G_\sigma(x,y) = e^{\frac{-(x^2+y^2)}{2\sigma^2}} \tag{1}$$

where represents the corresponding Gaussian probability distribution's standard deviation [Parker, 2011]. Convolution of the image is followed by application of the Laplacian operator: ∇

$$\nabla^2 = \frac{\delta^2}{\delta x^2} + \frac{\delta^2}{\delta y^2} \tag{2}$$

The Laplacian has the benefit of being rotation-invariant, thus it responds to changes in intensity similarly independent of the orientation of the mask [Gonzalez and Woods, 2010]. The Laplacian operator and the Gaussian filter can both be combined to form the Laplacian of Gaussian because the order is irrelevant (LoG)

$$\nabla^2 G_\sigma = \left(\frac{r^2 - 2\sigma^2}{\sigma^4}\right) e^{\left(\frac{-r}{2\sigma^2}\right)} \quad where\ r = \sqrt{x^2 + y^2} \tag{3}$$

B. Canny edge detection

The signal-to-noise ratio should be as high as possible, the distance between the calculated edge pixels and the edge should be as small as possible, and the edge detector should not identify multiple edge pixels when there is only one single edge. Canny [1986] took this approach to improve current methods by defining these three performance criteria. The best filter was identified by the author as one that meets all three requirements. The first derivative of a Gaussian function serves as an accurate approximation for those requirements.

$$G(x) = e^{-\frac{x^2}{2\sigma^2}} \tag{4}$$

Therefore, the derivative with regard to x is:

$$G'(x) = \left(-\frac{x}{\sigma^2}\right) e^{-\left(\frac{x^2}{2\sigma^2}\right)} \tag{5}$$

A Gaussian in two dimensions is given by

$$G(x,y) = \sigma^2 e^{-\left(\frac{x^2+y^2}{2\sigma^2}\right)} \tag{6}$$

In addition, derivatives of G exist in both the x and y directions. By convolving the input image with G′, an image E with improved edges will be produced because this is the approximation to Canny's ideal filter for edge detection [Parker, 2011]. The following step is a non-maximum suppression, which suppresses both the magnitude of gradients and all values. By following the edges by a lower and an upper threshold, hysteresis thresholding is used to filter out weak edges that are not coupled to strong edges [Canny, 1986; McIlhagga, 2011].

VII. Deep Learning Framework

The preprocessed image is taken and patches of size 64 x 64 x 3 were created from the denoised photos. Additionally, patches are divided into two categories: patches with oil spill pixels that are more than 1% and patches with oil spill pixels that are less than 1%. Nearly 40 pixels out of a total of 4096 pixels with a "1" label can be deemed background patches in patches with a 1 percent oil spill. Additionally, when combined with other patches, the patches with less than 1% oil spill worsen the dataset's imbalance and decrease the model's accuracy. A two-stage deep learning framework is then given patches. An Inception CNN that has 23 convolutional, rectified linear units (ReLU), pooling, fully linked, and SoftMax layers is used in the first stage. The cross-entropy is determined and defined at the SoftMax layer as the expected probability distribution of each output produced by each node of the final two-node fully linked layer:

$$\widetilde{P}(c_i) = \frac{e^{c_i}}{\sum_{j=1}^{2} e^{c_j}} \tag{7}$$

where P(ci) is the anticipated cross-entropy of ci and ci is the output of node I of the fully connected layer. The decision regarding the input patch is predicted after the cross-entropy for each of the two outputs is compared with respect to some threshold (i.e., significant or insignificant oil spill patch). To update the CNN model's parameters and provide a precise forecast for the patch class, the cross-entropy loss (CEL) is additionally computed and minimized using a backpropagation gradient descent approach. This is how CEL is described:

$$CEL = -\sum_{i=1}^{2} P(c_i) \log[\widetilde{P}(c_i)] \tag{8}$$

where the expected or desired probability distribution of the output value ci is denoted by P(ci).

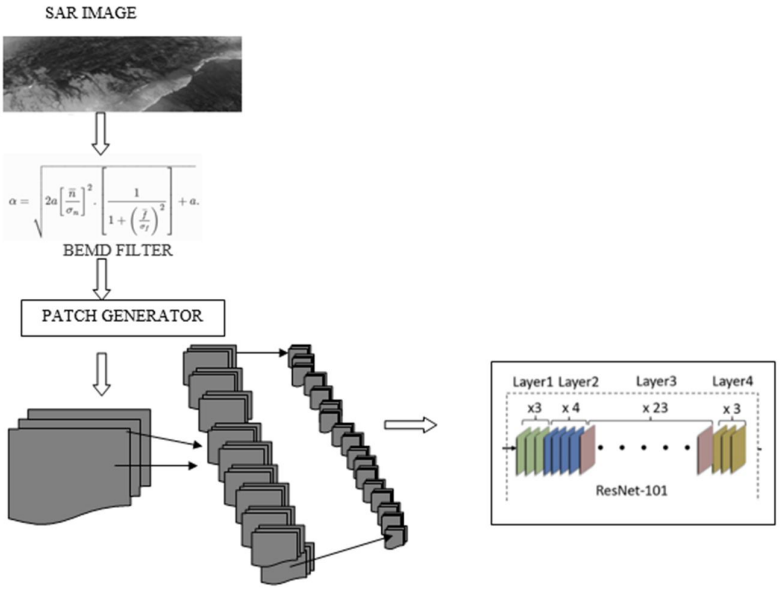

Figure 2. Deep Learning Framework

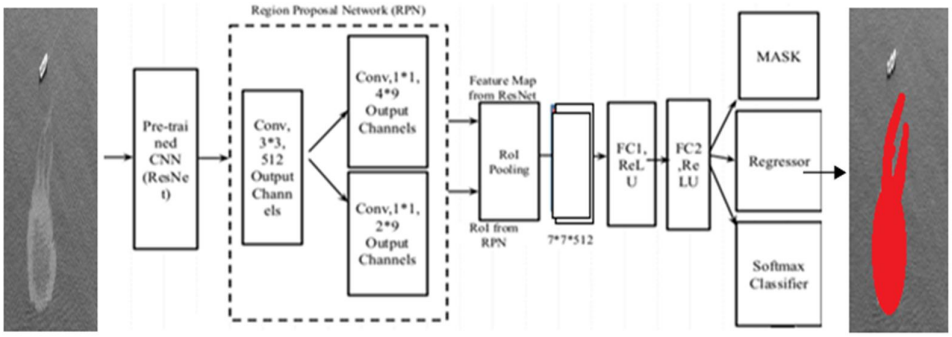

Figure 3. Architecture of MASK RCNN model

A. MASK R CNN Algorithm

Modern instance segmentation deep learning model Mask R-CNN combines pixel-level image classification with object recognition. It is a Faster-RCNN framework enhancement that has the extra capability of doing segmentation of the instance elements (ROIs). The foundation for creating each instance of an interest class in an image with a mask output is an object detection method. This model's superior capacity to segment items with high accuracy, especially when they overlap other objects, over other conventional classifiers and semantic segmentation models is critical for oil spill detection. The Mask R-CNN model typically consists of three stages: feature extraction from the input images by the backbone network; generation of Region of Interests (ROIs) from the Region Proposal Network (RPN) based on the feature maps output from the backbone; and extraction of objects of interest based on the output from the RPN which are sent to the fully convolutional layer (FC) and the fully convolutional network (FCN) for classification and instance segment The working of Deep learning framework and general architecture of Mask R-CNN is depicted in Fig 2 and Fig.3 respectively.

VIII. Validation and Discussion

Utilizing precision, accuracy, and recall metrics, the Resnet101 model's effectiveness at identifying photos based on the presence of oil spills is determined. Eq. (9), in which true positive (TP) and true negative (TN) are proportional to the number of correctly predicted values, calculates accuracy as the ratio of the number of images that are correctly classified to the total number of images. Positive predictions that were accurate are denoted by TP, and accurate negative predictions are denoted by TN. On the other hand, false positive (FP) and false negative (FN) refer to the quantity of wrongly predicted values. False positive predictions are denoted by FP, while false negative predictions are denoted by FN. Therefore, the total number of all predictions made by the model is the denominator of Eq. (9). Eqs. (10) and (11) can be used to determine precision and recall values given TP, TN, FP, and FN.

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN} \quad (9)$$

$$Precision = \frac{TP}{TP + FP} \quad (10)$$

$$Recall = \frac{TP}{TP + FN} \quad (11)$$

Overall, the model achieves a 94.89 percent accuracy and a 20.51 percent test loss. The lack of an oil spill is similarly properly identified in 90% of the test photographs, while it is mistakenly identified in 10% test images. The comparison with underlying backbone networks id depicted in Table I.

TABLE I. COMPARISON STUDY

Different Approaches	Accuracy	Recall	Precision	Dice
Inception v2	92.50%	81.40%	80.95%	81.28%
VGG 16	90.35%	77.63%	75.01%	76.30
Resnet 101	94.89%	78.3%	85.1%	79.6%

IX. Conclusion

In this study, the categorization of SAR dark patches was done using Resnet 101, a relatively deep DCNN. The implementation of the data augmentation technique for the large data set derived from 1100 SAR images allows Resnet 101, which has up to 16 weight layers, to perform better. When compared to hand-crafted features, the distinguishability of features acquired from the data set by Resnet 101 is substantially superior. As a result, Resnet 101 performs classification substantially better than more conventional techniques. From 92.50 percent, 81.40 percent, and 80.95 percent, the accuracy, recall, and precision increased to 94.2 percent, 78.3 percent, and 85.1 percent, respectively.

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New Challenges and its Security, Privacy Aspects on Blockchain Systems

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***Abstract*—Decentralization, autonomy, integrity, immutability, verification, fault-tolerance, anonymity, auditability, and transparency are all desirable qualities in a technology, and all of them are present in blockchain. In this paper, we first conduct a more in-depth survey of blockchain technology, focusing on its origins, the quantitative comparisons of consensus algorithms, the specifics of the cryptography employed by the blockchain (including public key cryptography, Zero-Knowledge Proofs, and hash functions), and exhaustive list of use cases for blockchain technology. In addition, this study concentrates on blockchain security issues. In this paper, we use a risk-based approach to evaluate blockchain security, classify the various threats to the network, dissect actual attacks and vulnerabilities, and round up the most recent blockchain security solutions. Finally, the di□iculties and future directions of research to improve the scalability and security of blockchain systems for large-scale deployments are discussed.**

***Index Terms*— Verifiable Credentials, Blockchain, Privacy, Consensus algorithm, Smart contract, Blockchain security, Risk, zero-knowledge proof.**

I. INTRODUCTION

There are numerous identity management strategies being developed, tested, and brought to market that are based on blockchain technology. This is a developing area, therefore it might be di□icult to understand the specifics of proposed systems, including their capabilities, security measures, and personal data protections. Despite the promising nature of many of the ideas, the majority of the projects rely on the availability of a trustwor- thy, secure, scalable, and sometimes publicly available blockchain platform. In light of this, blockchain-based identity management systems are a developing field that warrants close monitoring and evaluation for its potential, but not assured, impact on digital identity and data ownership.

A. Discrete Cryptographic Elements

In order to provide tamper-evidence and tamper- resilience, Blockchain Technology depends on significantly on foundational utensils from Cryptology and Data Se- curity. In its most general form, a Blockchain can be thought of as an immutable shared ledger that keeps track of transactions within a network of entities. Blockchain makes use of cryptographic hash algorithms to create tamper-evidence in the ledger.

B. Cryptographic HashFunction

A generic hash function converts messages or inputs of varying lengths into hash values of a predetermined

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length. Pseudo one-wayness, the theoretical impossibility of gener- ating the input message given the tag, and pseudo collision resistance, the theoretical impossibility of generating two input messages that produce the same hash value or tag, are two properties that a cryptographic hash function strives for to validate authenticity of a message through its tag. If a message is exposed to mistakes or is tampered with on purpose, the hash value will no longer match the original tag for two reasons inherent to cryptographic hash functions: message integrity and authenticity. In fact, a cryptographic hash function's output tag should show substantial (random) variation even for subtle changes to the input message. Because of this, we can use hash functions to build inviolable systems.

C. HashPointer

The hash pointer is a fundamental building component in blockchain technology. it combines a standard pointer structure with the hash value of data fragment it points to. Because storing hash pointer provides both location proof of data (through regular pointer) and the tamper evidence of the same (by hash value), it results in an inbuilt data integrity method. The process of committing the hash pointer to storage guarantees both the location and the integrity of the data fragment pointed to by the hash reference. Several different data structures with built- in data integrity and tamper evidence can be generated by substituting the hash pointer for the ordinary pointer in any acyclic pointer-based linked data structure. The Blockchain is an example of a tamper-proof data structure.

D. Blockchain:Tamper-evident Linked-List

A blockchain is a data structure that appears like a linked-list in which hash pointers are used in place of ordinary pointers between nodes. Each "block" in the chain stores some data and a hash that references the hash of the block before it in the chain. The genesis block, which starts the chain, does not need to include a hash pointer because it is the first block in the chain. If a blockchain block is accidentally altered or corrupted, the hash pointer of the corrupted block will no longer be valid and the blockchain will no longer function as intended. Therefore, a blockchain can be used to track down any accidental mistakes. For the entire blockchain to be validated if altering was purposeful, adversary would need to update hash reference in every block that came after the tampered block. Any attempt at tampering, however, can be easily shown if one possesses the final block of blockchain as a guaranteed value. This blockchain is a tamper-proof data structure that permits a fixed size commitment. A truly decentralised program to store assurance and, by extension, a decentralised network to ensure tamper- evidence of blockchain is achieved when a network of entities tracks last block of blockchain concurrently.

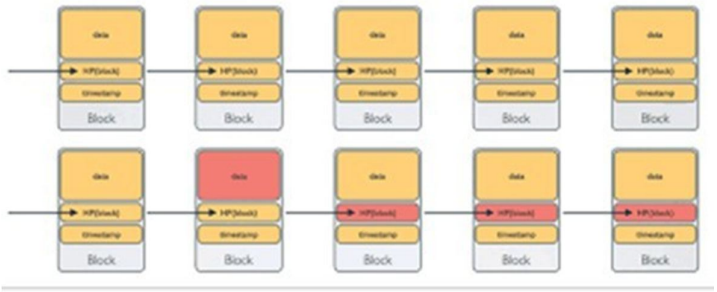

Figure. 1: hash pointers connected by blocks of linked-list

E. MerkleTree Tamper-evident BinaryTree

A Merkle Tree can be created in the same way that blocks in a blockchain are created, except that instead of ordinary pointers, hash pointers are used. The data blocks themselves are stored in the leaf nodes of a Merkle tree, while the intermediate nodes hold cumulative hash pointers to the appropriate subtrees. The top hash of a Merkle Tree functions as a size commitment for the entire tree, much like a block in a blockchain. Any alteration with the data in the root node, whether accidental or intentional, will be immediately visible to everyone with a copy of the hash reference. In the event of a network, the Merkle Tree can serve as a decentralised, tamper-evident storage for data if the hash pointer to the root node is disseminated throughout all entities.

II. OVERVIEW OF BLOCKCHAIN HISTORY

The earliest documented proposal for a blockchain-like protocol was made by Chaum in his 1982 Ph.D. thesis[4]. A cryptographically secured chain of blocks was first described by Haber and Stornetta [5]

in 1991. Merkle trees were introduced into the design by Bayer et al. in 1993 [6]. Szabo conceptualised the idea for a decentralised digital currency called ”bit gold” in 1998 [7]. Bitcoin, the first decentralised digital currency, was introduced in 2008 by programmer Satoshi Nakamoto [8]. Blockchain, the decentralised ledger that records Bitcoin transactions, was first mentioned in literature in 2008 [9].

Buterin published the whitepaper for Ethereum in2013. [10] The creation of Ethereum was successfully crowdfunded in 2014, and the network launched on July30, 2015. Ethereum's emergence marked the beginning of blockchain 2.0 because, unlike prior blockchain projects that concentrated on creating altcoins (currencies that are comparable to Bitcoin), it allows users to commu- nicate with one another using trustless distributed apps. Ethereum, on the other hand, is designed for decentralised data storage in addition to smart contracts, which are essentially little computer programmes. Ethereum 2.0 isan upgrade to the Ethereum network that intends to improve the protocol's throughput, e□iciency, and safety. The renovations will occur in three phases between 2020 and 2022.

Hyperledger is open-source blockchain software that was released in 2015 by the Linux Foundation. Hyperledger blockchain frameworks diverge from Bitcoin and Ethereum in order to better serve the needs of enterprise blockchain development. Eight blockchain frameworks (Hyperledger Besu, Fabric, Iroha, Grid ,Sawtooth, Burrow, Indy, and Labs); five Hyperledger tools (Hyperledger Avalon, Ex- plorer ,Cactus, , Cello, and Caliper) Since anyone is free to join the Bitcoin and Ethereum blockchain networks, these are examples of public blockchains, or permission- less blockchains. Since participants in each Hyperledger blockchain network must be validated before they can join the network, these networks are private blockchains, also known as permissioned blockchains.

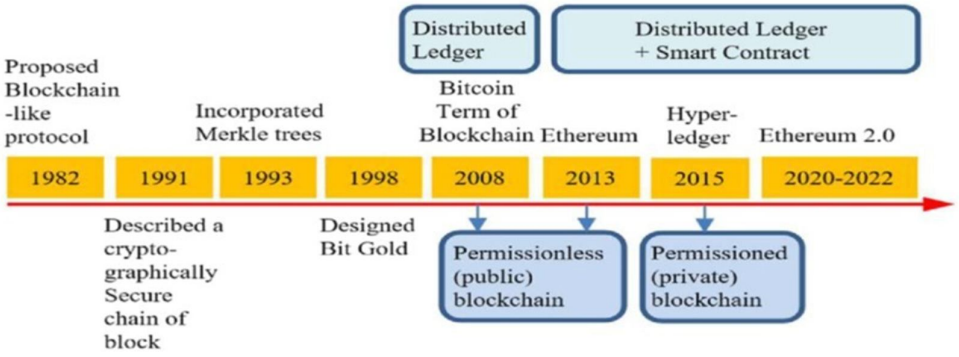

Figure 2: A timeline of blockchain development

III. SECURITY RISKS AND ATTACKS WITH BLOCKCHAIN

Research into blockchain security is required because the decentralised nature of the technology necessitates the maintenance of trust in the trustless underlying infrastruc- ture. In this part, we'll talk about the blockchain's security flaws and go over a number of actual exploits and faults that have been found in the technology. The OWASP Top 10 most critical security issues for web applications are evaluated in the context of blockchain technology [12]. In terms of online application security, the OWASP Top 10 is a well-known publication. Thus, one of the most important factors in the widespread adoption of blockchain technology in the enterprise is the reliability of its security features. One study looked at blockchain security from 2009 to May of 2017 and identified nine low-level categories of vulnerabilities [13].

The next level of blockchain security was given by a different research group. They noted that blockchain technology, like more conventional computing, is vulnera- ble to assaults such as Denial-of-Service (DoS), endpoint security, purposeful misuse, code flaws, and data pro- tection; however, the specifics of how these attacks can be launched vary. These kinds of attacks fall under the umbrella of ”network attacks,” which we have defined. Since humans are always going to be a potential weak spot in any system, our article expands the risk categories to include carelessness on the part of humans. To further stress the significance of this, we also list some low- level security risks, such as wallet security, Sybil attacks, personal key security, and the liveness attack, balance attack, timejacking attack, finney attack, race attack, and SelfHolding attack, all of which we

classify as examples of intentional misuse. When discussing security flaws in code, we separate blockchain versions 1.0 and 2.0's foundational code from smart contract code.

A. Actual vulnerabilities and exploits in blockchain technology

To highlight the importance of blockchain security, this article provides an overview of actual attacks and defects that have been discovered. Users conduct transactions on the blockchain via exchange platforms, and the private key for each transaction is stored in digital wallet. Coinbase and other wallets examples of blockchain techniques.

1) Critical software flaw: The CVE-2010-5139 prob- lem, an integer overflow flaw in the Bitcoin network's protocol that occurred in August of 2010, is widely regarded as the most infamous software flaw associated with the Bitcoin network. This flaw caused an erroneous transaction of 0.5 BTC to be added to a normal block, with 184 trillion BTC substituted for the missing 0.5 BTC; fixing this issue took more than 8 hours [14]. Moreover, there was a flaw that a block processed in v0.8 was not processed in v0.7 when Bitcoin was upgraded from v0.7 to v0.8, as the database used BerkeleyDB in v0.8 and LevelDB in v0.7. As a result of this flaw, nodes running version 0.8 and nodes running version 0.7 had two separate blockchains for a period of six hours [27].
2) Attacks on Coin Exchanges : Mt. Gox, a Bitcoin exchange based in Tokyo, had several thousand BTC stolen from it in 2011 due to flaws in network conventions.another 650,000 BTC was stolen from its online coffers, causing he to file for bankruptcy due to a bug in Bitcoin software that allowed users to modify transaction IDs [15]. With the end of 2013 coming in the form of an anonymous market When it was revealed that a vendor on Sheep Marketplace had taken advantage of a security flaw to steal 5400 BTC [16], the site shut down immediately. Bitfinex, the third-largest Bitcoin exchange, had 119,756 BTC stolen from it by hackers in August 2016 [17]. Cashaa, a cryptocurrency exchange situated in the United Kingdom, was hacked in July 2020, and 336 BTC were stolen. A European cryptocurrency trading business called 2gether had its systems breached in August of 2020, and hackers made off with $1,390,000 [18].
3) Attacks with wallets: In the blockchain system, the user's wallet is used to keep track of his or her credentials, digital assets linked to his or her address, and other account-related data. In the past decade, there have been a number of attacks. On April 3, 2013, hackers broke into Instawallet and stole 35,000 BTC, forcing the company to temporarily halt operations [19]. The Bitcoin Foundation revealed that on August 11, 2013, hackers had stolen user wallet balances by using a generation flaw of an outdated pseudo random number to crack the private key [20]. An Australian Bitcoin bank was attacked on October 23 and 26, 2013; hackers made off with 4,100 BTC from the wallet service's US-based server [21]. On July 19, 2017 [22], a hacker exploited a multi-signature flaw in the Parity Wallet to steal $30 million from at least three Ethereum accounts by compromising their addresses. The funds in affected multi-sig wallets were locked on November 6, 2017, when another accident was triggered due to a fault in the newly distributed version of the Parity Wallet library contract that was not properly initialised at the time [23].
4) Security flaws and vulnerabilities in smart contracts: On June 17, 2016, [24] it was announced that a hacker had stolen more than $50 million USD worth of bitcoin from a DAO constructed on Ethereum for a crowd-funded venture wealth finance. Because of carelessness in the smart contract's coding, a hacker was able to steal money from it [25]. Ether.Hacker Camp's Gold HKG in January 2017 had a bug in the contract code where ”14” was written instead of ”14” [26]. Two hackers won SmartBillions' 500,000 USD hack challenge in October 2017 and made off with 400 ETH before hackathon shut down [27]. A glitch in the smart contracts for the PoWH coin led a hacker to steal 888 ETH [28] in January of this year. In October of 2018, a reentrancy attack costing 165.38 ETH [29] was undertaken against the smart contracts of Spankchain.
5) Network attacks: According to research conducted by the Dell SecureWorks Counter Threat Unit in August 2014 [30], a BGP hijacker stole the earnings of bitcoin miners by diverting their tra□ic to a mining pool under the hijacker's control. The Ethereum network was hit by a DDoS (Distributed DoS) assault in September 2016, when it was revealed that the attack transactions were calling an EXTCODESIZE [31].
6) Attempted Endpoint Attacks: One type of endpoint attack is malware. More than a million machines were infected with malware and exploited to mine 26 million to- kens of cryptocurrency, the report claims [32]. In another type of endpoint assault known as ”cryptojacking,” the victim's web browser is hijacked and used to mine bitcoin while the victim browses the web. Pirate Bay [33], CBS's Showtime [34], and Indian government web pages [35] were all hacked and injected with crypto mining scripts in 2017 and 2018 respectively, and the attackers used the visitors computers to mine cryptocurrency, earning the attackers a mining reward. Cryptojacking code was also injected by attackers into third-party applications (like Google Tag Manager [36], WordPress [80], and Drupal [37] in 2017 and 2018 respectively) and advertisements

(like YouTube adverts [38] in 2018). Malware attacked 200,000 MikroTik routers [39] in 2018 and compromised the WiFi at a Starbucks in Buenos Aires [40] in 2017, allowing infected laptops to mine cryptocurrency.

7) IOTA-based attacks: A hacker in January 2019 attempted a phishing assault to steal customers' IOTA valued $3.94 million USD [41]. Six months they kept the privacy keys. Simultaneously, IOTA network was hit by a DDoS attack, keeping the developers too preoccupied to notice the hacker's theft [41]. The Foundation had to disable coordinator node, which confirmed all transactions, for more than 12 days in 2020 Feb to prevent an attacker from stealing cash. In this case, the hackers were able to fabricate transactions since they cracked IOTA's own hash-function [42]. At the current price of Bitcoin and Ethereum, the cumulative worth of all exploits is more than $40 billion. Therefore, hackers have always had, and will always have, a strong motivation to compromise blockchain systems in order to reap enormous rewards.

IV. SECURITY MEASURES FOR BLOCKCHAIN

A. Threat Assessment

Evaluation of Security Flaws in Smart Contract Code. Developed in 2016 [29], Oyente is a bug-detection tool specifically designed to examine smart contracts for secu- rity flaws. Security analyzer Securify [27] was introduced in 2018 to automatically establish the security or unsecurity of Ethereum smart contracts. Using symbolic model check- ing and abstract understanding, ZEUS checked fairness and soundness of smart contracts in 2018. around 94.6% of contracts were found to be susceptible [18]. Readers interested in learning more about the analytical tools can do so by consulting the sources cited beside Oyente, Securify, and ZEUS. Different tools have found different vulnerabilities in different smart contracts, with some finding more vulnerabilities. Therefore, developers have to pay close thought to creating smart contracts in opposition to both established and new attacks, as not all contracts are reliable adequate. To help users learn more about the smart contract analysis tools available to them.An examination of Transaction Logs and Financial Transactions. To detect attacks like Reen- trancy, UncheckedCall, Suicidal Vulnerability, Timestamp Dependence, Misuse-of-Origin, Failed Send, Mishandled Exception, Unsecured Balance, and DoS, TxSpector [6] was the first generic framework to analyse Ethereum transactions at the bytecode level using logic-driven anal- ysis in 2020. In 2020, an Ever-evolving Game was also introduced to use transaction logs to study actual attacks and countermeasures in the wild [5]. trapping people with honeypot smart contracts. Hackers have designed honeypot smart contracts with concealed traps rather than attempting to exploit the weaknesses of smart contracts; in 2019, HONEYBADGER was created to analyse over
2 million smart contracts and identified 690 honeypot smart contracts [12]. Evaluation of Consensus Algorithms. A framework for statistically analysing the security and performance of the PoW was presented in 2016 by a team of scholars from ETH Zurich and NEC Laboratories [15]. This year, Zhang and Preneel [13] examined PoW and demonstrated that it was unable to resist attacks from selfish miners, double spenders, and feather forkers, and hence could not reach the desired chain quality.

B. Finding defects and malicious programmes

In 2019, it was suggested that EVMFuzzer utilise a differential fuzzing technique to find vulnerabilities in the EVM by constantly creating seed contracts as input to target EVM and basing detection on execution outcomes [16]. To effectively detect security vulnerabilities and problems for smart contracts, a lightweight test-generation approach called HARVEY was described in 2020 [17].

C. Security of Essential Software Components

To combat the concentration of mining power in a small number of pools, which at the time accounted for about 80% of Ethereum's and 95% of Bitcoin's [18], SmartPool was created as a decentralised mining pool in 2017. mBCJ is a provably safe and extremely e□icient alternative proposed by Drijvers et al. [19] in 2019. They do this by pointing out certain subtle faults in the two- round multi-signature approach. Both Counter RAPTOR [11] to prevent and identify active routing attacks and Pixel [10], a pairing-based forward-secure multi-signature scheme, were presented in 2020 by Drijvers et al.

D. A Safer Way to Make a Smart Contract

To address the security issues with smart contracts, Luu et al. [2] suggested techniques for improving Ethereum's operational semantics in 2016. For this reason, Town Crier was created in 2016 [12] to vouch for the

veracity of any information entered into smart contracts. In 2018, we saw the introduction of FSolidM, a tool that helps developers define secure smart contracts as FSMs to improve security and functionality [13], and the introduction of Arbitrum, a tool that helps verify off-chain what a VM would do to enhance scalability and secrecy [11]. To combat the unease about the safety of Ethereum smart contracts, a group of researchers from Korea University described VERISMART in 2020 [15].

E. Verification of Smart Contracts

In 2018, Amani et al. developed bytecode-level pro- gramme logic to expand an existing EVM formalisation in order to formally verify EVM smart contracts [11], and Abdellatif&Brousmiche proposed a formal modelling technique to check the blockchain and user behaviour of the smart contract [11]. In 2020, Sun & Yu set up a framework to check the Binance Coin (BNB) contract and other smart contracts for security flaws [8], and in the same year, Permenev et al. presented VerX to automatically check the functional features of Ethereum smart contracts [9].

F. Confidentiality Protection

Hawk was created in 2016 as a private smart contract to conceal the details of financial dealings on the blockchain. In 2018, the anonymous payment solution Obscuro was introduced to the public as a safe and effective Bitcoin mixer [21]. The privacy-preserving PoS protocol analysis tool Ouroboros Crypsinous was described in 2019 [22], and the privacy-preserving requests from light clients were enabled by BITE [23]. By 2020, it has been proven that Zexe could replicate some well-known programmes while still protecting users' anonymity [24]. Receivers were first vulnerable to remote side-channel attacks [25] in the year 2020.

G. Regulations and oversight to prevent hackers from stealing money

Any funds in the compromised wallet could be frozen by the exchange platform. As a result of the implementation of new anti-money laundering (AML) legislation, it is now more di□icult for hackers to transfer the cash [26].

V. Conclusion

In the first place, this paper has completed a more in- depth study of blockchain technology. It gave a thorough and quantitative overview of blockchain's development and contrasted the most popular consensus solutions. Integrity, authentication, non-repudiation, and payment addresses are all essential in blockchain systems, and their implementations using public key cryptography, Zero- Knowledge Proof, and hash functions have been discussed in detail. The extensive uses of blockchain are then enumerated in this study. Furthermore, it has shown the extensive data and comparisons of cryptocurrency, the pioneering blockchain application, and the supply chain, a widely implemented use case. In addition, this study concentrates on blockchain security issues. It has detailed the Top 10 Web Application Security Risks, low-level risks, and high-level risks to provide a complete picture of the security threats to web applications. It has catalogued the causes of a wide variety of real-world attacks and vulnerabilities in blockchain systems.

Finally, the paper presents the security measures used in the fields of security analysis, detecting harmful codes & flaws, software code security, privacy preserving, and so on. In particular, eleven different smart contract byte- code vulnerability analysis methods have been presented and evaluated. We made this with the sincere desire that it will shed light on blockchain technology and its associated security concerns. Customers that conduct financial transactions using blockchain will focus more on the system's safety. We also hope that our research will be useful to academics as they continue to work on improving blockchain technology and resolving related security concerns.

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NLP using Wordnet Database for Monitor the Social Platform in Digital Forensic Investigation

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***Abstract*—Cyberbullying has made people too vulnerable to hatred and abuse which makes cyberbullying an important subject of matter all over the world. We propose a framework that prevents the use from using abusive words and predict user crime probability in social application with the help of one of the machine learning technique Natural Language Processing (NLP). NLP plays an important role in analyzing the given words and find out the alternative meaning and provide which category these words belongs to with the help of the WordNet database. In the previous system, social application user information is processed and kept aside and required is action not taken. We proposed an application that solves that existing system issue and provides a solution by making a complaint on the user in the social application. The proposed system consists of three application social book, social admin, crime reporting. First social book is social media application that provides activities like adding friends posting status and etc. Second social admin has the control of the whole social media application admin has all details of the user and so on Third crime application contains two-part public and police this application acts as a compliant system to our application where public user can raise a complaint against a person in social application to take some action.**

***Index Terms*— word net; Natural Language Processing; social platform; crime; cyberbullying; Cybercrime; complaint.**

I. INTRODUCTION

Cybercrime or computer-oriented crime is a crime that involves computers and the internet. Cybercrimes can be defined as "Offences that are committed against individuals or groups of individuals with a criminal motive to intentionally harm the reputation of the victim or mental harm, or loss, to the victim directly or indirectly, using modern networks such as internet and mobile phones. One of the major cybercrime encountered is cyberbullying.

Cyberbullying is defined as the use of electronic communication to bully a person, typically by sending messages or comments of an intimidating or threatening nature. Harmful bullying behavior can include posting rumors, threats, sexual remarks, a victims' personal information, or pejorative labels (i.e. hate speech). Bullying

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or harassment can be identified by repeated behavior and an intent to harm. Victims of cyberbullying may experience lower self-esteem, increased suicidal ideation, and a variety of negative emotional responses including being scared, frustrated, angry, or depressed. Victims of cyberbullying may not know the identity of their bully, or why the bully is targeting them, based on the online nature of the interaction. The harassment can have wide-reaching effects on the victim, as the content used to harass the victim can be spread and shared easily among many people and often remains accessible long after the initial incident. Nowadays cyberbullying has made people too vulnerable to hatred and abuse which makes cyberbullying an important subject of matter all over the world. The major function of social networking sites is to connect people and organizations from all over the world. Social media has provided a very effective medium for people to exchange their ideas and thoughts to millions of people in a single go. But not all the people use it for constructive purposes; some exploit these platforms for their sadist pleasures. Cyber bullying has a huge effect on the mind of the victim.
The main intention of this research is to find any type of abusive comments on the social platform and report the case to the respected official for further actions to be taken. Here the victim is free to lodge a complaint; hassle-free and can get a solution immediately. As the system admin has information of all the accounts on the platform, necessary implementation of action and further information about the offender is easily accessible.

II. Design Ideas And Relevant Concepts

A. Design ideas

The main aim of this system is to analyze the user activities to predict the probability of crime and make an online complaint to the police in case of offence. The proposed system consists of three application social book, social admin, and Crime reporting application:
1-Social book: It is the social media application that provides activities like adding friends posting status and etc.
2-Social admin: Admin has the control of the whole social media application admin has the all details of the user and so on.
3-Crime reporting application: It is divided into two part public and police this application acts as a compliant system to our application where public user can raise a complaint against a person in social application to take some action.
Crime reporting application acts as an Investigation system it contains two parts:

- Public
- Police.

Public are the general users of social book application .User has to register themselves in the crime reporting application with her or his credentials and login using valid credentials. After that in public part user login in that UI(user interface) ant it shows details like Online complaint status, status of CIR, status of FIR, Trace location and See criminal icon to check if there is any criminal present in the current location then by clicking the online complaints icon user can file a complaint about another person.
Likewise police also has to register her or his credentials and login with valid credentials. Similar to the public UI the Police UI (user interface) contains received complaints from the user and icons like Crime rate, cybercrime reporting, criminal record, criminal investigation.

B. Design ideas

In Crime reporting application public user can raise a complaint against a social user after that user login by clicking the complaint icon user need to fill following fields like complaint name, evidence, location etc this complaint form is forwarded to the police it is police choice to accept the complaint or not by clicking the accept button the complaint is taken by the police and accepted status will be notified to the public user when user checks his CIR status icon then by clicking cybercrime bar in Crime reporting application in police part. In cybercrime part police fills details of the social user details to request user chat data from social admin then police apply Natural language processing to existing abusive data which police already got then admin forward the requested user chat and details of the user to the police after that downloading the chat data and applying NLP after that comparing already existing abusive chat data which police got with admin sent user chat data and finding the probability of the Crime.

C. NLP WordNet

The aim of processing natural language is to create and synthesize computer systems that can interpret, understand and synthesize natural human languages. In the aim of understanding and generating meaningful phrases in the human language, natural language falls within the scope of artificial intelligence.

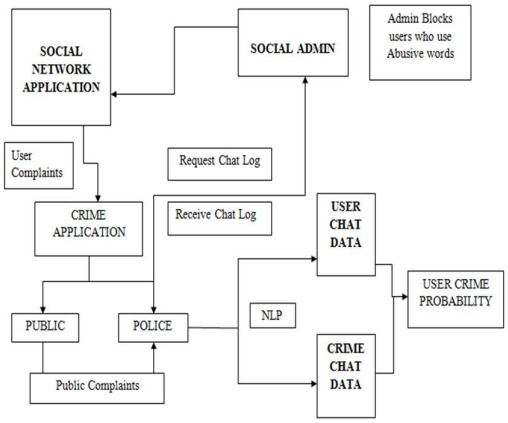

Figure 1. NLP Architecture for crime investigation

WordNet is a massive and publicly available, English language lexical database that was developed at Princeton University. It contains more than 120,000 concepts including nine noun hierarchies (80,000 concepts) and 554 verb hierarchies (13,500 concepts)[1]. WordNet is primarily designed for applications such as text mining and artificial intelligence. In contrast to a conventional dictionary containing word spelling, pronunciation, synonyms, and antonyms, WordNet describes the semantine association between word senses. A synset (synonym set) that reflects a distinct definition forms WordNet's fundamental building block. Specific language objects, i.e. noun, verb, adjective, and adverb, are organized into networks of synsets that are interrelated semantically and linguistically[11].

In the semántic network [13] of WordNet, nouns and verbs are interrelated in is-a hierarchy without breaching the boundary of the part-of-speech. The relationship of subordination between lexicalized concepts in the hierarchy is called hyponymy. For example, spoon is a hyponym of cutlery. Hypernyms are abstract concepts stored at the higher level, and the more relevant/customized concepts, labeled hyponyms, are located at the lower level in the hierarchy. For example, color is a hypernym of red. WordNet discusses the interaction between other language artefacts, such as adverbs and adjectives, in addition to the is - an association between verbs and nouns. Meronymy is used as an important aspect of a relationship. A meronym denotes a word or other element that together with other elements constitutes a whole. Thus, 'bark,' 'leaf,' and 'branch' are meronyms of the holonym 'tree.'

III. METHODOLOGY

This section will discuss the components utilized for the system to efficiently run the system.

JDK is an important component of the system. The Java Development Kit (JDK) is software used for development environment used for developing Java applications and applets. It includes the Java Runtime Environment (JRE), an interpreter/loader (Java), a compiler (javac), an archiver (jar), a documentation generator (Javadoc) and other tools needed in Java development.

Apache Tomcat is an open source web server that is developed by Apache software foundation. It basically makes our Java Web applications to run on host and server based system and it is configured on local host port 8080. It generally runs JSP, Servlet etc.

Client Server database is accessed in the google webpage. All the data are directed to MySQL databases and are stored in the form of corresponding directories inside a MySQL DATADIR directory, which is specified in a configuration. E.g. myExampleDB's files would be stored inside '$DATADIR/myExampleDB' directory. And according to this result, database files would be stored inside /var/db/mysql/%DB_NAME% directory

This section will use NLP WorldNet for processing the data from the user complain and the information available with the social admin.

WordNet can make connections among the words/concepts that humans often don’t make.

Following methodologies is used in WordNet to check similarity among the given set of information.

A. Leacock Chodorow Similarity

Measure is a lexical semantic similarity measure based on (Resnik, 1995)'s information content.

$$Sim(W_i, W_j) = Max\left[-\log \frac{Dist(c_i,c_j)}{2xD}\right]$$

$$Sim(W_i, W_j) = Max\left[\log 2D - \log Dist(c_i, c_j)\right].$$

where Dist(ci,cj) is the shortest distance between concepts ci and cj.

- Length is measured in nodes traversed (not edges); synonyms have length 1
- D = maximum depth of hierarchy (assuming unique beginner)

B. Wu and Palmer (1994) Conceptual similarity

$$Sim_{wup}(C1, C2) = \frac{2*N}{N1+N2+2*N}$$

- N1 = length of path c1 to lowest common subsume (LCS) of c1,c2
- N2 = path length c2 to c3
- N3 = path length c3 to root node Greater distance of nodes to LCS => lower& similarity

C. Information-based similarity measure (Resnik)

This measure uses the information content of the shared parents. The principle of this measure is as follows: two concepts are more similar if they present a more shared information, and the information shared by two concepts C1 and c2 is indicated by the information content of the concepts that subsume them in the taxonomy. Resnik measure is formally defined as follows:

$$Sim_{Resnik}(C1, C2) = -ln(p_{mis}(\mathrm{C1,C2}))$$

- Thus, the higher the LCS of a pair of concepts, the lower their similarity (it's 0 for the root node)

D. X-Similarity

In 2006, Petrakis et al. proposed a feature-based function called X-similarity that proposes matching words retrieved from WordNet by parsing meanings of terms. Two terms are comparable when the conceptions of the words and the meanings in their neighborhoods are lexically equivalent (based on semantine relations).

$$Sim_{xsim}(A, B) =$$

$$\begin{cases} 1, if\ S_{synsets}(A, B) > 0 \\ max\{S_{neighb}(A, B), S_{descr}(A, B)\}, if\ S_{synsets}(A, B) = 0 \end{cases}$$

Where A and B denote a set of synsets or definitions for words a and b, the similitude for Sdescr definitions and synonyms Ssynsets shall be determined as follows:

$$S(A, B) = \frac{|A \cap B|}{|A \cup B|}$$

IV. Related Work

WordNet can be used to analyze cybercrime using chat information and identification of criminal groups is possible by clique detection[1]. WordNet can be effectively used to improve retrieval performance without the requirement of very accurate query keywords to retrieve the most relevant context [7]. Natural language processing techniques make it possible to automatically identify offensive messages in social media, and this may help promote a healthy and secure social media ecosystem [15].

In crime analysis, the main responsibility for the development of the concept is to establish reasonable linkages in unstructured crime data. Unstructured crime reports can be used to extract plausible associations. Through text mining [3].Criminal profiling is a beneficial method for determining the most likely culprits based on the evidence identified at the scene of the crime. A thorough review of all factors related to cybercrime will provide the investigator with clear evidence to trace the attacks and narrow the reach of the criminal data and eventually apprehend the criminals[2]. Content features, sentiment features, and contextual features of documents can also be utilized for detecting harassment and abuse over a social platform. Even as bullying is a significant problem in online communities, there are still no known approaches for automatically and effectively detecting online harassment [16].

Writeprints procedure can also be utilized for recognizing anonymous identities and discovering connections. Writeprints is a process built on Karhunen-Loeve transformations, which uses a sliding window and pattern disruption algorithm with individual processor architectures at the author level [11].
Online radicalization and civil unrest are two important application of Intelligence and Security Informatics (ISI) [6].
A individual's probability value is a defendant that can be estimated by considering the correlation between the terminology that can be extracted from the SEMCON as well as the criminal ontology principles. Web crawlers are useful for acquiring and processing user data like those of blogs, feeds, comments, etc. linguistically and conceptually employing objective metric ontology development SEMCON [8].Computational linguistics in natural language processing and psycholinguistics can be used to identify cybercriminal-to-cybercriminal and second type is cybercriminal-to-victim communications and help the targeted victim or the community[13][4].
K-means clustering with certain modifications help in the process of crime pattern recognition.
Clustering algorithm for a data mining approach can also be used to detect the crimes patterns and speed up the process of solving crime [14]. Apache spark can be used for analyzing the Big Data generated by various social platforms to identify the real approved account, taking into consideration various requirements [6]. The classifier Naïve Bayes is applied to identify comments as abusive or not abusive. And efficiency can be accessed via the use of 10-fold cross-validation on minimally processed results [17].

A. Social Book Application

In this module the end user has to register with the Social book where the user has to give their basic details like name, address, mobile number, email id etc. The user has to enter valid user name and password checks validation finally user interface will be displayed to the user. Social book application contains activity like adding friends, posting status, commenting status of other friends, recommending friends to the user etc.
Position figures and tables at the tops and bottoms of pages. Table I is centre aligned, table II is left aligned and table III is right aligned. Avoid placing tables and figures in the middle of a page. Leave sufficient room between the figures/tables and the main text. Figure captions should be centered below the figures; table captions should be centered above. Avoid placing figures and tables before their first mention in the text. Use the abbreviation “Fig. 1, Fig. 2 and Fig. 3” even at the beginning of a sentence. All figures and tables must cite in the text using figure and table number.
To figure axis labels, use words rather than symbols. Do not label axes only with units. Do not label axes with a ratio of quantities and units. Figure labels should be legible, about 9-point type.
Color figures will be appearing only in online publication. All figures will be black and white graphs in print publication. Screenshot, programs, and other junk images etc must be removed; instead block diagrams, algorithm, flowchart, circuit diagram, state diagram, UML designs, etc may be introduced.
The paper must have proposed system, results, discussion to infer the quality of the research paper. All the figures, equations and etc must be in high resolution and in good quality.

Figure 2. Social book application

B. Social Book Admin

In this module Social book admin controls the Social book application admin has the access privilege to access user comments logs in the application. Admin has two responsibility first is to add spam keywords and upload

image that indicate some kind of abusive content these spam keywords and image is used to block users who uses words and image that are similar to spam keywords and image in the application before that these spam keywords are processed using natural language processing Social admin UI (user interface) contains social users and police icons. In social users part admin can view list of social users and in police part admin can view the request came from police to get the details of the users and chat data.

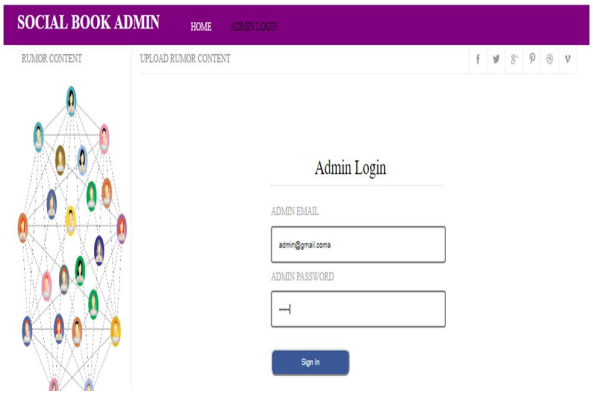

Figure 3. Social Book Admin login

C. Crime Reporting Application

Crime reporting application acts as an Investigation system it contains two parts Public and Police. Public in the sense are the general users of social book application or any people User has to do registration in Crime reporting application with her or his credentials and login using valid credentials likewise police also has to register her or his credentials and login with valid credentials after that In public part user login in that UI(user interface) it shows details like Online complaint status, status of CIR, status of FIR, Trace location and See criminal icon to check if there is any criminal present in the current location then by clicking the online complaints icon user can file a complaint about another person same as in Police UI(user interface) contains received complaints from the user and icons like Crime rate, cybercrime, criminal record, criminal investigation.

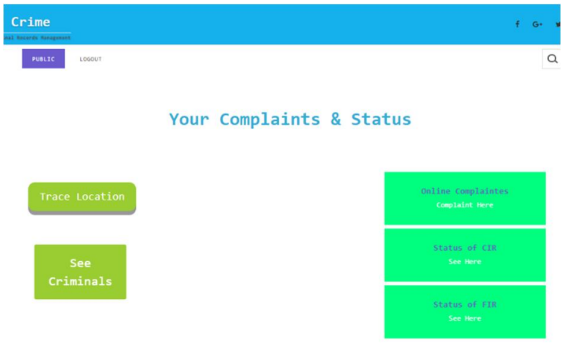

Figure 4. Current status for raised complaints

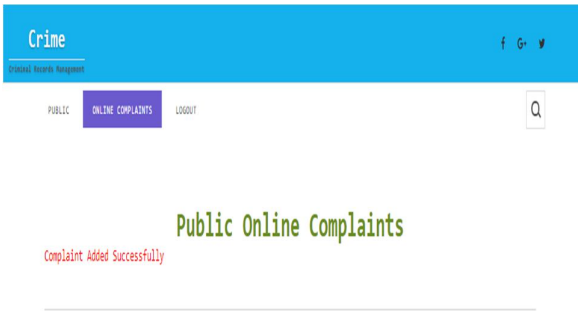

Figure 5. Crime Reporting Application

D. Investigation

In Crime reporting application public user can raise a complaint against a social user after that user login by clicking the complaint icon user need to fill following fields like complaint name, evidence, location etc this complaint form is forwarded to the police it is police choice to accept the complaint or not by clicking the accept button the complaint is taken by the police and accepted status will be notified to the public user when user checks his CIR status icon then by clicking cybercrime bar in Crime reporting application in police part. In cybercrime part police fills details of the social user details to request user chat data from social admin then police apply Natural language processing to existing abusive data which police already got then admin forward the requested user chat and details of the user to the police after that downloading the chat data and applying NLP after that comparing already existing abusive chat data which police got with admin sent user chat data and finding the probability of the Crime.

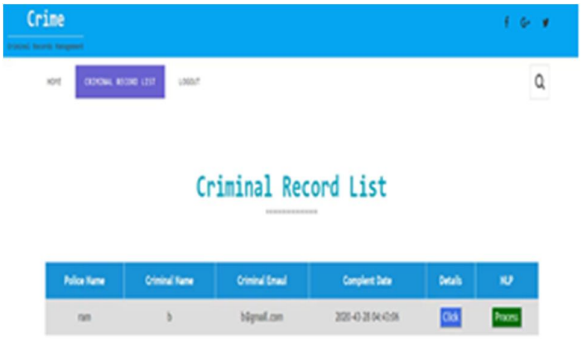

Figure 6. Criminal record list analyzation

Figure 7. Blocking

Figure 8. NLP

V. CONCLUSION

A social platform is a web-based technology that enables the development, deployment and management of social media solutions and services. It provides the ability to create social media websites and services with complete social media network functionality. Everyone on the platform is vulnerable to some sort of abuse or hatred. This paper introduces an a framework that prevents user from using abusive words and predict user Crime probability in social application with the help of one of the machine learning technique Natural Language Processing (NLP).NLP plays important role in analyzing the given words and find out the alternative meaning and provide which category these words belongs to with the help of Word Net database. In previous system social application user chat logs are processed and kept aside and required action not taken by keeping these chat data we cannot find the user future crime level activity to overcome this problem We proposed an application that solve that existing system issue and provide a solution by making a complaint on user in social application.
In the future, planning to incorporate a system that will enable the user to directly contact the authority and seek remedies, then also to implement an online counseling facility for the affected which can be accessed from anywhere in the world.

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Overview of Blockchain's Application: Advantages and Disadvantages

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***Abstract*—The Blockchains concept has recently emerged as an important area of research. Blockchains are records in the form of a list, where each record is linked with the other by cryptographic techniques. Blockchain has been popular because of its decentralized, peer-to-peer transaction and immutable properties. It is a shared digital ledger available to all nodes or users present in the public or the private peer-to-peer network. The Blockchain enables a fully decentralized system which has been an important feature because of which no one can control the operations on it. It is an open form of distributed ledger which records all transactions carried on it by all parties.**

In this paper, we are presenting a systematic overview of working of Blockchain technology which is mainly focused on introduction, types, and basic design elements along with its applications such as currency, smart contracts, digital voting, supply chain management, healthcare services. Each application of blockchain has been critically reviewed and advantages along with shortcoming of each application has been discussed.

***Index Terms*— Blockchain, Applications, Smart contracts, Digital voting, and Supply chain management.**

I. INTRODUCTION

Blockchains are records in the form of a list, where each record is linked with the other by cryptographic techniques. In Blockchain the block contains the Block header and transaction data. Since all blocks are cryptographically connected, modification of the data becomes impossible [1]. The block header consists of four important parts such as previous block information, associated timestamp with it, nonce, and Merkle tree root's hash. In a blockchain, every block is identified by a hash value generated by the SHA256 cryptographic hash algorithm. Each block contains the hash of its parent inside its header. In this way, it creates long sequences of hashes that link every block with the parent block, where each block has a single parent, but a single block may have several children [2, 3].

The hash value of the previous block is used for creating the hash value of the current block, a consensus algorithm is used for calculating the root value of transaction T and nonce. The detailed information of the block is stored in Timestamp which has a size of 4 bytes. The Nonce is a number used only once to generate. In this field, 32 or 64-bit integers are stored that are used in the mining process. The detailed summary of every transaction is contained in a Merkle tree. The integrity of such a large data set is summarized and verified by using the Merkel tree which is also referred to as binary hash tree [2]. For the sake of identification and verification of transactions, the root of the Merkle tree plays an important role. The Merkle tree can store the

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children's node information up to a size of a gigabyte. After comparing hash, transaction data is verified using authentication path while the transaction value is generated by Ralph Merkle's algorithm [4,5,6]. In the blockchain, the operation such as edit, modifying and deletion of block is impossible after transaction is confirmed.

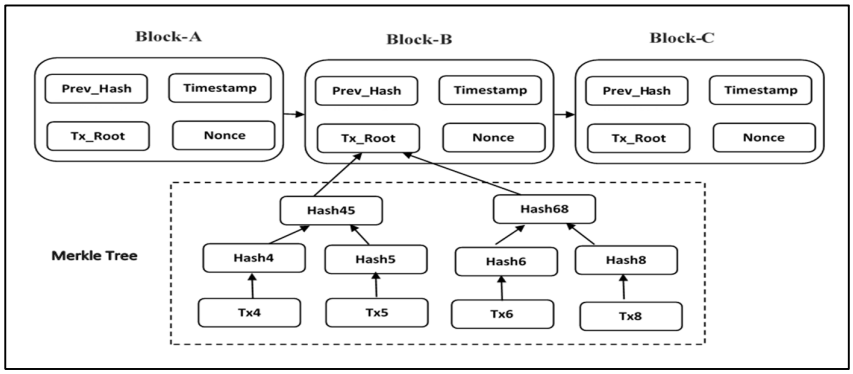

Figure 1: Basic Structure of Blockchain

Figure-1 represents the structure of three blocks Block-A, B, and C which are forming a chain of blocks called Blockchain. Block-B represents Transaction root, and contains Hash45 and hash68 along with Transaction root labeled as 'Merkle tree'.

Satoshi Nakamoto first introduces the Blockchain concept, for solving double-spending problems in electronic transactions [3,4]. Blockchain is also called a distributed digital ledger which is immutable and secured with cryptographic techniques. The peer nodes are imitated by consensus in a peer-to-peer network for transaction log that is controlled in a decentralized fashion [4,7].

This paper intends to provide a complete overview of blockchain applications. This paper is organized as Types of Blockchain. It is then followed by the Application of Blockchains such as Digital Currency, Smart Contracts, Digital voting, Supply Chain Management, Copy Rights, Digital Identity, Property Title Registries and Blockchain in Healthcare. The next section is Related work which is followed by the conclusion and references.

II. Types of Blockchain

The Blockchain is classified into two main categories as Permissionless and Permissioned blockchains.

In Permissionless blockchains there are no restrictions on its nodes, where anybody can read and examine data openly. The validation of written data can be performed by using the consensus protocol. The permissionless blockchains are fully decentralized, transparent, and secured with cryptographic techniques. The transactions in Permissionless blockchains cannot be changed on the node once it is confirmed. The permission-less blockchains have another type called public blockchains in which the ledgers are visible to anybody. On Internet, anybody can examine it and can add a block of transactions to it. Bitcoin and Ethereum are two cryptocurrencies that are executed in public blockchain [4, 8].

The Permissioned Blockchains can be accessed or written by a limited group of authorized participants. The consensus algorithm is used for the validation of data written by the authorized participants. The Business and Social applications mainly used permissioned blockchains [4].

Depending on the authorized permissions, Permissioned Blockchains are open and closed in nature. In Open Permissioned Blockchains data can be read by anyone who has been authorized to write data in the blockchain, this type of blockchain is considered partially decentralized. In Closed permissioned blockchains, only participants' data are visible, this type of blockchain is considered fully centralized and not transparent to another participant. The permissioned Blockchains are consortium blockchains and private blockchains [4, 8].

In Consortium blockchains only particular organization groups such as banks can verify and add a transaction on blockchain but, the ledger could open or be restricted on the selected group [4, 8]. The Consortium blockchains are classified as R3 and Corda. While, in Private Blockchains only authorized persons can inspect and add transaction blocks but, on the internet all persons are permissioned to view the transaction. The private blockchain is classified as Monax and Multichain [8].

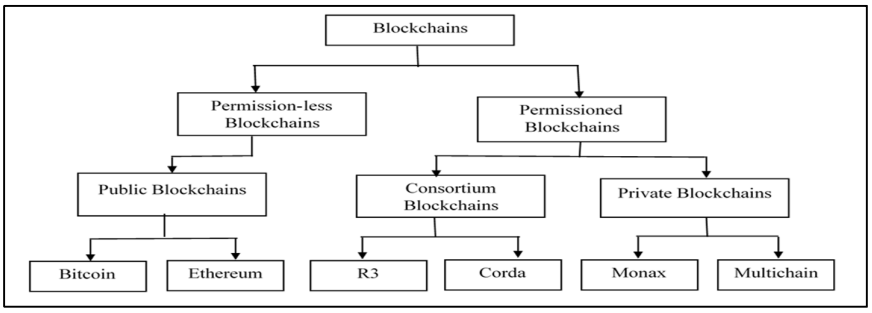

Figure 2: Types of Blockchains

III. Applications of Blockchains

The following section describes the applications of blockchains along with advantages and disadvantages of each application in detail.

A. Digital Currency

By introducing Bitcoin, decentralized digital currency came into existence it is called the founding application of blockchain technology. Coins and tokens are two types of cryptocurrencies that are based on Blockchain [3]. The payment can be made by exchanging Bitcoins between two participants without the involvement of any third party or even without using different forms of currency [3,4]. The Bitcoin, Ethereum, Bitcoin Cash, EOS, Ripple, Litecoin, Tether, Binance Coin, Bitcoin SV, and Steller are some currencies based on blockchain [3,4]. Some countries such as USA, Canada, Netherlands, and South Korea these countries which has started the payment method using Bitcoin.

Advantages: Using Cryptocurrencies two participants can directly exchange or can-do payment without involving a third party, without intermediaries which provide the transparency, security of the transaction. Some central bank has considered Cryptocurrencies as an external asset. Government by using Cryptocurrencies to control the currency value.

Disadvantage: The criminal activities or scam/attack are increased day by day in bitcoin and other cryptocurrencies has not clear view about the monitoring status or support of the cryptocurrencies [9]. Blockchain is used in distributed nature, operation of the blockchain are encryption and complexity, as compared to traditional payment such as cash and debit card, the blockchain transaction speed is slow and cumbersome.

Now a days researchers focus on blockchain security and how to fast the transaction speed, the various security applications and tools are developed such as Oyente, Remix, Gasper, Securify, S Analysis, Smartcheck and Mythril [10].

B. Smart Contracts

An American cryptographer Nick Szabo has introduced Smart Contract in 1990, but the practical applications of smart contracts started after widespread use of blockchain in 2008 [11]. The smart contract is implemented on blockchain where validation is executed automatically. Using smart contracts money, property, shares can be exchanged. The smart contract which is developed using serpent, Low Level Lisp like Language, and solidity can be executed using Ethereum Virtual Machine (EVM) [11,12]. In Blockchain technology the Ethereum is first platform that specially developed to decentralized applications and smart contract run.

Using smart contract insurance company to verification or validate the client claims and provide the calculation of a payment.

Advantages: Smart contract is written in a computer form that is executed automatically without using third party, there is no need of lawyer or intermediaries, its effect to saving money, fraud reduction, manually felling errors are avoided in smart contracts, as Compared to traditional contract the smart contract are cheaper and faster.

Disadvantages: Smart contract specially develop on the solidity language**,** Lack of awareness about smart contract, what is smart contract, how to execute smart contract and smart contract uncertain legal status in many countries. Smart contract flexibility is low as compare the traditional contract.

Blockchain developer will require to provide the platform of services, tools and user-friendly interfaces for minimum required of technical expert.

C. Digital Voting

The process of voting that use paper or electronics voting for computer that used special software. Cost of paper voting process is high. Electronic voting is not secure because hacker can hack the machine and tampered with their votes. Recently many countries have started using blockchain technology to cast and store the votes. Using Blockchain technology the system is transparent, everybody can verify the voting counting and its very difficult to tampering voting. The Agora of Swiss company to working on this system for open source.

Digital voting based on Blockchain is executed on open permissioned blockchain. In the midterm elections held in West Virginia, US, in 2018, the mobile voting project was used, using which the military persons and their family members were able to cast their votes. The blockchain server with distributed nature was used in this project [4, 12, 13].

Advantages: Blockchain-based digital voting systems would ensure voter confidentiality and transparency. Fast result of Blockchain based digital voting and useful for military/army person and front worker for cast their vote.

Disadvantages: On Internet many hackers or attackers will be hack the system and social privacy issue will occur. How to identify the voters, In digital voting, if allow the people to vote on their self-computers, laptop, mobile, then hacker, attacker to hack the user computers or malware that infected to user's computer, that affect the tampering voting process.

In digital voting system process may not be allow the people to vote on their own computer or devices, The blockchain with the help of IOT and other smart technologies to identify the voters with thumb impression or face recognition to solve the privacy issues.

D. Supply Chain Management (SCM)

By using blockchain technology in supply chain management, costs could be reduced which will remove the intermediaries or third parties which would increase the trust between sellers and buyers. Recently, Walmart has been using blockchain technology, to remove intermediaries between buyers and sellers which have increased the degree of transparency in transactions. Due to which buyers can easily track the products [4, 14]. Walmart is developing a blockchain-based supply chain application on the pork market in China in collaboration with IBM and Tsinghua University of Beijing [15, 16]. The report state that, it has become easy to track food items and has enabled effective monitoring for food safety which has increased the trust of customers in the products [16]. In supply chain management use of blockchain technology, IoT technology and new concepts such as sensors, RFID, GPS, barcodes chips have made it easy to track the products and location of goods or product containers within few seconds [4].

Estonia is the first country to develop the KSI blockchain which has established a strong secure network in that country [4, 13].

Advantages: Using the blockchain technology in supply chain management by removing the intermediaries, it effects to transparent process, cost saving, fast processing and time saving. With the help of blockchain technology and use of IOT technology, sensors, GPS, barcodes chips, RFID to easily track the product and location of goods withing few seconds.

Disadvantages: As a new technology of Blockchain the adoption or implementation, training cost is high and not useful for small business or small companies.

Now a days the researchers focus on how to increase the network speed and how to fast the transactions speed and security. In future the blockchain adoption cost may be reduced.

E. Copy Rights

On the internet unauthorized users can copy the data and illegally transfer, share this data on the network. The blockchain technology can be used the Trusted Timestamping and hash function that provide and maintain the copyright ownership. When the data is created, the date and time defined on this data. The Trusted Timestamping the data is store on encoded form. In blockchain use the hash function to provide the security and immutability. The Blockchain technology solve the copyrights problem and to maintain the copyrights ownership [6].

Advantages: In Blockchain technology can maintain the copy rights information, to provide the security of the information and immutability using the trusted timestamping and hash function.

Disadvantages: Due to blockchain technology is new, currently there are not any standards / protocol. Blockchain technology run on internet there are many hackers or malicious users are present, which increases the possibility to hack the node or network. If this happens, then it cannot maintain the copyrights ownership and hackers or unauthorized can easily share documents on internet.

The researcher currently working on blockchain security tools, standards, and protocol, in future they will be develop the blockchain standards and protocol. In blockchain technology to use the advance cryptography, trusted timestamping, and hash function for maintain the security and copyright ownership.

F. Digital Identity

Every country is now focusing on the digital identity. Each sector to utilize the digital identity such as documentation, banking, security, hospital, industry, company. Malicious users or Hacker to misused or hack the digital identity. Blockchain technology to use the advance cryptographic techniques, digital signature for verification of identity, to solve the above problem. In blockchain the information is store on block and this block is secured using by advance cryptographic techniques, there were anyone does not change the information in this block [6].

Advantages: Blockchain technology to use the advance cryptography for secure the digital identity, in this technology ones the data or information are added in the blocks then does not any changes in that block and anyone any time anywhere to view or read the data or documents.

Disadvantages: Sometimes identity is hacked or misused by many unauthorized users. In blockchain technology to use the digital signature for verification the transaction but this is long process, and the transaction speed is also slow.

Blockchain technology uses the advance cryptography and this technology the information is securely stored on the block that easily not modified or hack the information. In blockchain network the transaction process to use the proof-of-stake (PoS) protocols and consensus algorithm that take the minimum time for digital signature verification process.

G. Property Title Registries

Property Title Registry uses the Blockchain technology for store the property title in distributed ledger platform of Blockchain technology. Blockchain technology open nature, to publicly access, verify the records of property with low cost. Benefits of Property Title Registries to use Blockchain technology are transparency, fraud elimination, minimum cost [17, 4].

Advantages: Anyone could publicly inspect the property records on blockchain with minimum cost and time. The open nature of blockchain property title records would also enable developers to come up with new applications providing easier ways for accessing, processing, and inspecting these records. Mainly, fraud elimination, transparency, cost-effectiveness, transfer of rights without third-party notary involvement are the key benefits of a blockchain-based property title registry.

Disadvantages: Due to new technology of blockchain, now a days lack of awareness, how to use the blockchain technology, how to work blockchain technology and the adoption cost is high therefore training cost for new employee is also high. If buyer or seller is illiteracy, then intermediaries or agent will misguide or fraud.

To spread the awareness of blockchain technology in government office, institutions. Each government department or office to train the one employee and after training of this employee to train to others. As a new technology of blockchain, the training cost is high but due to blockchain its many benefits to accept it, in future the adoption of blockchain and training cost will may be reduced.

H. Blockchain in Healthcare

In healthcare by using the blockchain technology many benefits are attained to the patients and healthcare services such as 1] patients' medical history, reports online secure and store, manage their records anywhere anytime and share the medical reports to specialist doctors to anywhere any time. 2] Use Blockchain technology in healthcare service to provide the authentication, confidentiality, and data sharing. 3] Securely collected and store the patient's data and share to doctors or healthcare providers of patients.4] To maintain the medical records and protect the identity of patients or protect the patients' medical reports integrity. 5] Medical company to uses the blockchain technology to maintain the medical records, documents, audits documents, medicine ownership and management of medicine supply. [18-20, 1].

In 2016, Estonia implemented blockchain to safeguard its national electronic health record system, Patients can log in to give or rescind health records access, Patients can see name and time stamps when their records were accessed by anyone, e-Prescribing, e-Ambulance, e-Identity.

MEDREC this platform is used for handling the medical records electronically and its specially develop for to sharing the medical information, confidentiality, authentication. [18-20, 1].

Advantages: Using blockchain technology it has been easy to manage, accessing, integrating, and sharing securely health records anytime anywhere. Patients keep track of their medical history, that easily check the

latest medical prescriptions and share the information securely to the providers. Medical data and documents are safe, secure in blockchain technology. The Insurance companies are using blockchain technology with smart contracts for billing and claim settlements and to increasing the process in effectiveness of fraud detection and to reduce the administrative cost [1].

Disadvantages: In blockchain technology currently there is not any government rules and regulations for e-healthcare system. Now a days number of patients are increasing this very difficult and challenging task to maintain patients' information in an e-healthcare system, that effects to storage issue will occur.

Blockchain technology user will store the data on cloud storage technology that will solve the storage issue.

IV. Related Work

A. Kiayias et al (2015) have described the Segwit application, this applications parallel run with Blockchain network. Signature data moves from the main Blockchain system to the extended sidechain [21].

Karame, G et al (2016) have develop the Oyente application. This application is used for to detect the bugs on Ethereum contracts [22].

F. Idelberger et al. (2016) have described The Lightning network application, in this application to create the transaction receipts with double signed [23].

Mehrdokht Pournader et al (2020) Blockchain applications in supply chains, transport and logistics: a systematic review of the literature, has presented the Blockchain applications in supply chains, logistics and transportation [24].

Yan Xu et al(2020), "Application of blockchain technology in food safety control:current trends and future prospects", author have proposed the framework applications of blockchain technology in food safety control [25].

Shuyi Pu et al (2020), "Blockchain adoptions in the maritime industry: a conceptual framework", has present the Blockchain applications from different maritime sectors and to developed the framework of blockchain to use in the industry [26].

Kichan Nam et al (2019)," Blockchain technology for smart city and smart tourism: latest trends and challenges, Asia Pacific Journal of Tourism Research", has focus the blockchain technology is use in the smart city and tourism framework and present the blockchain technology evolve and influence in the industry [27].

Alexandre Dolgui et al (2020), "Blockchain-oriented dynamic modelling of smart contract design and execution in the supply chain, International Journal of Production Research", authors have developed and test the model for smart contract design in the supply chain with multiple logistics service providers [28].

Zhi Li et al (2019), CKshare: secured cloud-based knowledge-sharing blockchain for injection mold redesign, Enterprise Information Systems, Authors has proposed a blockchain based secured and distributed platform for knowledge sharing and private cloud technology [29].

Alexander Savelyev (2017), Contract law 2.0: 'Smart' contracts as the beginning of the end of classic contract law, Information & Communications Technology Law, authors has presented the applications of existing contract law provisions (smart contract), Blockchain smart contract implement in governments, transparency and digital citizenship [30].

Manal Mohamed Alhejazi et al (2021), "Enhancing the blockchain voting process in IoT using a novel blockchain Weighted Majority Consensus Algorithm (WMCA), Information Security Journal" Authors has proposed a novel decentralized blockchain Weighted Majority Consensus Algorithm that the detection of a malicious anomaly, as it is able to detect if a miner is honest, fake, or disable. Then based on this judgment the system may take strict actions to prevent the system from attacks [31].

Maral Sotoudehnia (2021), 'Making blockchain real': regulatory discourses of blockchains as a smart, civic service, Regional Studies," Author have focus the blockchain technology as a data -driving and producing civic service. Also focus on digital leadership, transparent data management and digital empowerment that blockchain to improve the government services [32].

Prateek Pandey et al (2020), "Securing and authenticating healthcare records through blockchain technology, Cryptologia", Authors has proposed a blockchain based secure architecture for e-healthcare systems [33].

QingQiu Gan et al (2021), "A critical review of blockchain applications to banking and finance: a qualitative thematic analysis approach", Author has presented the systematic Review on Blockchain applications in Banking and Financial sector with benefits, risks and challenges [34].

Jiaguo Liu et al (2021), "Blockchain technology in maritime supply chains: applications, architecture and challenges". Author has presented the detail review or Blockchain technology in maritime supply chains with

Impact, applications , architecture and challenges and proposed a blockchain-based maritime supply chain system (BMSCS) for global economic development [35].

V. Conclusions

This paper presents an overview of the emerging technique called Blockchain. Blockchain technology is becoming popular because of its decentralized, peer-to-peer transaction and immutable properties. This paper intends to address the key points such as Blockchain introduction, Blockchain types with its applications and each blockchain applications advantages and disadvantages with how to solve overcome disadvantages.

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Comparison and Analysis of Reactive Routing Protocols over MANET

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***Abstract*—Different routing algorithms will be investigated in this research, and their performance in terms of Packet Delivery ratio, Bandwidth, and Round Trip Time would be evaluated by continuous changing input values. We employed Network Simulator-2 to accomplish the architecture (NS-2). In MANET nodes are communicate with each other using wireless transmission media. Because nodes easily flow and can structure themselves randomly, the topology of a MANET is dynamic and can change quickly and nodes in a MANET typically need help from other intermediary nodes to form channels to communicate with destination nodes. As a result, the MANET requires constantly changing topology to establish routing from all these nodes. To achieve this task in this research paper we conducted detailed survey, implemented routing like DSR, DSDV, AODV, and compare results using various quality metrics.**

***Index Terms*— MANET, NS-2, DSDV, DSR, Routing Protocols, PDR, de1ay, QoS Parameters.**

I. INTRODUCTION

There are bunches of examination have been finished in earlier years to look at the execution of various directing conventions in MANET. These steering conventions businesses different methodologies or measurements to pick the best reasonable way between the source hub and the objective hub, some of them use the open bandwidth and a couple of them use the bobbed really look at between the sets. Remote systems administration is another innovation that licenses clients to electronically gain admittance to data and its administrations no matter what their area. Remote organizations are arranged into two sections. Fixed and wired passages are known as framework/organized network. Inside its correspondence span, a versatile organization interfaces with an organization span (called a base station). While conveying, the versatile unit can move about geologically. At the point when one base station's reach is depleted, it will interface with another base station and starts speaking with that station. Al l hubs in impromptu organizations are allowed to move and can be joined progressively as

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per their need. Since each host's remote transmission range is confined, a host should look for the assistance of encompassing hosts for the bundle sending to the objective location to interface with has outside the transmission span. Subsequently, all hubs in this organization act like a switch and find and keep up with the courses to different hubs in an organization. MANETs are a kind of impromptu organization that comprises of a gathering of independent versatile hubs that are associated with each other utilizing radio waves. Versatile hubs inside the radio scope of each other can convey straightforwardly, while different hubs need the help of delegate hubs to course their messages.

The Distance-Vector with an Objective Succession (DSDV) [3], the Bellman- Passage Steering Calculation is a changed form of the Bellman-Portage Directing Calculation. Every single versatile station has a steering table that contains every single imaginable objective, the quantity of bounces should expect to arrive, and the grouping number of objective hubs. The arrangement number is utilized to separate among old and new ways, additionally keeping from circles framing. The stations send directing tables to their closest neighbors consistently. In the event that there has been a fundamental change in a station's directing table since the last update, it will likewise be sent. Accordingly, the update is both occasion driven and time- driven. Dynamic Source Directing (DSR) is a responsive convention. It works out the courses as required and furthermore monitors courses. The principal utilization of source steering is a huge separating component of DSR. They complete different the entire bounce by-jump courses to the objective in source steering. To store these courses course reserve is utilized. The source course is remembered for the bundle header of information parcels.

II. Related Work

Many works have been done in field of routing protocols. Different methods protocols had been compared with help of different types of simulation tools like NS-2, OMNet, and OPNET etc. To investigate the feasibility, quality, reliability performance evaluation performed. Some of recent important studies done recently mentioned below: Performance evaluated by comparing routing protocols AODV, DSDV, and DSR and found that DSDV performance is less than others [1]. In [2] performance comparison performed on reactive category of routing techniques based on metrics like PDR, Throughput, Average end to end delay (AETED) using NS2 simulator, simulation result shows that AODV performed well in some aspects like PDR, and packet loss in DSDV less when compared with AODV. In [3] comparison is done on reactive, cluster based routing protocols and proactive routing protocol. Analysis is includes parameters like PDR, Routing overhead through simulation with help of GLOMOSIM simulator**.** In [4] comparative investigation performed in three routing protocols and considering metrics like AETED, and throughput to calculate its performance by changing the pause time NS-2.33 was used for analysis and it shows that DSR outperforms the other two protocols for throughput and PDR; and DSDV performed well for end to end delay. In [5] researchers simulated AODV and DSDV, compared results, they analyzed results using all performance evaluation metrics.

III. Methodology

In this paper we simulated, compared, analyzed three different routing protocols to get the most effective routing protocol by calculating AETED, throughput, PDR, and routing load (RL). Earlier also many works and research done in this field. In this paper we are changing environment every time and then calculating the result according to AETED, throughput, loss of packets, and RL for each protocol. We just comparing and analyzing protocols and accordingly we can select. We've created graphs for different scenarios that include adjusting packet size, timeframe altering between packet transmissions, and modifying motion. After performing experiment we are getting different results while there is any change in packet size, time frame etc., and accordingly we are analyzing and comparing all routing protocols which one is more effective on performance metrics. While changing packet size, or modifying environment (small network/ routing load) different routing protocol performing differently.

Including an OTcL translator serving as a user interface to control and regulate simulation settings, NS-2 is built employing C++. In order to distinguish the base system computing, such as a data network and optimization technique, from the simulated management, NS-2 integrates 2 distinct primary computer languages. This decreases the amount of time needed to process packets and events. C++ is appropriate for activities that demand great performance and minimal alteration, like reduced signal analysis and bandwidth allocation. On the other hand, rapid modification is required for activities like communication network and network generation, necessitating the employment of an adaptable programming language like Tcl. A tracing folder and an auxiliary

filename file are generated during the building of the Tcl script. The raspberry pi is used as a processor in the experimental work and the simulations have been carried out and the resultant values are displayed in graph.

IV. PERFORMANCE EVALUATION

Network throughput alludes to the mean information pace of effective information or message conveyance over a network. It is determined in bits each second (bps). A fundamental confusion about estimating network throughput is that estimating the time taken to transfer or download a huge record is the greatest throughput of an organization. This strategy doesn't consider correspondences above, for example, Organization recipient window size, network idleness, or machine restrictions. Most extreme organization throughput rises to the TCP window size separated by the full circle season of correspondence information parcels. To find throughput a follow record is utilized with a different steering convention for better execution.

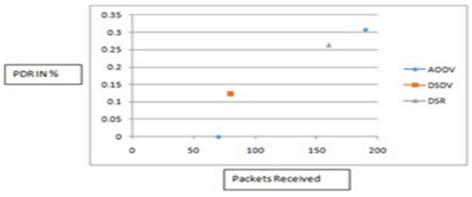
Jitter is an unfortunate impact brought about by the innate affinity of TCP/IP organizations and parts. This subject will portray the circumstances and logical results of jitter. Butterflies are characterized as a distinction in the postponement of gotten bundles. The sending side transmission bundles in a consistent stream and spaces them equitably separated. Because of organization blockage, improper lining, or setup mistakes, the postponement between bundles might change as opposed to stay consistent, as displayed in the figure. This divergence creates some issues for sound playback at the less than desirable end. Playback might experience holes while sitting tight for the appearance of fluidly deferred parcels. To find Jitter a follow record is utilized with a different directing convention for better execution. The start to finish delay is otherwise called one-way delay (OWD). This alludes to the time taken for a bundle to be sent over an organization from source to objective. It is an exceptionally common term in IP network observing and varies from full circle time (RTT).

Parcel misfortune happens when a transmission isn't gotten by its expected objective. In the TCP/IP convention, when parcel misfortune happens, the objective will ask the source to resend the lost bundle. Be that as it may, this can create a setback for correspondence. However, in UDP convention, the misfortune parcel will be disregarded and bring about ill-advised show on the objective area. Bundle misfortune might incorporate unfortunate sign strength at the objective, normal or human-made association, uncontrolled framework commotion, equipment disappointment, programming double dealing, or over-burden network hubs. Follow documents of isolated directing conventions are utilized to track down parcel misfortune for improved results. Follow documents of isolated directing conventions are utilized to track down parcel misfortune for improved results. Simulation setup of proposed techniques is shown in table I.

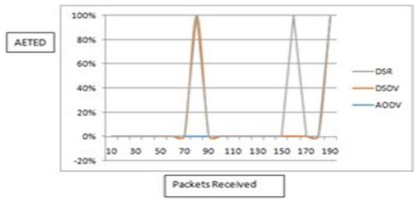
TABLE I. SIMULATION SETUP

Parameter	**Value**
Performance parameter	PDR, AETED, throughput (TP), RL, reading load
Protocols	AODV, DSDV, DSR
Number of nodes	20, 80
Number of rows	4
Simulation area	1000 * 1000
Simulation time	15 minutes
Packet size	1024
Propagation	Direct sequence
Start time	80 seconds

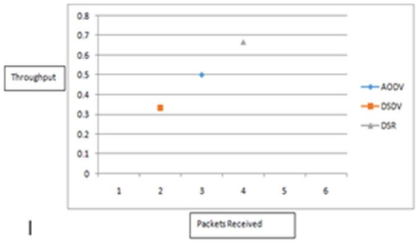
Graph 1 displays the effectiveness vector of three methods created following extracting evidence from the simulated labeled dataset. The PDR, the number of packets sent, AETED, TP, and RL for each protocol are shown individually in the table. Likewise, we've created graphs for a variety of scenarios, including adjusting packet size, altering the timeframe between packet transmissions, and modifying motion.

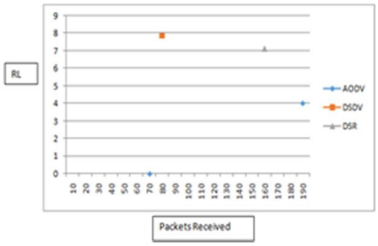


Graph.1.a. PDR



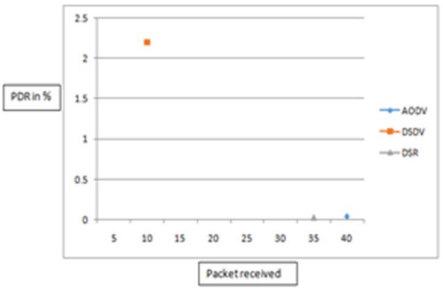
1.b. AETED

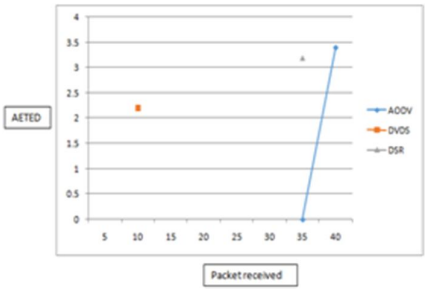




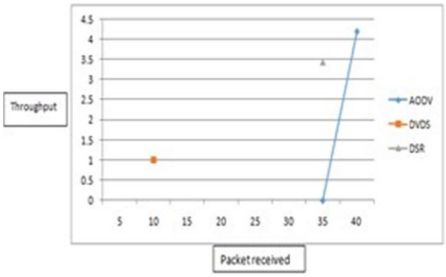
Graph.1.c. TP 1.d. RL

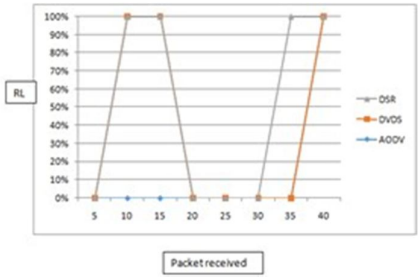
In charts, X-Pivot is showing the recreation time and Y-Hub is showing the quantity of parcels got in every conventions. Comparatively we have created the diagram for various circumstances like by changing bundles size, by changing versatility and time stretch between parcel sending. It is a discrete occasion driven test system implies that it start parcel sending at the predetermined time by us and stop likewise at a predefined time. We have taken 20 hubs and reproduction time=15 min in our situation record. Source hub is 0 and objective hub is 2. Hub 2 is moving in nature so way to Objective is changing like clockwork. Diagram 1 shows information move from source to objective. Dropping parcels in figure shows the bundles lost.





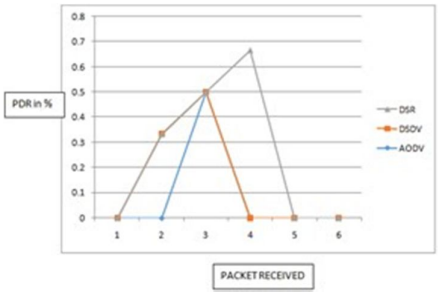
Graph.2.a. PDR 2.b. AETED



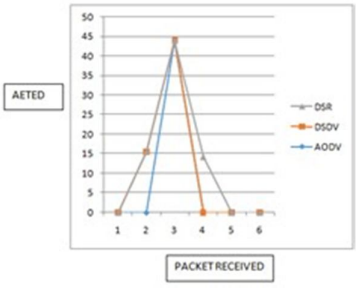


Graph.2.c. TP 2.d. RL

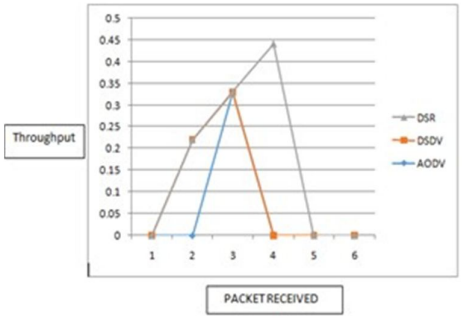
Graph 1 displays the effectiveness vector of three methods created following extracting evidence from the simulated labeled dataset. The PDR, the number of packets sent, AETED, throughput, and RL for each protocol are shown individually in the table. Likewise, we've created graphs for a variety of scenarios, including adjusting packet size, altering the timeframe between packet transmissions, and modifying motion. Graph 2(2a,2b,2c,2d) here also we change the packet size, time frame for packet transmission and we are getting different results according to change in data sets and compare their efficiency accordingly. Same Process is done in graph 3(2a,2b,2c,2d), and as we are increasing time gap in these 3 graphs packet receive no. is decreasing.
Graph 4(2.a,2.b,2.c,2.d) , graph 5(2.a,2.b,2.c,2.d), graph 6(2.a,2.b,2.c,2.d), graph 7(2.a,2.b,2.c,2.d), and graph 8(2.a,2.b,2.c,2.d) also demonstrate the results of three methods in various environments. After examining all of the data for various packets, time periods between packet transmission, and mobility, From experimental results DSR shows comparatively better than AODV routing protocol, which performs significantly better than the DSDV protocol. By examining all of the graphs for various packet sizes, and time intervals between mobility and packet transmission, we can conclude that the DSR method performs marginally higher than the AODV protocol, which performs substantially better than the DSDV methodology.



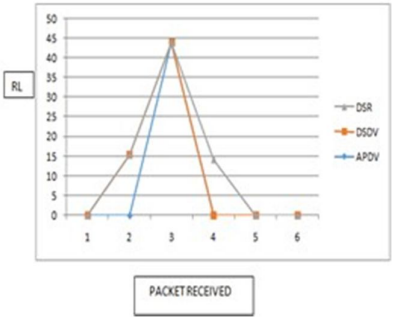
Graph.3.a. PDR



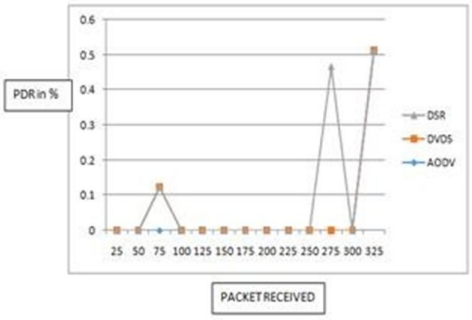
3.b. AETED



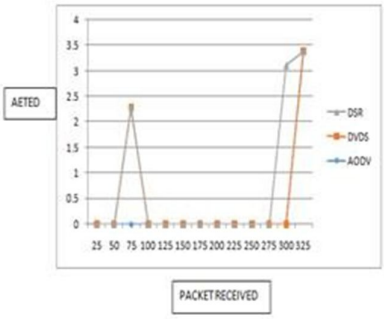
Graph.3.c. TP



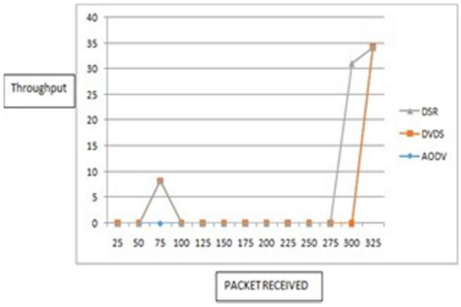
3.d. RL



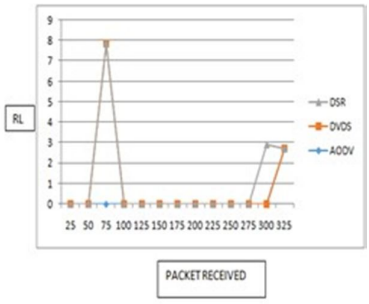
Graph.4.a. PDR



4.b. AETED



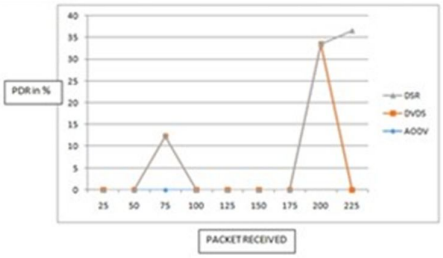
Graph.4.c. TP



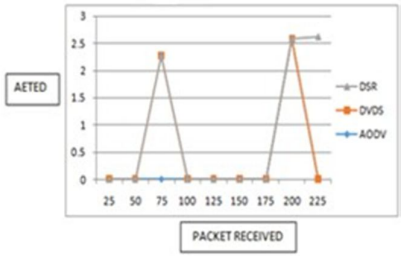
4.d. RL

We can see from graphs 1, graph 2, and graph 3 that as the time gap increases between packets sent, the count of packets received decreases. DSDV protocol performance at various packet sizes is an essential fact that we have investigated. We may conclude from graphs 1, graph 4, and graph 5 that adjusting packet size has no influence on the DSDV protocol's performance. While rise in packet size, packets intercepted in AODV decreases, lowering PDR. With respect to rising size of packets, the average time between packet sends likewise

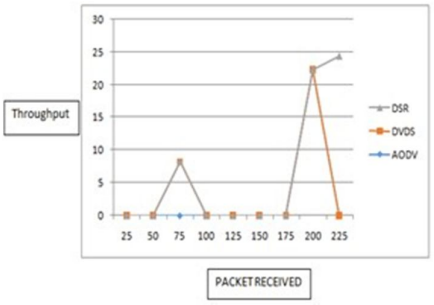
reduces. Asthe packet size grows larger, so does the throughput. As seen in the performance matrices graph 1, graph 4, and graph 5, the efficiency of the AODV protocol degrade with rising packet size. Graph 1, graph 4, and graph 5 will be used to assess the ability of the DSR protocol at different packet sizes. With rising packet size, we would see that the packet delivery ratio (PDR) drops. As the packet size grows larger, the DSR protocol's throughput drops. With the growth in data packets, so does the routing overhead. When packet size rises the AETED reduces. Except for the RL, the DSR protocol level is higher for smaller packet sizes.



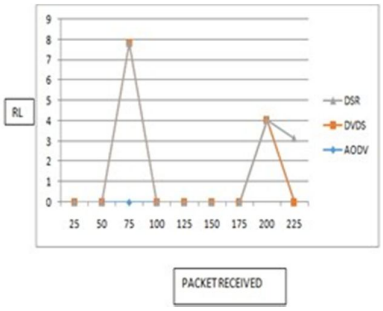
Graph.5.a. PDR



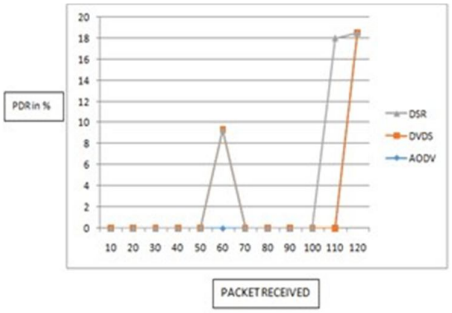
5.b. AETED



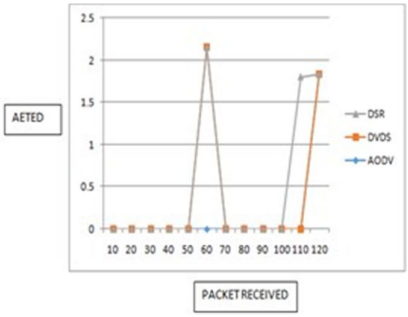
Graph.5.c. TP



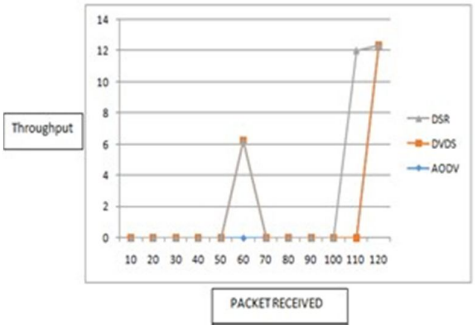
5.d. RL



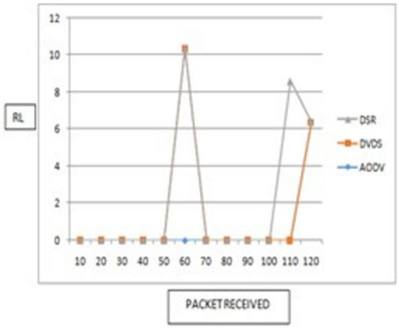
Graph.6.a. PDR



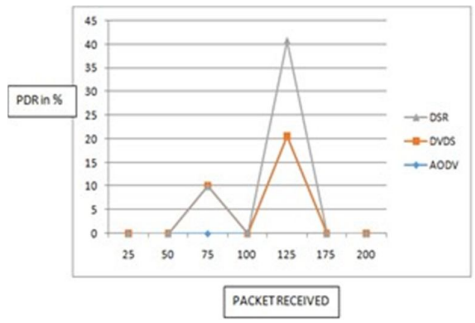
6.b. AETED



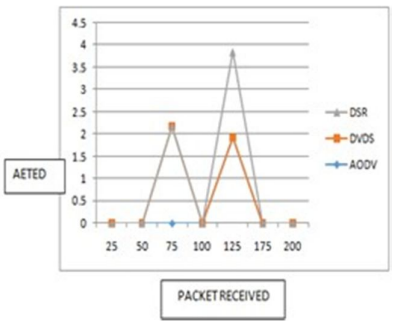
Graph.6.c. TP



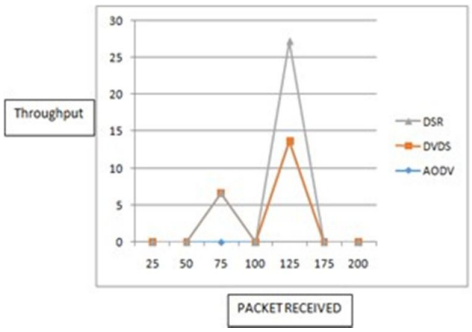
6.d. RL



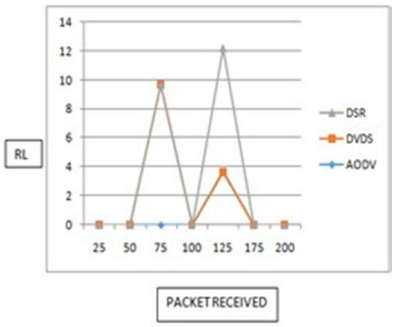
Graph.7.a. PDR



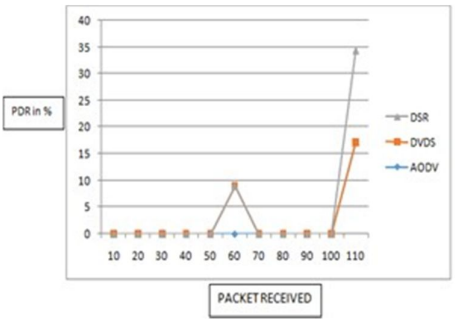
7.b. AETED



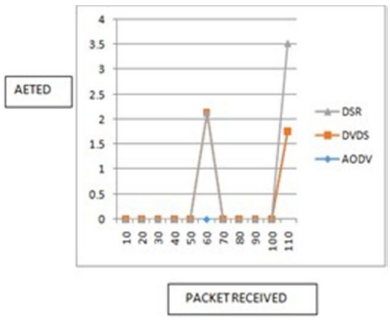
Graph.7.c. TP



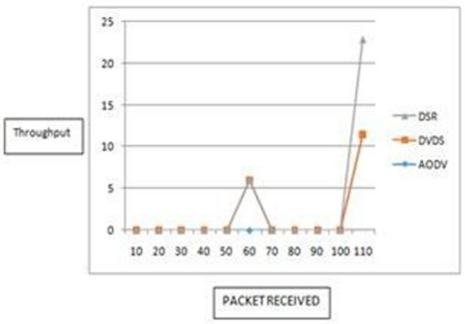
7.d. RL



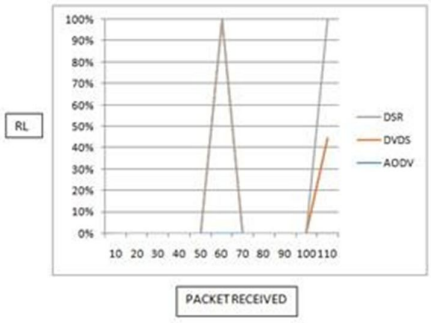
Graph.8.a. PDR



8.b. AETED



Graph.8.c. TP



8.d. RL

V. Conclusion

MANET is an assortment of decentralized portable hubs, progressively laying out fleeting organizations without having any fixed or concentrated foundation. In this venture, AODV and DSDV steering conventions are looked at which are proposed for MANETs. In the DSDV steering convention, versatile hubs occasionally communicate their directing data to their neighbors. For every hub, it is vital to keep up with its steering table. AODV convention utilizes the course demand parcel strategy to find its courses when required. And this large number of conventions examination is finished by including a few boundaries, for example, parcel throughput, start to finish delay, conveyance proportion, bundle misfortune rate, and consumed energy. The re-enactment results show that AODV execution is superior to DSDV regarding bundle conveyance proportion and start to finish delay while for parcel misfortune and consumed energy DSDV execution is superior to AODV. For the throughput boundary, the AODV and DSDV execution was almost equivalent. For little organizations, DSDV functions admirably and AODV turns out best for bigger organizations. In light of the charts, we reason that the DSDV standard has unfortunate proficiency, with low throughput and critical steering load when matched to the AODV and DSR strategies. At times, AODV outflanked DSR convention, in spite of the fact that DSR beat AODV convention generally, for example, while contrasting normal end-with end delay. The exhibition of the DSDV strategy is unaffected by bundle size varieties. A more modest parcel estimates, the AODV and DSR conventions perform successfully. As the versatility of hubs develops, the presentation of each of the three conventions reduces.

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Designing a Model to Monitor the Commitment of People to Wear a Face Mask, Even if an Image of their Real Face is Printed on it, using Deep Learning

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***Abstract*—The novel coronavirus (COVID-19) has rapidly affected our daily lives, which led to stopping the wheel of life for millions of people around the world and disrupting trade and global movements.**
The most important measure to limit the spread of this virus is to wear a mask on the face, so this procedure has become a new normal. In the near future, many public service providers will require customers to wear masks properly to benefit from their services. Therefore, the discovery of the face mask has become a critical task to help the global and local community.
In this paper, we propose a method using deep learning techniques and models that detects the faces of several people in a image or video stream in real-time and then identifies the faces of people who wear a mask and people who do not wear a mask, it also discovers people who put a mask in the wrong way, that is, the mask is under the chin or covers the mouth and chin only, and the nose appears, and here it means its absence, and also discovers people who wear a mask with the real features of their faces hidden behind the mask, that is, they put a mask but appear as if they are not wearing a mask.

***Index Terms*—Covid-19, Computer Vision, Image Processing, Deep Learning, data augmentation, Transfer Learning, CNN(Convolution Neural Network), Back Propagation, Adam Optimizer, Face Detection and Face Mask Detection.**

I. INTRODUCTION

Novel Coronavirus (Covid-19) is a highly contagious epidemic disease caused by Severe Acute Respiratory Syndrome 2 (SARS-CoV-2) that originated in the Chinese city of Wuhan in late December 2019 and has since spread globally, common symptoms include fever, cough and shortness of breath, and COVID-19 infection can mostly be transmitted through respiratory droplets generated when people breathe, talk, cough, or sneeze. The World Health Organization (WHO) announced that Covid-19 became a pandemic on March 12, 2020, and since that time this epidemic has become a major threat to the life of the entire world, which has infected millions of people around the world and led to the death of many of them, and thus the world is facing a huge health crisis due to the rapid transmission of the virus. Therefore, a comprehensive ban was imposed on countries around the world to mitigate this spread, and this affected the local and global economy and led to a halt in the wheel of life, which made researchers work around the clock to find solutions and design strategies to control the epidemic and

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reduce its spread and its impact on human health and the economy. In light of the easing of the ban measures, many guidelines have been issued by the World Health Organization (WHO) to limit the spread of this virus. Accordingly, the most effective preventive measure is to wear a mask for personal protection in public places, but there are people who do not wear masks and it is difficult to monitor them manually. Therefore, when a certain person removes the mask in public, he is not only risking his life, it also risks the lives of others who may have been in contact with the person during the period when he was not wearing a mask. Currently, people who are not wearing a mask are manually and visually screened by guards at entry and exit points, and guards cannot be placed everywhere to check on those people who take off their masks and roam without restrictions once they are checked at the entrance gate, efforts have been made in automatically examining people who do not wear a mask with the help of computer vision and artificial intelligence techniques, and here deep learning models have been used because it has shown tremendous potential in many applications of object detection in images, and one of the most important applications of object detection is the detection of human faces. To monitor that people follow the basic safety principle by wearing masks, a strategy must be developed that is divided into two parts: detecting faces in each input image or in a live broadcast video taken by a camera set for this purpose, and discovering masks on those faces, and this includes discovering the mask if the part of the hidden face is imprinted on it. Behind the mask, and also detecting the mask if it covers the mouth or chin (the mask condition is placed in the wrong way), and an alarm is issued if a person is detected without wearing a mask.

II. Materials and Methods

A. Related Work

Object detection is one of the trending topics in the field of image processing and computer vision. Ranging from small scale personal applications to large scale industrial applications, object detection and recognition is employed in a wide range of industries. Some examples include image retrieval, security and intelligence, OCR, medical imaging and agricultural monitoring. The process of object detection mainly involves localizing the objects in images and classifying them (in case of multiple objects). Traditionally, researchers used pattern recognition to predict faces based on prior face models. A breakthrough face detection technology then was developed named as Viola Jones detector that was an optimized technique of using Haar Cascade [1], and HOG[2], and these algorithms are heavily based on Feature Engineering. However, it failed because it did not perform well on faces in dark areas and non-frontal faces. Since then, researchers are eager to develop new algorithms based on deep learning to improve the models of face detection . Deep learning allows us to learn features with end to end manner and removing the need to use prior knowledge for forming feature extractors. In the era of Deeplearning, it is possible to train Neural Networks that outperform these algorithms, and do not need any extra Feature Engineering. There are various methods of object detection based on deep learning which are divided into two categories: one stage and two stage object detectors. Two stage detectors use two neural networks to detect objects, for instance region-based convolutional neural networks (R-CNN) and faster R-CNN. The first neural network is used to generate region proposals and the second one refines these region proposals; performing a coarse-to-fine detection. This strategy results in high detection performance compromising on speed. The seminal work R-CNN is proposed by R. Girshick et al. [3]. R-CNN uses selective search to propose some candidate regions which may contain objects. After that, the proposals are fed into a CNN model to extract features, and a support vector machine (SVM) is used to recognize classes of objects. However, the second stage of R-CNN is computationally expensive since the network has to detect proposals on a one-by-one manner and uses a separate SVM for final classification. Fast R-CNN [4] solves this problem by introducing a region of interest (ROI) pooling layer to input all proposal regions at once. Faster RCNN [5] is the evolution of R-CNN and Fast R-CNN, and as the name implies its training and testing speed is greater than those of its predecessors. While R-CNN and Fast R-CNN use selective search algorithms limiting the detection speed, Faster R-CNN learns the proposed object regions itself using a region proposal network(RPN) .

On the other hand, a one stage detector utilizes only a single neural network for region proposals and for detection; some primary ones being SSD (Single Shot Detection) [6] and YOLO (You Only Look Once) [7]. To achieve this, the bounding boxes should be predefined. YOLO divides the image into several cells and then matches the bounding boxes to objects for each cell.

This, however, is not good for small sized objects. Thus, multi scale detection is introduced in SSD which can detect objects of varying sizes in an image. Later, in order to improve detection accuracy, [8] proposes Retina Network (RetinaNet) by combining an SSD and FPN (feature pyramid network) to increase detection accuracy and reduce class imbalance. One-stage detectors have higher speed but trades off the detection performance but then only are preferred over two-stage detectors. Like object detection, face detection adopts the same

architectures as one-stage and two-stage detectors, but in order to improve face detection accuracy, more face-like features are being added. However, there is occasional research focusing on face mask detection. Some already existing face mask detectors have been modeled using OpenCV, Pytorch Lightning, MobileNet, RetinaNet and Support Vector Machines. As the world began implementing precautionary measures against the Coronavirus, numerous implementations of Face Mask Detection systems came forth.

Ref[9] have performed facial recognition on masked and unmasked faces using Principal Component Analysis (PCA). However, the recognition accuracy drops to less than 70% when the recognized face is masked.

Ref[10]introduced a method to identify face mask wearing conditions. They divided the facemask wearing conditions into three categories: correct face mask wearing, incorrect face mask wearing, and no face mask wearing. Their system takes an image, detects and crops faces, and then uses

Ref[11] to perform image super-resolution and classify them. The work by [12] presented a method that detects the presence or absence of a medical mask. The primary objective of this approach was to trigger an alert only for medical staff who do not wear a surgical mask, by minimizing as many false positive face detections as possible, without missing any medical mask detections.

Ref[13] proposed a model that consists of two components. The first component performs uses ResNet50 [14] for feature extraction. The next component is a facemask classifier, based on an ensemble of classical Machine Learning algorithms. The authors evaluated their system and estimated that Deep Transfer Learning approaches would achieve better results since the building, comparing, and selecting the best model among a set of classical Machine Learning models is a time consuming process.

B. Proposed Methodology

a) Dataset: The dataset which we have used consists of 1580 total images out of which 889 are of masked faces and 691 are of unmasked faces. A data set is a collection of data. In Deep Learning projects, we need a training data set. It is the actual data set used to train the model for performing various actions. We need to split our dataset into two parts :

•Training Dataset: A dataset that we feed into our Deep learning algorithm to train our model.
•Testing Dataset: A dataset that we use to validate the accuracy of our model but is not used to train the model. It may be called the validation dataset.

The purpose of splitting data is to avoid overfitting which is paying attention to minor details/noise which is not necessary and only optimizes the training dataset accuracy. We need a model that performs well on a dataset that it has never seen (test data), which is called generalization. The training set is the actual subset of the dataset that we use to train the model. The model observes and learns from this data and then optimizes its parameters. The validation dataset is used to select hyperparameters (learning rate, regularization parameters). When the model is performing well enough on our validation dataset, we can stop learning using a training dataset. The test set is the remaining subset of data used to provide an unbiased evaluation of a final model fit on the training dataset. Data is split as per a split ratio which is highly dependent on the type of model we are building and the dataset itself. If our dataset and model are such that a lot of training is required, then we use a larger chunk of the data just for training which is our case. In our approach, we have dedicated 80% of the dataset as the training data and the remaining 20% as the testing data, which makes the split ratio as 0.8:0.2 of train to test set.

b) Architecture: Fig.1 represents our proposed system architecture. It consists of two major stages. The first stage of our architecture includes a Face Detection Model (CNN), which localizes multiple faces in images of varying sizes and detects faces . The detected faces extracted from this stage are then batched together and passed to the second stage of our architecture, which is a Face Mask Detection Model (CNN). The results from the second stage are decoded and the final output is the image with all the faces in the image correctly detected and classified as either masked or unmasked faces.

C) Face Detection Model: In order to detect the face in color image, we have used the OpenCV library. The latest OpenCV includes a Deep Neural Network (DNN) module, which comes with a pre-trained face detection convolutional neural network (CNN), which is depends on Single Shot MultiBox Detector (SSD). The new model enhances the face detection performance compared to the traditional models. Whenever a new test image is given, it is first resized into 300×300 , we use mean subtraction, normalization and converted from RGB into BGR and then sent into the pre-trained model which outputs the number of detected faces. Every face detected comes out with a level of confidence which is then compared with a threshold value to filter out the irrelevant detections. After we have the faces, we need to evaluate the bounding box around it and resized every detected face into 224×224 because Deep CNNs require a fixed-size input image. Therefore we need a fixed common size for all the images , and then send it to the face mask detection model to check if the face has a mask or not. The overall process flow diagram of the model is shown in Fig. 2 .

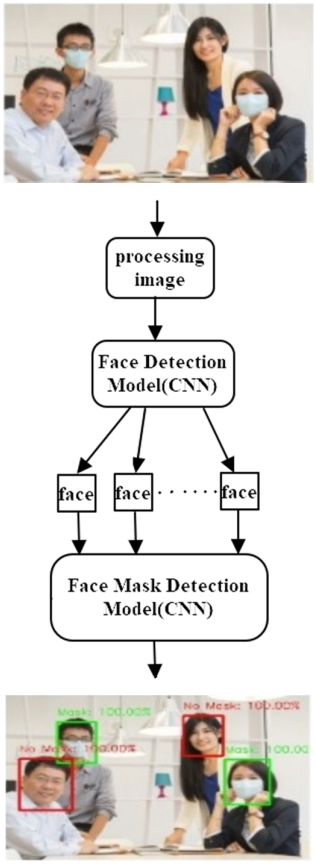

Fig. 1: system architecture

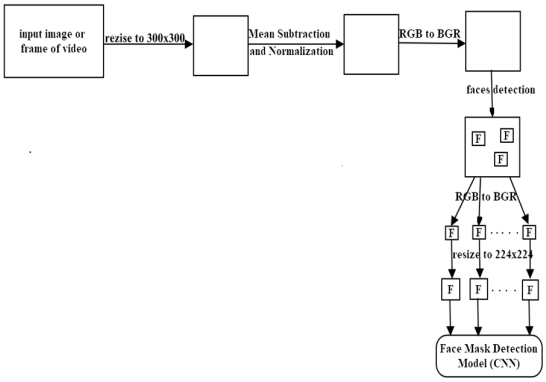

Fig. 2: process flow diagram

d) Face Mask Detection Model: The face mask detection model is trained by us using a dataset consisting of images with mask and without mask. We have used Keras along with Tensorflow to train our model. First part of the training includes storing all labels of the images in a Numpy array and the corresponding images are also reshaped (224, 244, 3) for the base model. Before inputting, new image data is generated based on old image data by making effects on images such as rotations up to 20 degrees, zooming in and out up to 15%, width or height shift up to 20%, up to 15 degrees shear angle in the counterclockwise direction, flip inputs horizontally and points outside the boundaries of the inputs are filled from the nearest available pixel of the input. This step is called Data Augmentation, and it is a very useful technique because it increases the data set of the images. This

step contributes to the process of generalization of the model, making it more efficient. For the image classification, it is now a common practice to use transfer learning which means using a model which has been pre-trained on millions of labels before and it has been tested that this method results in significant increase in accuracy. Obviously, the assumption here is that both the problems have sufficient similarity. It uses a well-structured and deep neural network that has been trained on a large amount of data set. Due to somewhat same nature of the problem, we can use the same weights which have the capability to extract features and later in the deep layers, convert those features to objects. The base model that we have used here is MobileNetV2 with the given 'ImageNet' weights. ImageNet is an image database that has been trained on hundreds of thousands of images hence it helps a lot in Image classification. For the base model, we truncate the head and use a series of our self defined layers. We used an average pooling layer to reduce the spatial dimensions of the output volume and Pool size is set to 7 x7, a flatten layer which transforms matrix of features into a vector that can be fed into a fully connected neural network classifier, a dense layer of 128 neurons with a ReLu activation function is added , a 50% dropout layer for optimization, The final layer (Dense) with two outputs for two categories uses the Softmax activation function. The overall process flow diagram of the model is shown in Fig. 3.

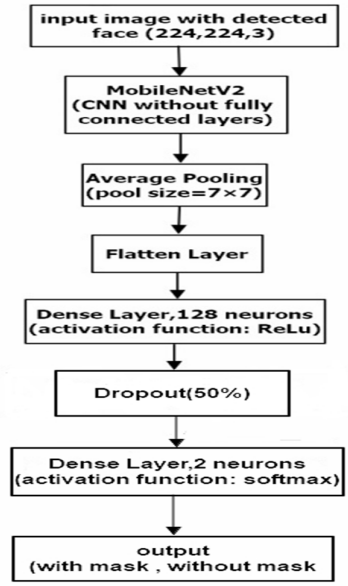

Fig. 3 : process flow diagram of the model

e) Training The Face Mask Detection Model: To train the built model, we rely on the Back Propagation method, that is, it adjusts the weights of the output layer on the test data based on the value of the loss function, which measures the difference between the actual output and the expected output of the model. As the number of epochs increases, its value decreases, On the other hand, the accuracy increases, and this is what we want, as we note in Fig. 4, which shows the training process, And here we use binary_crossentropy as a loss function. During the training process, the concept of Validation is used, which is a useful concept to check the efficiency of the model during the training process and prevent it from falling into the problem of overfitting. Therefore, the validation data is used to verify the efficiency of training the model and is used during the training phase, but is not used for the process of adjusting the weights.

f) Hyperparameters: A hyperparameter is a parameter or a variable we need to set before applying an algorithm into a dataset. These parameters express the "High Level" properties of the model such as its complexity or how fast it should learn. Hyperparameters are fixed before the actual training process begins. They can be divided into two categories: optimizer hyperparameters and model hyperparameters. Optimizer parameters help us to tune or optimize our model before the actual training process starts. Some common optimizer hyperparameters are as follows. Learning rate is a hyperparameter that controls how much we are adjusting the weights of our neural network with respect to the gradient. Mini-batch size is a hyperparameter that influences the resource requirements of the training and impacts training speed and number of iterations. Epochs are the

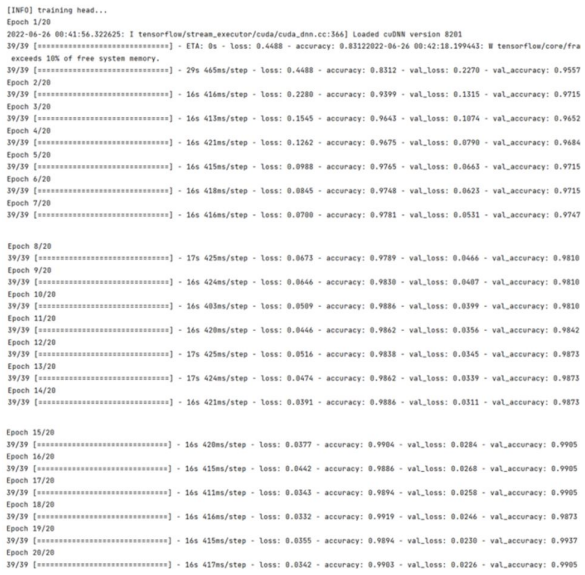

Fig. 4: training the model

hyperparameters that determine the frequency of running the model. One epoch is when an entire dataset is passed forward and backward through the neural network only once. Model hyperparameters are parameters that are more involved in the architecture or structure of the model. They help us to define our model complexity based on the different layers like the input layer, hidden layer, and output layer of a neural network. Initially, we trained with different values of hyperparameters by changing one and keeping the other constant and noted down the results in each case. We selected the hyperparameters that produced better performance through evaluation metrics. We have chosen the hyperparameters as follows: initial learning rate is taken as 0.0001, batch size is taken to be 32 and number of epochs as 20. In our case, the target size is also one of the hyperparameters which we kept (224, 224, 3) as it is default input shape of MobileNetV2.

g)Evaluation The Model: After the model training process is completed, the model is evaluated on the testing data, which are data that are not included in the model training process. The evaluation process consists of first looking at the classification report which gives us insight towards precision, recall and F1 score. The equations of these three metrics are as follows:

$$\text{Precision(P)}=\frac{True\ Positives}{True\ Positives+False\ Positives} \quad (1)$$

$$\text{Recall(R)}=\frac{True\ Positives}{True\ Positives+False\ Positives} \quad (2)$$

$$\text{F1-score}=2\times\frac{P\times P}{P+R} \quad (3)$$

Using these three metrics, we can conclude the efficiency and performance of the model. The Classifiction Report on the testing data during the process of training the model on the training data appears as follows, Fig.5.

```
[INFO] evaluating network...
2022-06-26 00:47:31.805471: W tensorflow/core/framework/cpu_allocator_impl.cc:80]
              precision    recall  f1-score   support

   with_mask       0.99      0.99      0.99       178
without_mask       0.99      0.99      0.99       138

    accuracy                           0.99       316
   macro avg       0.99      0.99      0.99       316
weighted avg       0.99      0.99      0.99       316
```

Fig.5 : Classifiction Report

Finally, the training curve and the validation curve for Loss/Accuracy are plotted in terms of Epochs, Fig. 6.

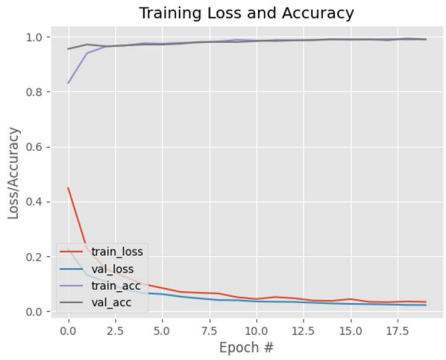

Fig. 6: the training curve and the validation curve for Loss/Accuracy

We note that the Accuracy rate of the training data (train_acc) starts with approximately 78% at the first epoch and increases with the number of epochs until it reaches approximately 99% , on the other hand, the average loss of training data (train_loss) starts with approximately 45% at the first epoch and decreases with increasing number of epochs to reach approximately 0.1% .
We note that the Accuracy rate of the validation data (val_acc) starts with about 95% at the first epoch and increases with increasing the number of epochs until it reaches approximately 99%, which is considered a very high percentage and therefore the efficiency of the model is high, on the other hand, the loss rate for the validation data (val_loss) starts with about 22% at the first epoch and decreases with the increase in the number of epochs to less than 0.1%, and there are simple signs indicating the emergence of overfitting because the value of the loss rate for the validation data is slightly less than the loss rate value for the training data, the lower the loss rate and the higher the accuracy rate, the better the model and neural network used.

III. RESULT

We implemented our model on images containing one and more faces. We also implemented it on videos and live video streams by removing and wearing masks one by one. Some screenshots of the results are shown below:

A. Test 1

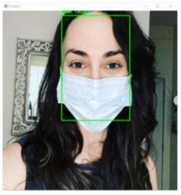

Fig. 7 : Test 1

Fig. 7 shows an image of a girl who puts a mask on her face correctly and covers the nose and mouth, when it was entered into the model that we built, the face was surrounded by a rectangle in green and given the classification mask and the percentage of detection, which means that it was discovered that she was wearing a mask at 100% .

B. Test 2

Fig. 8 : Test 2

Fig. 7 shows an image of a man who does not wear a mask on his face, when entered into the model that we built, the face was surrounded by a rectangle in red and given the classification no mask and the percentage of detection, which means that it was discovered that he is not wearing a mask 100% .

C. Test 3

Fig. 9 : Test 3

Fig. 9 shows an image of a young man putting a mask on his face, but in the wrong way, as it is placed on the chin only and does not cover the nose and mouth. When inserted into the model that we built, the face was surrounded by a rectangle in red and given the classification no mask and the percentage of detection, which means that it was discovered that he does not wear a mask with a percentage of 99.81 % .

C. Test 4

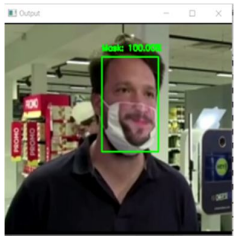

Fig. 10 : Test 4

Fig. 10 shows an image of a young man putting a muzzle on his face, but the real part of the face hidden behind the muzzle was printed on it, when it was entered into the model that we built, the face was surrounded by a rectangle in green and given the classification mask and the percentage of detection, which means that it was discovered that he was wearing a muzzle at 100% .

D. Test 5

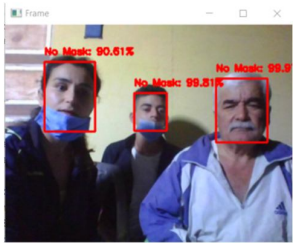

Fig. 11 : Test 5

Fig. 11 shows an image captured by a camera in real time, which is a frame from a live broadcast video of three people, one of whom is not wearing a mask, where the face is surrounded by a rectangle in red and given the classification no mask and the percentage of detection, which means that it was discovered that he is not wearing a mask by 99.99%, and the second is wearing a mask But in a wrong way, as it is placed on the chin and mouth only and does not cover the nose, as the face was surrounded by a rectangle in red and given the classification no mask and the percentage of detection, which means that it was discovered that he did not wear a mask with a percentage of 99.81%, and the third is wearing a mask but in a wrong way as it is placed on the chin only It does not cover the nose and mouth, and it was discovered that he does not wear a mask by 90.61% .

E. Test 6

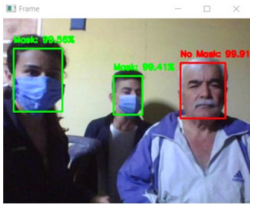

Fig. 12 : Test 6

Fig. 12 shows an image taken via a camera in real time, which is a frame from a live broadcast video of three people, one of whom is not wearing a mask, where the face is surrounded by a rectangle in red and given the classification no mask and the percentage of detection, which means that it was discovered that he is not wearing a mask by 99.91%, and the second is wearing a mask Correctly covering the nose and mouth, where the face was surrounded by a rectangle in green and given the classification mask and the percentage of detection, which means that it was discovered that he is wearing a mask with a percentage of 99.41%, and the third is wearing a mask correctly and covers the nose and mouth where the face was surrounded by a rectangle in green and giving the classification mask and the percentage for discovery, which means that it was discovered that he was wearing a muzzle, with a percentage of 99.56% .

IV. Future Work

More than fifty countries around the world have recently initiated wearing face masks compulsory. People have to cover their faces in public, supermarkets, public transports, offices, and stores. Retail companies often use software to count the number of people entering their stores. They may also like to measure impressions on digital displays and promotional screens. We are planning to improve our Face Mask Detection tool and release it as an open-source project. Our software can be equated to any existing USB, IP cameras, and CCTV cameras to detect people without a mask. This detection live video feed can be implemented in web and desktop applications so that the operator can see notice messages. Software operators can also get an image in case someone is not wearing a mask. Furthermore, an alarm system can also be implemented to sound a beep when someone without a mask enters the area. This software can also be connected to the entrance gates and only people wearing face masks can come in.

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A study of Soil Testing Methods for Nutrient Analysis

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***Abstract*—Nutrient analysis for crop production provides direction for farming techniques which may give more yield as output. The nutrient estimation is related to chemical as well as image processing-based techniques. There are variety of methods available so far for nutrient estimation. This paper contributes in terms of review of different methods which may provide platform for the researchers working in the domain. The machine learning and image processing approaches are responsible to make nutrient analysis easier. Thus, methods with the use of machine learning and image processing are also addressed in this paper.**

***Index Terms*— Nutrient analysis, methods, machine learning, image processing.**

I. INTRODUCTION

Organic matter, and consequently soil organic material, are essential components of soil that have a direct impact on soil resistance to erosion as well as physicochemical features as soil structure, water holding ability, and Cation Exchange Capacity (CEC). So, for a wide range of environmental and agricultural practices, geographical assessment of SOM concentration is crucial. SOC determination with the conventional laboratory method is costly, catastrophic, and gradual. As a result, there is a growing need for quick, economical, non-destructive, and adequately precise methods for forecasting SOC in the field utilizing either mobile or online sensing infrastructure. According to reports, the method known as visible and near-infrared reflectance spectroscopy (VNIRS) holds promise for soil analysis [4, 6]. VNIRS has been extensively employed for the in situ online and on-line forecasts of several soil parameters, including SOM, due to the availability of reliable and portable detectors. Given the direct spectral response SOC has in the NIR spectral range and the changes in soil color that are related to changes in the soil organic matter content detectable in the visible (VIS) range, SOM is in fact a crucial parameter that is frequently used for assessing soil quality. It is also regarded as one of the most frequently and successfully predicted parameters using VNIRS [4, 12, 13]. VNIRS can offer a quick and affordable field estimation of SOC once the spectral characteristics have been calibrated for SOC prediction using chemometry or machine learning approaches.

Analysis of SOM contents is necessary for scientific fertilization because SOM content, a key indicator of soil fertility, has a significant impact on both the physicochemical characteristics and soil attributes. The three most important organic components of soil are nitrogen (N), phosphorus (P), and potassium (K) (K). Since spectral reflectance of soil is negatively correlated with SOM content and the SOM content could be obtained from measured soil reflectance spectrum [2, 3], visible (VIS, 400-780 nm) and near-infrared (NIR, 780-2526 nm) spectroscopy is an advantageous and competent technique for quickly and inexpensively monitoring SOM [1]. Along with support vector machine, back-propagation neural network, partial least squares regression, linear regression, and partial least squares regression, many studies have advocated and evaluated discrete spectrum

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data modelling strategies (SVM).
This paper intends to discuss on soil nutrient detection methods. The neural network platforms may constitute models based on deep neural networks (DNN) such as convolutional networks (CNN) or recurrent neural networks (RNN).

II. Literature Survey

The crucial supplemental source in [1] is soil, which serves as the mechanism of plant development. The crucial nutrients that plants require in the greatest quantities are nitrogen (N), phosphorus (P), and potassium (K). These nutrients should be present in sufficient quantities in the soil to ensure perfect plant growth, which results in exceptional harvests and increased yield yields. The fundamental responsibility for ranch directors at that stage is to assess the soil's NPK levels. The benchmark method to assess soil NPK levels was soil material examination. In order to determine the distinctive absorbance spectra of soil, near infrared (NIR) spectroscopy was welcomed as a non-terrifying, fast, and ecosystem-safe technology. From 1240 nm forward, there are several different types of intentional NIR absorption frequencies. The NPK supplement levels of the various soil tests were evaluated using the following cultivars in the purposeful NIR absorbance frequencies ranging from 1240 nm to 1480 nm. In addition, the dataset was broken down and presented using Artificial Neural Network (ANN) to determine the association between the NIR absorbance data and the levels of NPK supplements in the soil. The model's preparation R is 0.998, testing R is 0.996, test R is 0.996, and general R is 0.998 in light of the relapse investigation. This work reveals that NIR absorbance spectra can be used to describe NPK soil supplement amounts.
In [2], creators present a compact soil nitrogen finder by utilizing a chip-scale Fourier change infrared spectroscopy sensor to empower quick location of soil nitrogen, and a supporting programming with capacities like otherworldly procurement, foundation deduction, and information stockpiling was additionally program. The identifier was utilized to identify the phantom information in the real farmland climate. 120 haphazardly chosen soil tests were utilized to adjust soil nitrogen to soil reflectance utilizing fractional least squares. 76 haphazardly chosen tests were kept for approval. Aftereffects of the investigations showed values for the coefficient of assurance as high as 0.934, and root mean square mistake was 1.923. After the model was installed in locator, 10 soil tests were tried for check. The overall mistake between the anticipated worth and the genuine worth was under 13%, and the base relative blunder was 5.56%. The outcomes confirmed that finder can at first understand the fast forecast of soil nitrogen and give a specific specialized reference to scaling down of convenient distinguishing instruments.
In [3], creators have given a broadband photograph acoustic spectrometric (PAS) framework was laid out for the discovery of weighty metal pollutants in soil. The weighty metal component lead (Pb) was chosen as a favored discovery target. The close to infrared photograph acoustic spectra of sullied soil tests with different centralizations of Pb were gathered and the spectroscopic connection between the dirt retention pinnacles and Pb focuses was examined. Four progressed otherworldly preprocessing strategies were investigated to work on the power of the expectation model. In light of the maximal relationship coefficient and insignificant root mean square mistake models of expectation, a two-layer feed-forward network with a continuum eliminating preprocessing strategy with a connection coefficient as 0.96 was tried as the most fitting technique for Pb focus forecast. This reality confirms that the broadband PAS assessment technique, as a nondestructive testing strategy, can be possibly utilized as an elective evaluation identification technique for weighty metal toxins in soil without the inclusion of confounded example pretreatment.
In [4], have given an analysis is to change preparation in view of harvest needs and soil properties and to decrease how much manure in soil without lessening yield. The dirt investigation method center around photon assimilation attributes of the significant soil supplements (nitrogen, phosphorus and potassium). The dirt examples under test were first stove dried and afterward blended in with four sorts of manure [KNO3, TSP, and NPK] in the fixation scope of 0.02-10%. Close to IR laser pillar go through the shut circle Mach-Zander Interferometer to decrease vacillations connected with bar way and interfaces with soil test. At the point when IR radiations are engaged onto an example, the particles in the example will expand their vibration energy by engrossing energy at explicit frequencies relying upon the sub-atomic calculation, bond qualities and nuclear masses. The dissipated pillar is along these lines changed, making a mark of the designated object with tops at the engrossing frequencies. This procedure gave fast, non-disastrous and synchronous assurance of nitrogen, phosphorus and potassium focuses in soil compost combinations.
In [5], an optical transducer is created to gauge and to identify the presence of Nitrogen (N), Phosphorus (P) and Potassium (K) of soil. Such transducer is expected to conclude how much additional substance of these

supplements are to be added to the dirt to build soil ripeness. This can work on the nature of soil and decreases the undesired utilization of manures to be added to the dirt. The N, P, and K worth of the still up in the air by retention light of every supplement. The optical transducer is executed as a recognition sensor which comprises of three LEDs as light source and a photodiode as a light identifier. The frequency of LEDs is picked to fit the retention band of every supplement. The supplement assimilates the light from LED and the photodiode convert the leftover light that is reflected by reflector to current. The framework uses an Arduino microcontroller for information obtaining along these lines the result from the transducer is changed over into an advanced presentation perusing. Testing on different examples of soils, showed that the optical transducer can assess the measures of NPK soil content as High, Medium and Low.

In [6] picture handling and counterfeit neural organization was utilized to proficiently recognize the supplements and pH level of soil with the utilization of Soil Test Kit (STK) and Rapid Soil Testing (RST) of the Bureau of Soils and Water Management: (1) pH, (2) Nitrogen, (3) Phosphorus, (4) Potassium, (5) Zinc, (6) Calcium, and (7) Magnesium. The structure of the framework is made of five areas in particular soil testing, picture catching, picture handling, preparing framework for neural organization, and result.

In [7], the complete nitrogen (TN) content in soil tests was identified in the phantom scope of 900-1700 nm utilizing a hyper unearthly imaging (HSI) framework. Trademark frequencies were extricated utilizing uninformative variable end (UVE) and the progressive projections calculation (SPA), independently. Fractional least squares (PLS) and outrageous learning machine (ELM) were utilized to lay out the alignment models with full spectra and trademark frequencies, individually. The outcomes demonstrated that the expectation impact of the nonlinear ELM model was better than the straight PLS model. Moreover, the models utilizing the trademark frequencies could likewise accomplish great outcomes, and the UVE-ELM model performed better, having a relationship coefficient of forecast (rp), root-mean-square blunder of expectation (RMSEP), and remaining expectation deviation (RPD) of 0.9408, 0.0075, and 2.97, separately. The UVE-ELM model was then used to appraise the TN content in the dirt example and get a conveyance map. The exploration results demonstrate that HIS can be utilized for the recognition and representation of the conveyance of TN content in soil.

In [8] the dirt test report values are utilized to group a few critical soil highlights like town astute soil ripeness records of Available Phosphorus (P), Available Potassium (K), Organic Carbon (OC) and Boron (B), as well as the boundary Soil Reaction (pH). The arrangement and expectation of the town astute soil boundaries helps with decreasing inefficient use on compost inputs, increment benefit, save the hour of substance soil examination specialists, further develops soil wellbeing and ecological quality. These five arrangement issues are settled utilizing the quick learning grouping strategy known as Extreme Learning Machine (ELM) with various actuation capacities like Gaussian outspread premise, sine-squared, exaggerated digression, three-sided premise, and hard breaking point. After the exhibition investigation of ELMs with different enactment capacities for these dirt boundary groupings, the Gaussian outspread premise work achieves the greatest presentation for four out of five issues, which goes above 80% in the greater part of the exactness rate computations in each issue, trailed by exaggerated digression, hard cutoff, three-sided premise, and sine-squared. Nonetheless, the exhibition of the last characterization issue, for example the pH grouping, gives moderate qualities with the Gaussian outspread premise and best execution (close 90%), with the exaggerated digression.

In [9] creators decided this information at the drawn-out N treatment site Mer Bleue lowland, Ontario, during a multi month time frame in summer. Soil temperatures diminished with NPK expansion in shallow peat soil essentially during the daytime (t-test, $p < 0.05$) inferable from expanded overshadowing, though they expanded in more profound peat soil (t-test, $p < 0.05$), likely by improved warm conductivity. These impacts were affirmed by RMANOVA, which likewise recommended an impact of volumetric water substance as co-variable on soil temperature as well as the other way around ($p < 0.05$). Found the middle value of over totally prepared medicines, the mean soil temperatures at 5 cm profundity diminished by 1.3 and by 4.7 C (standard deviation 0.9 C) around early afternoon. Water content was generally emphatically impacted by inside plot spatial heterogeneity yet additionally reacted to both N and PK load as indicated by RMANOVA ($p < 0.05$). Generally speaking, water content and CO2 fixations in the close surface peat (t-test, $p < 0.05$) were lower with expanding N load, proposing more fast soil gas trade. The outcomes consequently recommend that adjustments of lowland environment structure with N affidavit have huge implications for actual boundaries that thusly control biogeochemical processes.

In [10] displaying and proficient supplement the board were utilized to assess turf misfortune issue. A three-element and five-level focal composite rotatable plan (CCRD) with a reproduction of a relapse model was utilized to upgrade preparation rates. The review examined the joined impacts of treatment with nitrogen (N), phosphorus (P), and potassium (K) on both the morphological and physiological characteristics and on the incorporated turf execution (ITP) of overseeded perpetual ryegrass (Lolium perenne). Treatment with N and P

altogether expanded turf stature, thickness, shading, new and dry loads, while N, P, and K fundamentally impacted turf cover, quality and winter-kill. The Spring progress was deferred by treatment with N and P, and sped up by preparation with K. Photosynthesis (Pn), happening (Tr), and stomatal conductance (Gs) were extensively upgraded by treatment with N, P, and K. Protein levels and all out-chlorophyll levels were considerably expanded by treatment with N and P and with N, P, and K, separately, during a 2-year time span. During two separate investigations directed during 2 sequential years, the ideal mixes of N, P, and K were N: 30, P: 24, K: 9, and N: 30, P: 27, K: 6 g m−2. The significant finish of the paper is that a decent supplement application using N, P, and K is vital to improving the colder time of year execution of lasting ryegrass.

In [11] creators accentuated that dirt testing is corresponding to establish tissue testing and not a substitute in plantation the executives. Contemplations to guarantee soil testing gives agent and helpful data and understanding of two normal soil test boundaries: 1) Saturation Percentage (SP); and 2) pH were likewise examined. This article will zero in on the supplements nitrogen (N), phosphorus (P), and potassium (K).

In [12] have given strategy to precisely, quickly, steadily, and nondestructively measure the NPK levels in tomato plants, a nondestructive assurance technique in view of multispectral three-layered (3D) imaging was proposed. Multiview RGB-D pictures and multispectral pictures were simultaneously gathered, and the plant multispectral reflectance was enrolled to the profundity facilitates as indicated by Fourier change standards. In light of the Kinect sensor present assessment and self-alignment, the brought together change of the multiview point cloud coordinate framework was understood. At last, the iterative nearest point (ICP) calculation was utilized for the exact enlistment of multiview point mists and the reproduction of plant multispectral 3D point cloud models. Utilizing the standardized grayscale likeness coefficient, the level of phantom cross-over, and the Hausdorf distance set, the precision of the reproduced multispectral 3D point mists was quantitatively assessed. The outcomes showed that the multispectral reflectance could be enlisted to the Kinect profundity facilitates precisely founded on the Fourier change standards, the remaking exactness of the multispectral 3D point cloud model met the model reproduction needs of tomato plants. Utilizing back-proliferation counterfeit neural organization (BPANN), support vector machine relapse (SVMR), and Gaussian cycle relapse (GPR) strategies, assurance models for the NPK substance in tomato plants in light of the reflectance qualities of plant multispectral 3D point cloud models were independently developed. The relative mistake (RE) of the N content by BPANN, SVMR and GPR forecast models are assessed. The NPK substance assurance execution of these models was steadier than those of single-view models.

In [13], creators talk about N and P use effectiveness and how they are fundamental for plant and climate. Nitrogen (N) and phosphorus (P) are the main supplements for crop creation. The N adds to the underlying part, nonexclusive, and metabolic mixtures in a plant cell. N is principally a fundamental piece of chlorophyll, the compound in the plants that is liable for photosynthesis process. The plant can get its accessible nitrogen from the dirt by mineralizing natural materials, fixed-N by microorganisms, and nitrogen can be set free from plant as buildup rot. Soil minerals don't deliver an enough measure of nitrogen to help plant; in this way, preparing is vital for high creation. Phosphorous contributes in the complex of the nucleic corrosive construction of plants. The nucleic corrosive is fundamental in protein union guideline; in this way, P is significant in cell division and advancement of new plant tissue. P is one of the 17 fundamental supplements for plant development and connected with complex energy changes in the plant. Previously, development underway and usefulness of harvests depended intensely on high-portion utilization of N and P composts. In any case, keep adding those synthetic manures over the long run has awful outcomes in unavoidable losses in regards to no improvement in crop efficiency. Applying high dosages of substance manures is a main consideration in the environmental change as far as nitrous oxide gas as one of the ozone depleting substance and eutrophication that happens on account of P contamination in water streams.

In [14] creators gave concentrate on which shows that, complete blends of either unique reflectance or first-request subsidiary spectra have been created to evaluate leaf nitrogen (N), phosphorus (P), and potassium (K) substance of tree, bush, and grass species utilizing hyper unearthly datasets from light, moderate, and seriously corrupted vegetation locales in Helin County, China. Leaf N, P, and K substance were connected to distinguish appropriate mixes. The best mixes were those of reflectance distinction (Dij), standardized contrasts (ND), first-request subordinate (FD), and first-request subsidiary contrast (FD(D)). Straight relapse investigation was utilized to additionally improve touchy band-based blends, which were contrasted and 43 oftentimes utilized observational otherworldly lists. The proposed hyper otherworldly lists were displayed to really evaluate leaf N, P, and K affirming that hyper phantom information can be possibly utilized for fine scale observing of corrupted vegetation.

In [15] creators recognized fast soil and plant supplement testing advances in view of a web search, and assessed the reason for conveying them as elective supplement insightful frameworks. 36 of such applications were

distinguished, out of which simply 5 are committed exclusively to establish investigation. All in all, the working systems of the greater part of the items were viewed as founded on colorimetric, spectroscopy or sensor innovation. In any case, in examination with customary wet science strategies, the exactness of the items is yet to be completely settled, given the lack of information in such manner. Consequently, creators reflected upon the adequacy of the items in producing important data to direct reasoning compost proposals, and in that setting examined the idea of adjusted manure systems that consider soil levels of various supplements; related soil factors that decide supplement bioavailability and genuine take-up by harvests; and complex cultivating frameworks that might sabotage the accuracy and proficiency of manure application.

In [16] creators gave the review which investigated the chance of assessing nitrogen content in a field grass utilizing warm pictures and fake neural organizations (ANN), in view of the reason that plant herbage with a higher N content would be retaining all the lighter energy for dynamic photosynthesis, along these lines producing abundance energy as hotness. This is the primary announced review to utilize warm infrared pictures and ANN to assess field nitrogen content under various states of nitrogen (N) compost. The examination was directed in a controlled environment climate to disconnect the impact of a vital natural boundary, accessible soil N, on field grass herbage temperatures. The undertaking was the initial move towards fostering a savvy compost spreader to oversee N applications in view of plant temperature.

In [17] creators presented a GA-BPNN strategy, which joined a back spread neural organization (BPNN) with the hereditary calculation advancement (GA). This study was directed in Guangdong, China, in view of soil supplement substance and hyper ghostly information. The forecast exactness from an incomplete least squares relapse (PLSR), BPNN and GA-BPNN were looked at utilizing field perceptions. The outcomes showed that (1) Among three strategies, the GA-BPNN gave the most reliable evaluations of soil all out nitrogen (TN), complete phosphorus (TP) and absolute potassium (TK) substance; (2) Compared with the BPNN models, the GA-BPNN models altogether further developed the assessment correctness of the dirt supplement substance by diminishing the overall root mean square blunder (RRMSE) values at the territorial scale for TN, TP and TK, separately. This showed that by streamlining the boundaries of BPNN, the GA-BPNN gave more noteworthy potential to working on the assessment; and (3) Soil TK content could be all the more precisely planned by the GA-BPNN strategy utilizing HuanJing-1A Hyperspectral Imager (HJ-1A HSI) (maker: China Aerospace Science and Technology Corporation; Beijing, China) The exploration results gave a significant reference to high-exactness forecast of soil supplement substance.

In [18] creators gave study to evaluate the capability of infrared thermography (IRT) detecting by checking soil surface temperature (SST) with a high spatiotemporal and warm goal in an adaptable horticultural application. Creators checked soil surface temperature (SST) varieties more than a 48 h period for three medicines in a grape plantation: uncovered soil (plot S), 100 percent biochar cover (plot B), and biochar-corrected dirt (plot SB). The SST of all plots was observed at 30 min spans with a stand mounted IR warm camera. The dirt temperature at 10 cm profundity in the S and SB plots was checked ceaselessly with a 5 min goal test. Plot B had more prominent day by day SST.

In [19] creators show study to inspect the expected advantages of warm imaging on cultivating, information was accumulated from existing exploration on warm imaging and examination of soil arrangement to make a table with a shading plan as a rule for investigating the state of soil. The outcomes show that warm imaging can identify water creation and measure the temperature of soil; this can permit ranchers to decide the ideal temperature and water arrangement for life forms that favor prolific soil. The shading plan goes about as a simple reference and compelling device for checking soil attributes/creation. Hence, warm imaging, with its simple use, can possibly be used generally all through agribusiness to actually take a look at soil richness.

In [20] Spatial expectations of soil full scale and miniature supplement content across Sub-Saharan Africa at 250 m spatial goal and for 0-30 cm profundity stretch are introduced. Forecasts were delivered for 15 objective supplements: natural carbon (C) and aggregate (natural) nitrogen (N), complete phosphorus (P), and extractable-phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulfur (S), sodium (Na), iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), aluminum (Al) and boron (B). Model preparation was performed utilizing soil tests from ca. 59,000 areas (an aggregation of soil tests from the AfSIS, EthioSIS, One Acre Fund, VitalSigns and inheritance soil information) and a broad heap of remote detecting covariates notwithstanding landform, lithologic and land cover maps. A group model was then made for every supplement from two AI calculation.

In [21] creators dissected the Blue-green fluorescence (BGF) outflow by leaves of sound sunflower plantlets, and carried out BGF and warm imaging in the discovery of the contamination by O. Cumana during underground parasite advancement. Expansions in BGF discharge were seen in leaf sets of solid sunflowers during their turn of events. Lower BGF was reliably identified in parasitized plants all through leaf development and low shade focus was recognized at definite time, supporting the understanding of a reduction in auxiliary metabolites upon

disease. Parasite-prompted stomatal conclusion and happening decrease were proposed by hotter leaves of immunized sunflowers all through the investigation. BGF imaging and thermography could be executed for quick screening of sunflower rearing material. The two strategies are important ways to deal with survey the cycles by which O. Cumana changes physiology (optional digestion and photosynthesis) of sunflower.

In [22] exploratory review pointed toward assessing the capability of involving infrared thermography for planning full scale porosity at the dirt surface and assessing the number and size of such macropores. The introduced strategy was applied to a limited scale study (lab soil flume).

In [23] creators have referenced those Spectroscopic strategies are among the ones generally used for this reason and close to infrared spectroscopy is the most helpful technique up to this point. Creators show that a discrete frequency close to infrared spectroscopic gadget is created and tried. Alignment is finished utilizing halfway least squares relapse technique. The on-field testing versus lab testing shows a high worth of coefficient of assurance.

In [24] creators have dissected impact of temperature on phosphorus content of the dirt. The progressions of different parts of phosphorus under various warm radiation temperature, picking soil of defensive farmland, through indoor warm radiation recreation, soil was uncovered under different high temperatures going from 100 ℃ to 700 ℃, the outcomes showed that warm radiation had little impact on absolute phosphorus and accessible phosphorus fundamentally expanded between 200-300 ℃. As warm radiation temperature was expanded, water-solvent and approximately joined phosphorus content had a pattern of first increment then, at that point, decline, arrived at the most extreme at 300℃. Iron (Fe) P content and calcium (Ca) P content commonly expanded, aluminium (Al) P content and blocked (O) P content fundamentally diminished. Under the radiation temperature between 100 ℃ and 400 ℃, the dirt natural phosphorus converted into inorganic phosphorus, Al-P and blocked P converted into water-solvent and inexactly consolidated phosphorus and Ca-P. Under the radiation temperature somewhere in the range of 400℃ and 700℃, the Water-dissolvable and free bound phosphorus and Al-P converted into Fe-P, Ca-P and impeded P. Thorough investigation, 200-300℃ was positive when soil cleansing applied with warm radiation.

In [25] creators researched the capability of the infrared spectroscopy procedure for non-horrendous estimation of soil properties. For the review, 280 soil tests were gathered from a few locales in Zhejiang, China. Information from close to infrared (NIR, 800-2500 nm), mid infrared (MIR, 4000-400 cm-1), and the joined NIR-MIR locales were contrasted with figure out which delivered the best expectation of soil properties. Least-squares support vector machines (LS-SVM) were applied to build adjustment models for soil properties like accessible nitrogen (N), phosphorus (P), and potassium (K). The outcomes showed that both unearthly areas contained significant data on N, P, and K in the dirt contemplated, and the consolidated NIR-MIR locale did somewhat more awful than either the NIR or MIR district. This work exhibited the capability of LS-SVM coupled to infrared reflectance spectroscopy for more productive soil investigation and the securing of soil data.

In [26], creators have given highlighted Application of quantitative models for noticeable close infrared beam spectroscopy for the estimation of soil-accessible potassium. These outcomes show that the indicators of soil-accessible potassium display various impacts with 29 pretreatment techniques and eight relapse calculations. Creators tracked down that a mix of three techniques, Savitzky-Golay, standard ordinary variate, and oust propensity, would be advised to soundness than other pretreatment strategies. The supporting calculations that structure a troupe of different feeble indicators have preferable precision and security over other relapse calculations. Accordingly, a more powerful and dependable noticeable close infrared beam (VIS-NIR) model is proposed, which can be utilized across ventures to evaluate the dirt accessible potassium fixation.

In [27] an audit is given which summarizes the use of photograph acoustic and photograph warm spectroscopies for the examination and portrayal of soils and soil natural matter and talks about the viewpoints around here.

In [28], creators have given technique for estimating the NPK levels in tomato plants, a non-destructive assurance strategy in view of multispectral three-layered (3D) imaging was proposed. Multiview RGB-D pictures and multispectral pictures were simultaneously gathered, and the plant multispectral reflectance was enlisted to the profundity organizes as indicated by Fourier change standards. In light of the Kinect sensor present assessment and self-adjustment, the bound together change of the multiview point cloud coordinate framework was understood. At last, the iterative nearest point (ICP) calculation was utilized for the exact enlistment of multiview point mists and the recreation of plant multispectral 3D point cloud models. Utilizing the standardized grayscale comparability coefficient, the level of otherworldly cross-over, and the Hausdorff distance set. The outcomes showed that the multispectral reflectance could be enlisted to the Kinect profundity arranges precisely founded on the Fourier change standards, the remaking exactness of the multispectral 3D point cloud model met the model reproduction needs of tomato plants. Utilizing back-spread counterfeit neural

organization (BPANN), support vector machine relapse (SVMR), and Gaussian cycle relapse (GPR) techniques, assurance models for the NPK substance in tomato plants in light of the reflectance qualities of plant multispectral 3D point cloud models were independently built. The NPK substance assurance execution of these models were steadier than those of single-view models.

In [29] creators analyzed the discovery capacity of laser-instigated breakdown spectroscopy (LIBS) combined with help vector relapse (SVR) and get an exact and dependable technique for the quick identification of each of the three components. An aggregate of 58 manure tests were given by Anhui Huilong Group. The assortment of tests was isolated into an adjustment set (43 examples) and an expectation set (15 examples) by the Kennard-Stone (KS) strategy. Four distinct boundary enhancement techniques were utilized to develop the SVR adjustment models by component fixation and the power of trademark line factors, specifically the customary network search strategy (GSM), hereditary calculation (GA), molecule swarm improvement (PSO), and least squares (LS). The preparation time, assurance coefficient, and the root-mean-square mistake for all boundary advancement techniques were dissected. The outcomes showed that the LIBS procedure combined with the least squares-support vector relapse (LS-SVR) technique could be a solid and precise strategy in the quantitative assurance of N, P, and K components in complex lattice like compound manures.

In [30] creators introduced a point-by-point examination of supplement streams and misfortunes in the "feed consumption discharge lodging stockpiling treatment application" excrement chain, while thinking about contrasts between domesticated animals' creation frameworks. Creators assessed the natural misfortune from the fertilizer fasten in 2010 to be up to 78% of the discharged nitrogen, and more than half of discharged phosphorus and potassium. Most prominent misfortunes happened from lodging and capacity stages, by means of NH3 outflows (39% of absolute nitrogen misfortunes), and direct release of excrement to water bodies or landfill (30-73% of complete supplement misfortunes).

In [31] creators investigated the chance of assessing nitrogen content in a field grass utilizing warm pictures and fake neural organizations (ANN), in view of the reason that plant herbage with a higher N content would be retaining all the lighter energy for dynamic photosynthesis, along these lines transmitting abundance energy as hotness. This is the primary announced review to utilize warm infrared pictures and ANN to assess field nitrogen content under various states of nitrogen (N) compost. The examination was directed in a controlled environment climate to segregate the impact of a vital natural boundary, accessible soil N, on field grass herbage temperatures. The undertaking was the initial move towards fostering a brilliant manure spreader to oversee N applications in light of plant temperature. Image combination is in its early stages in the utilization of Digital Soil Mapping, and the consolidation of the picture dish honed unearthly lists into the dirt forecast models has only sometimes been broke down. This examination performed picture skillet honing of Landsat 8, WorldView-2, and Pleiades-1A in a smallholder town called Masuti in South India utilizing three container honing strategies: Brovey, Gram-Schmit (GS), and Intensity-Hue-Saturation (IHS) techniques. The examination broke down the connections between multispectral (MS) and container honed (PAN) ghastly lists and soil all out nitrogen (TN), fostered the dirt TN forecast models utilizing Random Forest strategies, and investigated the impacts of various PAN phantom files on soil TN expectation models. The outcomes showed the phantom conduct of PAN otherworldly lists and MS ghostly lists were comparative. The outcomes additionally showed that dirt TN models in light of MS/PAN unearthly lists have marginally higher model execution and more itemized portrayal of TN spatial example contrasted and soil TN models in view of MS ghastly lists. Soil TN models in view of the GS PAN and MS ghastly files achieved somewhat higher expectation precision contrasted and those in light of other PAN and MS phantom files. This exploration advocates the advancement of picture skillet honing methods in computerized soil planning and soil supplement the board research.

III. COMPARATIVE STUDY OF METHODS

The nutrient testing methods are considered for comparative of different papers. The total number of count of papers is indicated with respect to methods used. Figure 1 shows the graph of comparative method for. From Image processing Methods many researchers make use of thermal images for nutrient analysis. Also, some researchers make use of color-based analysis. Figure 2 shows comparative image types used in nutrient analysis.

The change in potassium from lab testing is plot in figure 4. It is found that as mixture level in grams increases, potassium contents also increase.

The change in electrical conductivity from lab testing is plot in figure 4. It is found that as mixture level in grams increases, electrical conductivity contents also increase.

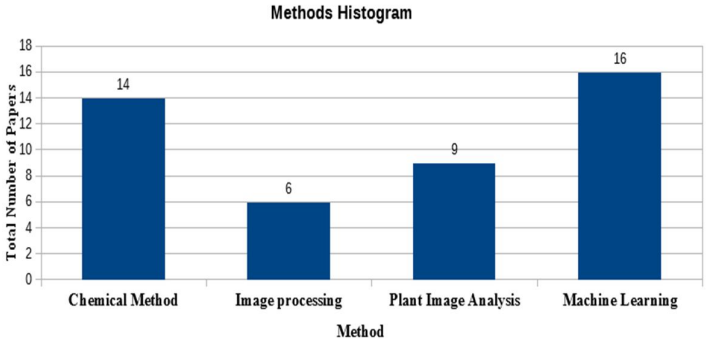

Figure 1: Comparative of different methods vs number of papers contributing

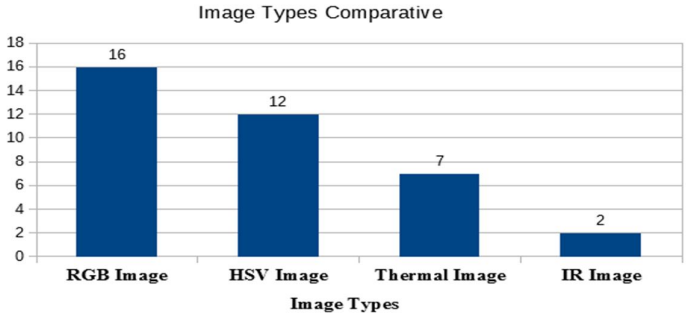

Figure 2: Comparative of Image types used in different papers

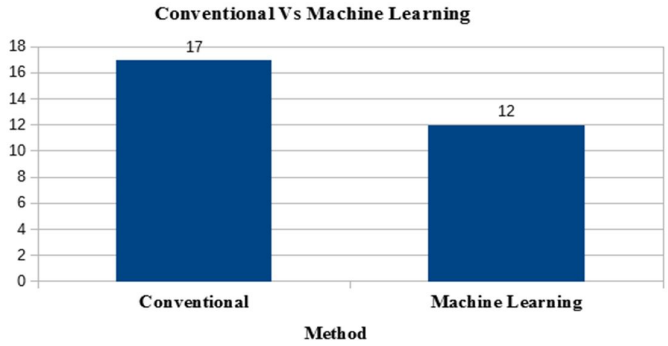

Figure 3: Comparative count of conventional vs machine learning methods

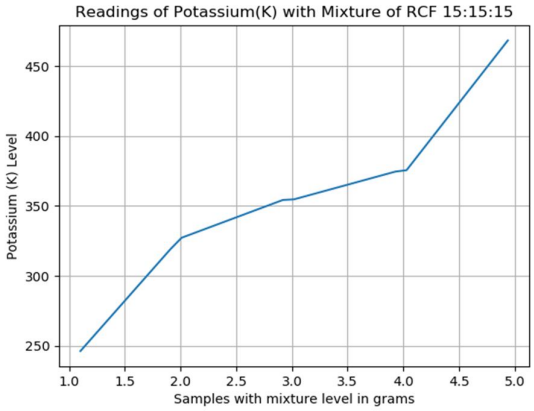

Figure 4: Change in potassium with respect to change in mixture level

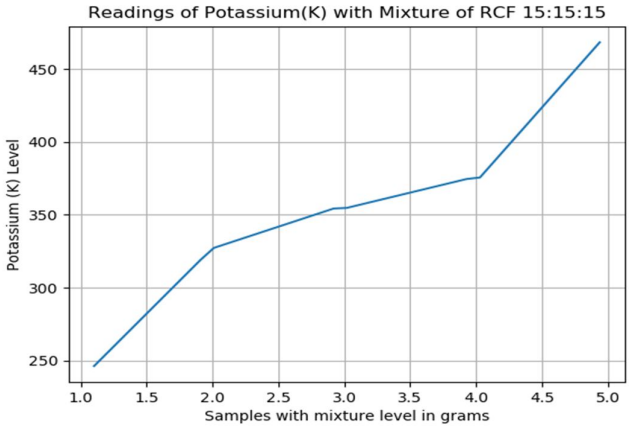

Figure 5: Change in electrical conductivity with respect to change in mixture level

IV. Conclusion

In the field of agriculture, selective crops farming with respect to soil content plays important role for economic development. The soil content and with respect to it the selection of crop is important aspect for getting better and assured results. Soil testing plays important role for selecting right crop to be cultivated in the farm field. The right economic approach starts from testing the soil contents and respective changes with respect to time in the soil as per consumption and age of the crops. The nutrient content analysis of the soil is important aspect and this paper contributes to form a platform for understanding the soil testing methods for analyzing its nutrient contents.

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Web Service Ranking and Classification using Intelligent Techniques

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***Abstract*—In the fastidious ever-growing world of businesses when the constant exchange of web services takes place, it is important for the buyer and seller to understand where their web service stands. A web service is a set of open protocols and standards that allow data to be exchanged between different applications or systems. Web services can be used by software programs written in a variety of programming languages and running on a variety of platforms to exchange data via computer networks such as the Internet in a similar way to inter-process communication on a single computer. The QWS dataset version II is collected from literature which is not having class level. The dataset is normalized using min-max method and employ stratified cross validation to make different fold systems. To make the different web services into different class levels, we employ two different clustering algorithm viz. K-means, and Fuzzy C-means to cluster different web services into different clusters. To test the different class level simulated by clustering algorithm, machine learning algorithm is employed i.e. Genetic Programming (GP), and Random Forest to test the efficacy of the model. From our experimental results, it is observed that C-Fuzzy means clustering provided the best clustering level compared to other techniques. The average accuracy of 99.23% provided by Genetic programming.**

***Index Terms*— Fuzzy C-means, K-means, Genetic Programming, Random Forest, Intelligent Techniques, Web Services.**

I. INTRODUCTION

The inter connectivity of thousands of different types of computers across the globe that are a component of various networks is known as the Internet. A web service is a defined technique for message transmission between client and server applications on the World Wide Web. A software module called a web service is designed to perform a certain set of tasks. In cloud computing, web services are searchable and dynamically typed across a network. The client that called the web service would be able to receive functionality from the web service [1].

A web service is a collection of open protocols and standards that enable the transfer of data across various software programs or computer systems. In a manner similar to inter-process communication on a single computer, web services may be used by software programs created in a range of programming languages and running on a variety of platforms to exchange data across computer networks like the Internet.

A web service is any piece of software, application, or cloud technology that connects to the internet and exchanges data messages, typically in the form of XML (Extensible Markup Language), using defined web

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protocols (HTTP or HTTPS). Web services have the advantage of allowing programs developed in different languages to connect with one another by exchanging data over a web service between clients and servers. A client invokes a web service by submitting an XML request, which the service responds with an XML response**.**

A. The functions of web services are

- It can be accessed through intranet networks or the internet due to the standardized XML message protocol.
- Independent of programming language or operating system.
- It is self-describing when using the XML standard.
- It is easy to find using a location-based strategy.

The basic Components of Web Service are XML and HTTP is the most fundamental web services platform. The following components are used by all typical web services:

A SOAP (Simple Object Access Protocol):

It is a message protocol that is independent of transport. Sending XML data in the form of SOAP Messages is the foundation of SOAP. Each communication includes an XML document that serves as an attachment. Only the XML document's structure, not its content, follows a pattern. The most advantageous aspect of Web services and SOAP is that all communication is done via HTTP, the industry-standard web protocol [2].

B. UDDI (Universal Description, Discovery, and Integration)

UDDI [2] is a standard for specifying, publishing and discovering an online service provider. It offers a specification that makes hosting data through web services easier. In order for a client application to find a WSDL file and learn about the various activities that a web service performs, UDDI offers a repository where WSDL files can be hosted. As a result, the UDDI, which functions as a database for all WSDL files, will be completely accessible to the client application. The necessary data for the online service will be stored in the UDDI register, just as a phone book would have a person's name, address, and contact information. So that a client application can determine its location [3].

C. WSDL (Web Services Description Language)

A web service cannot be used if it cannot be located. The web service's location should be known to the client making the web service request. In order to invoke the relevant web service, the client application must, second, comprehend what the web service does. This is done using the WSDL, or Web services description language. Another XML-based file that describes what the web service performs to the client application is the WSDL file. Using the WSDL document, the client application will be able to comprehend where the web service is located and how to access it [2].

In this paper, QWS version II [4, 5] dataset is collected from literature which is not having any class labels. To categorize the web service, it is propose to employ K-means and Fuzzy C-means clustering and followed by machine learning algorithm to the accuracy of categorization.

The remainder of the paper is organized as follows. Section II provides a concise discussion of the literature survey. A summary of machine learning approaches is given in Section III, and a thorough explanation of the results and discussions is given in Section IV. Finally, the paper's conclusion is presented in section V.

II LITERATURE SURVEY

To evaluate and categorize web services, a variety of machine learning approaches have frequently been used. As a WSDL component is crucial for classifying web services, Fokaefs et al. [6] used the VTracker tool to represent a WSDL file by calculating the minimum distance between two trees. From this, they discovered that the simulation results' accuracy varied significantly if the WSDL component was removed from the data. The tool's output is the proportion of XML models for two WSDL interfaces that have had items added, altered, or removed.

Romano et al. [7] use of a comparable technique known as WSDLDiff allows for the analysis of WSDL interface evolution without the need for manual inspection of the XML modifications. In order to extract highly dominating attributes using feature selection, Aversano et al. [8] compare the associations between the various attributes and also extract the relationship among attributes by employing machine learning. To represent various UML diagrams, Xing et al. [9] chose UMLDiff and discovered the function of each attribute in the classification

of web services. In order to categorize and forecast whether web services will be suitable for a given purpose, Zarras et al. [10] concentrated on Amazon Web services' progress in the real world.
A number of SOA anti patterns were discovered by Kral et al. [11] and several anti-patterns in SOA architecture were also addressed. Recently, Moha et al. [12] used the SODA for SCA systems rule-based approach (Service Component Architecture). Later, this technique was expanded for Web service ant patterns in SODA by Palma et al. [13]. Using a set of WSDL metrics, W is used to specify/identify the primary symptoms that characterize an anti-pattern. WSDL is a declarative rule specification based on a domain specific language (DSL). Based on eight bad practises in the development of WSDL for Web services, Rodriguez et al. [13] and Mateos et al. [14] presented a set of principles for service providers to follow when producing WSDLs. Recently, Ouni et al. [15] proposed a search-based approach based on standard GP to find regularities, from examples of Web service anti patterns, to be translated into detection rules. Most recently, Mohanty et al.[2, 16,17] employed neural networks, decision Tree and support Vector Machine to classify the To uncover regularities from samples of Web service anti patterns to be converted into detection rules, Ouni et al. [14] recently presented a search-based technique based on conventional GP. Most recently, Mohanty et al. [2, 16, 17] suggested data envelopment analysis and FMADMA to categorize various web services based on the quality of web services. They also used neural networks, decision trees, and support vector machines to identify the quality of web services. Quality of web services and also proposed data envelopment analysis and FMADMA to classify different web services based on the quality of web services.

III. METHODOLOGY

In this paper, two different types of clustering method used to classify the web services into different class labels based on their quality attributes.

(i) K-means algorithm
(ii) Fuzzy C-means Clustering Algorithm

A. K-means Algorithm

K-Means Clustering [19, 20, 21] is an Unsupervised Learning algorithm, which groups the unlabeled dataset into different clusters. Here, K specifies how many pre-defined clusters must be produced as part of the process; for example, if K=2, there will be two clusters, if K=3, there will be three clusters, and so on. It gives us the ability to divide the data into various groups and provides a practical method for automatically identifying the groups in the unlabeled dataset without the need for any training. Each cluster has a centroid assigned to it because the algorithm is centroid-based. This algorithm's primary goal is to reduce the total distances between each data point and its corresponding clusters. The algorithm takes the unlabeled dataset as input, divides the dataset into k-number of clusters, and repeats the process until it does not find the best clusters. The value of k should be predetermined in this algorithm.
The two major functions of the k-means clustering algorithm are:

- Through an iterative approach, chooses the best value for K Centre points or centroids.
- Each data point is assigned to the nearest k-center. A cluster is formed by the data points that are close to a specific k-center.

Hence each cluster has data points with some commonalities, and it is away from other clusters.

B. Fuzzy C means Clustering

It is an approach for unsupervised learning that enables us to create a fuzzy division out of data. The approach is dependent on a parameter m that represents how fuzzy the result is. The classes will become muddled for high values of *m*, and all items will tend to belong to all clusters. The parameter *m* affects how the optimization problem is solved. In other words, different *m* choices will likely result in distinct partitions. An illustrating the impact of the *m* selection determined by the fuzzy c-means is provided below.
Instead of belonging to only one cluster as is the case with classic k-means, each point has a probability of being a part of each cluster with fuzzy clustering. In Fuzzy-C Means clustering, each point has a weighting associated with a specific cluster, as a result, a point is not so much "in a cluster" as it is "affiliated" with the cluster, with the degree of association being decided by the inverse distance to the cluster's centre. It is actually performing more work than K means, fuzzy-C means will typically run more slowly. With each cluster, each point is reviewed, and each evaluation involves more processes. K-Means only needs to calculate distance, whereas fuzzy c-Means needs to perform a full inverse-distance weighting.
The process flow of fuzzy c-means is enumerated below:

1. Assume that there are k fixed clusters.
2. **Initialization:** Calculate the likelihood that each data point x_i belongs to a specific cluster k using a random initialization of the k-means μ_k and the formula P (point x_i has label $k|x_i, k$).
3. **Iteration**: Recalculate the cluster centroid as the weighted centroid given the membership probability of all the data points. x_i

$$\mu_k(n+1) = \frac{\sum_{x_i \epsilon k} x_i * P(\mu_k|x_i)^b}{\sum_{x_i \epsilon k} P(\mu_k|x_i)^b} \qquad (1)$$

4. **Termination**: Continue iterating until convergence or up to the amount of iterations that the user specifies (the iteration may be trapped at some local maxima or minima).

C. Genetic Programming

GP is an extension of GA that does away with the requirement that the chromosome representing the individual be a binary string of a specific length. In GP, the chromosome functions as a kind of programs that is performed to provide the desired consequences. A binary tree with operators and operands is one of the most basic types of programs, and it works for this application. As a result, each answer can be evaluated as an algebraic expression. According to Koza [23] "GP can be used to solve a huge number of seemingly dissimilar issues from many different domains," which is a startling and counterintuitive result.
The executional steps of Genetic Programming are as follows:

1. Generating an initial population (generation 0) of distinct computer programs at random from the available terminals and functions.
2. The next sub-steps (referred to as a generation) should be applied to the population iteratively until the termination criterion is met.

- Run each program in the population and determine (explicitly or implicitly) its fitness using the fitness measure for the problem.
- With reselection permitted, choose one or more individual program(s) from the population with a probability depending on fitness to take part in the genetic processes in (c).
- By conducting the following genetic operations with the following probability, create new individual program for the population:
- Copy the individual program you have chosen to the new population. - Crossover: By recombining two selected program ' randomly chosen portions, produce new offspring program(s) for the new population. - Mutation: By randomly changing a randomly selected portion of one selected program, one new offspring program will be produced for the new population. - Operations that change the architecture.

3. The best program in the population created throughout the run (the best-so-far person) is collected and declared as the run's outcome once the termination requirement has been met. If the test runs well, the outcome might be a solution or a close approximation to the issue.

D. Random Forest

Random Forests are an example of Ensemble methods that are used for the purpose of classification. If numerous decision trees are used with a random selection of attributes, the result is a random forest, which improves the performance of a great example. At each split, a fresh random sample from the features is selected for each tree [24, 25, 26]. For instance, the dataset can have a highly potent feature. Most trees would use that feature as the top split when using bagged trees. A group of trees with a lot of correlation would come from this. Such highly connected numbers cannot be averaged, hence the gap will remain. Random forests attempt to build trees by randomly deleting features from each split, which is advantageous [26].

Algorithm
Decision Tree (T, P, y)

- *Initialize a new Decision Tree(DT) with a single root node*
- *If one of the stopping criteria is met, then, label the root node in DT as a leaf with most prominent value of 'y' in DT.*
- *ELSE, search for a distinct function (f(p)) at the input attributes value such that splitting DT according to f(p)' outcomes(v_1, v_2, v_3,……v_n) gains the best splitting metric with highest accuracy.*
- *If best splitting metric>'threshold' THEN label't' with f(p).*

- *FOR each outcome v_i of f(p)*
  - *Set ST1=DecisionTree (BS(f(p))= (yDT, P,y)*

Where BS=best splitting metric.

- *Connect the root of t'_{DT} to sub tree 'e' with an edge that is labelled as v_i*
- *END FOR*
- *ELSE mark the root node in T as a leaf with the most common value of 'y' in S as label*
- *END IF*
- *END IF*
- *RETURN DT*

T= Training data, p= prediction, y= class label

IV. Results and Discussions

In this paper, Quality Web Services (QWS) dataset of version II is collected from literature. The dataset is having 10 attributes viz. Response time, Availability, Throughput, Successability, Reliability, Compliances, Best Practices, Latency, and Documentation and having no class labels [18]. The data set is having two thousand five hundred seven samples of records. Firstly, the dataset is normalized by using min- max method so that all data point within the range of 0 and1. As dataset is to be categorized into different labels as to find out the web services rank demanded by different software organizations claimed to be a particular category, two different clustering techniques are employed viz. K-means algorithm and Fuzzy C-means algorithm to the web services to categories into four labels. By employing Fuzzy C-means algorithm, it is observed that there are 766 samples of web services categorized into cluster level '1', 706 samples of web services in category '2' followed by 549 in category '3' and 485 web services comes under the category of class '4'. But in case of K-means algorithm, it is also observed that there are 369 samples of web services categorized into '1', 466 samples of dataset categorized into category '2', followed by 548 samples of web services in category '3' and finally 1123 web services categorized into category '4'.

As it is found that the two algorithm categorized the web services into different clusters, it is required to test their accuracy level by employing machine learning techniques. Accordingly, two machine learning techniques are employed i.e. Random Forest and Genetic Programming to find out the accuracy of different clusters based on their quality attributes.

TABLE I. WEB SERVICE RANKING BY FUZZY C-MEANS ALGORITHM AND ITS ACCURACY BY MACHINE LEARNING TECHNIQUES

Sl. No	**Techniques**	**Fold-1 (%)**	**Fold-2(%)**	**Fold-3 (%)**	**Fold-4 (%)**	**Fold-5 (%)**	**Fold-6 (%)**	**Fold-7 (%)**	**Fold-8(%)**	**Fold-9 (%)**	**Fold-10 (%)**	**Average (%)**
1	GP	99.9	99	98.9	99	98.9	99.9	98	99.9	98.9	98.9	99.23
2	Random Forest	97	96.8	97	97	98	97.7	97.8	97	97	98	97.33

It is learned from Table 1 that folds 1 and 6 had 99.9% accuracy for clustering. The accuracy of the folds 2, 4, and 8 is 99%, while the accuracy of the folds 3, 5, 9, and 10 is 98.9%, on average of 99.23% for results derived from GP simulation. The accuracy of folds 1, 3, 4, 8 and 9 is observed to be 97% using Random Forest. The accuracy of folds 5 and 6 is 98%. The accuracy for fold 2 is 96.8 %, fold 6 is 97.7%, fold 7 is 97.8%, and the average accuracy is 97.33%.

TABLE II. WEB SERVICE RANKING BY K-MEANS ALGORITHM AND ITS ACCURACY BY MACHINE LEARNING TECHNIQUES

Sl.No	Techniques	Fold-1(%)	Fold-2(%)	Fold-3 (%)	Fold-4 (%)	Fold-5 (%)	Fold-6 (%)	Fold-7 (%)	Fold-8(%)	Fold-9 (%)	Fold-10 (%)	Average (%)
1	GP	99.9	99	98.9	99	98	99	99.9	97	99	98	99
2	Random Forest	97.3	94.8	95.6	97	95.4	97.7	96.8	97	96.5	95.9	97.33

Web services are ranked using K-means clustering in Table 2, the GP and Random Forest are used to test the precision of the rankings. From the simulated study, it can be seen that folds 1 and 7 have accuracy of 99.9%, while folds 2, 4, 6, and 9 have accuracy of 99%. The maximum accuracy was determined to be 99.9% for folds 1

and 7, which is pretty, incredibly good. Similar to the random forest method, the average accuracy of web services ranking were determined to be 97.33%, which is also quite good.
Oveally, it is observed that both techniques are predicted high degree of accuracy as far as web service is concerned.

V CONCLUSION

With the ubiquitous use of web services, it is crucial to track down and evaluate their quality. The machine learning models (techniques) that have been employed to categorize these web services into four main categories based on quality criteria. In this paper, fuzzy C-means and K-means algorithms were used to rank various web services into four clusters. The QWS dataset has been subjected to analysis using a number of supervised models, including A, B, C, and D. Later, the accuracy label of the clustering approaches used by the K-means and Fuzzy C-means algorithms was checked the accuracies using Random Forest and Genetic Programming. In this paper, the scikit learn library has been used for simulation. While Random Forest approach has done quite well, genetic programming has performed exceptionally well.
To increase the mannequin's accuracy, feature scaling and hyper parameter tuning have been used. The phases of machine learning modelling, from data splitting into train and test sets (used exclusively for hyper parameter tuning), through computation of average accuracies for all 10 folds presented. Finally, we draw the conclusion that, given the collection of quality attributes, this study might be utilized to classify a new web service into one of the four major classifications.

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Statistical Test for Distributed Cluster-based Intermittent Fault Detection in Wireless Sensor Networks

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***Abstract*—Due to the regular growing number of applications, distributed WSN enhanced to enjoy very large appeal. Occasionally, a small number of distributed nodes are drop some data value or unable to transmit accurate data to the respective or specific fusion Centre or to a nearby node. In the process of distributed network's performance suffers significantly because it is not aware of the node's malfunction. Data from the defective or affected node might be treated as outliers. So that for identify the data sent by the problematic sensor node can be found using a different statistical test. In this paper, proposed a DSFDOA method that a clustering-based statistical Z-test and a self-detectable distributed fault detection system are bringing forward. Put forward in DSFDOA and distributed sensor node algorithm is perform in Python and MATLAB, and staging is measured in terms of different parameter like false data alarm rate and detection data accuracy (DDA) & (FDAR). The results initiate demonstrate that the proposed approach shown performs better than the current algorithms and when compared to the execute results of the previous algorithm.**

***Index Terms*— WSN, Fault diagnosis, K-mean, Intermittent fault.**

I. INTRODUCTION

WSN is very large network but it represent of small region in a distributed manner , independently energy sensor distributed nodes called "wireless sensor networks" (WSNs) are dispersed around an small area and used to collect data, identify unusual events, and communicate wirelessly. This new technology has become a reality because to rapid advancements in embedded micro sensing, MEMS, and wireless communication [1], [2]. In general scenario in different time sensor nodes are remotely sensing the different applications include the specific environment, data monitoring, precision statistic of agriculture, medical observation and its applications. The major objective of the sensor nodes are Sensing the node, processing the data, and communication between to specific data points based on the components that when combined in a small device, enable a wide range of these applications. The effective design and deployment of WSNs has grown in importance due to their many widely used applications.

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The key characteristics of WSNs are availability, sustainability, and consistent performance, which can be harmed by a variety of things like external noise, topology changes brought on by broken links, energy depletion, hardware failure, malicious attacks, etc. The deployment of sensor nodes in unattended regions frequently results in them becoming defective. Any environmental changes have an impact on the sensors' performance because of message corruption from impulsive noise and topological changes, as well as message loss. Different fault types, including hard faults, soft faults, transient faults, byzantine faults, and others, can occur in WSNs. Sometimes a sensor node will be silent [3, 4], or it will send the fusion centre incorrect information. Soft faults occur when a sensor node exhibits anomalous behaviour for an extended period of time [5, 6]. There should be a decrease in accuracy in the estimating or procedure for detection if the network does not recognise that sort of problem and processes the data under the assumption that the particular sensor node is trouble-free. Finding such a malfunctioning node that is producing anomalous data is thus a crucial and difficult task in WSNs.

For the purpose of locating the soft faulty node, the centralised algorithms for fault diagnosis described in the literature [7] make larger use multi-hop of data exchange among the sensor nodes. The communication process uses the majority of the energy; consequently, the algorithms do not use little energy. [8]. It is vital to build an algorithm that would utilise reduced interaction between the fault nodes discovery because the sensor nodes in distributed WSNs operate with specific small range and limited energy power with battery and typically non-renewable resource. The distributed detection strategy is suggested here in place of the centralised method to improve the energy efficiency of the detecting algorithm.

The local coordination strategy [9], one of the most crucial techniques in distributed frameworks, is the foundation of the suggested algorithm. Each sensor node works along with its neighbours to find and recognise the network's malfunctioning sensor nodes and determine the degree of node confidence interval by examining the next hop neighbour distributed sensors' data. Here, the self-determination capabilities of each sensor limit the packet transfer. The cluster approach groups comparable types of objects into groups and defines how to divide elements so as to reduce the degree of similarity and dissimilarity [3,17]. The clustering algorithms have many applications in several domains, including learning theory, visualization, artificial intelligence, neural networks, and statistics. They are highly helpful in real-world settings. The clustering method, which is based on pattern categorization under unsupervised machine learning, timer series analysis, and statistical data, is also employed in practical applications [12,18] of distributed clustering.

II. Related work

Invalid data must be protected so that the network performance doesn't suffer. Sensor malfunction or environmental noise can result in faulty data. This section discusses sensor errors and significant methods that have been put out to date to prevent them in sensor networks. The two main categories of defect detection algorithms are centralised and distributed approaches. In the centralised approach, the fusion centre gathers information from all the cluster head or centroid with other distributed sensor nodes in a specified range and determines which sensor node is malfunctioning or faulty based on factors such as loss of data packets[10-11], communication delay, absence of frequent network activity [12-13], low buffer occupancy [14], the concept of channel loading, etc. Due to flooding, each of the aforementioned strategies raised the dispersed overhead of communication and its computation on the cluster network.

More nodes powered are used by the status exchange-based strategy outlined in [15]. The amount of energy left over is used as a warning sign for node faulty. By doing this way, additional node energy is used & the node quickly enters a dead state. Each sensor node in a distributed WSN can, to some extent, detect if it is faulty or fault-free, just like a biological component. Often referred to as a self-monitoring technique and show the node capability. This method uses less energy since it sends less information to the fusion centre or its neighbours. Authors suggested a self-monitoring strategy in [16]. In this method, each sensor node updates its neighbours once per predetermined amount of time. The neighbour then recognises the node's presence and notifies the fusion centre of its status. When that time period has passed and the neighbour has not discovered any update packets, the neighbour announces that the node might not exist and transmits information to the fusion centre. The data from each sensor is reported to the cluster head, and the cluster head is analysed by the fusion center to determine the state of each node's fault in the network.

Since each sensor is aware of its neighbours, this method employs a static network. However, the strategy covered in this study is used in a dynamic clustered network where each cluster gather the information of sensor node determines its status by processing the data it receives and identifying its neighbours based on the data at each time interval. Prior to contacting the central, each node in the nearby based on the clustering and

coordination approach determines its status using information from its neighbours. A nearby coordination strategy is employed in [9]. Each node in this system determines its nodes status is faulty or fault free based on the discrepancy between two data points and its own cluster sensed data & by using the median method to reading of its neighbours. Clustering increases algorithm complexity, which results in very little or extremely poor energy efficiency. Numerous nodes were deployed in the same direction out of their own interest thanks to the multilayer clustering method. The node assembles or resembles the cluster node, depending on the gateway between them [11,19], and has effectively addressed distributed WSN clustering.

III. Fault and Network Model

The network model of a decentralised arbitrary network with dispersed sensors is described at the outset of this section. A fault model is then discussed, which provides a concise explanation of how the fault entered the foundational network.

In this model we consider a distributed cluster based sensor network with containing of K sensor nodes, such as Kl, K2, K3……..K_N, which are distributed at random across a rectangular terrine. Assume that the every node has some specific transmission ranges of its cluster head and all the sensor nodes are the same and uniform. In order to make things simple, we'll suppose that each sensor node Ki can link to every sensor node and located inside the peripheral of cluster Ci where cluster sensor node Ki is regarded to be present at the centre of Ci. The cluster head data points has an own transmission network range of Si is the same as the radius I of Ci.

The suggested technique takes into account any softly malfunctioning sensor nodes that are present in the dynamic distributed WSNs. Since the malfunctioning sensor faulty nodes are still functional, it is presumed that all the faulty nodes have transmitting data to their close neighbour by using one-hop neighbours. These types of node give inaccurate information to their nearby nodes because of less or more range of data noise or the node failure of any sensor node data point based on the components.

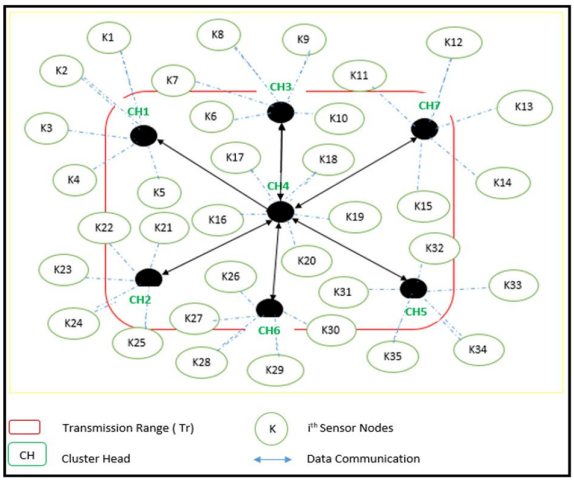

Figure 1. System model for distributed Network

Data points are divided into K clusters Sj (J = 1, 2,..., K) and associated with a representation using K-mean clustering procedures (cluster centres). In order to construct a better algorithm, the key phase of the proposed method is the division of data points into a set of represented vectors and K-mean clustering. Until a halting condition is satisfied, the mapping process is restarted starting with a starting set of cluster centres. The Lloyd iteration is used to represent the suggested distributed algorithms (based on K-mean).

Find the partition of K, where i=1, 2,..., K and $Ki=\{X|d(X,C_i) \leq d\ d(X,C_j)\ \}$ for all $I \neq j$, then calculate the cluster head for each cluster to generate a new sensor node that set of clusters representing KC_{p+1}, given a set of cluster centres $KC_p=\{C_j\}$. Find the partition of K, where i=1, 2,..., K and $Ki=\{X|d(X,Ci) \leq d\ d(X,Cj)$ for all $I \neq j$. Then, given a set of cluster centres KCp={Cj}, calculate the cluster head for each cluster to produce a new sensor node that set of clusters representing KCp+1.

In the distributed process 7 no. of cluster head representing the network structure. All the cluster head CH1, CH2, CH3, CH5, CH6, and CH7 are connected through the main cluster or centroid CH4. Each cluster heads are sensing the connected nodes and gather the information. Based on the distance between to data point measure the

distance and find out the data or node is faulty or fault free sensor node. Here sensor nodes are distributed and divided into uniform manner and find out the closest or nearest cluster head and do the communication. Each cluster head collected or connected with 5 no. of sensor nodes.
CH1 is gather the information from connected sensor nodes like K1,K2,K3,K4,K5 , CH2 cluster head collect the information from K2,K22,K23,K24 and K25, CH3 cluster head collect the information from K26,K7,K8,K9,K10 sensor nodes to fusion center, CH7 cluster head collect the information from K11,K12,K13,K14 and K15 sensor nodes, CH5 cluster head to collect the information from K31,K32,K33,K34 and K35 sensor nodes that closet to neighbor sensor nodes, CH6 collect the information from K26,K27,K28,K29 and K30 no. of sensor nodes and CH4 collect the information from assign the nodes and gather information from different cluster. CH4 cluster head is also connected or transmitted through specific nodes as K16, K17, K18, K19 and K20 respectively.
After gathered the information from sensor nodes and its cluster head compute the distance and find out faulty or not.

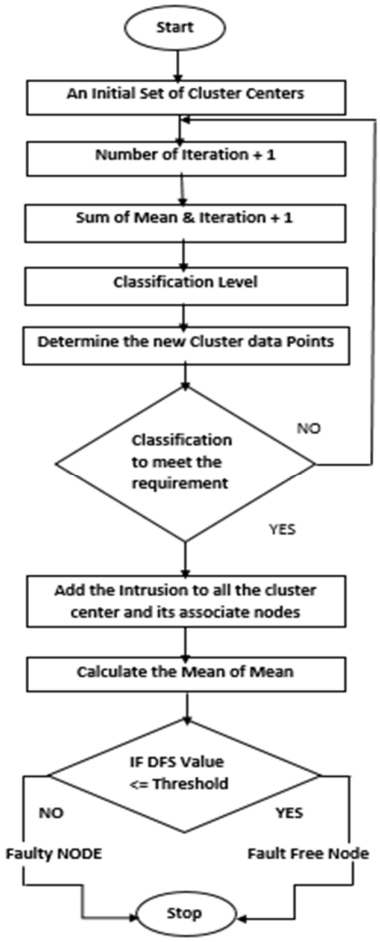

Figure 2. Flow chart of the proposed algorithm for fault finding

IV. Distributed K-Mean Self Fault Detection Algorithm

Here is a detailed description of the cluster-based k-mean self-detecting distributed algorithm. There are three different states in the DSFDOA algorithm. The following is a list of perceptive descriptions of various states.

A. Implementations states of the Proposed Algorithm

Here 3 unique states of the proposed K-mean algorithm to detect the self-cluster based faulty intermittent nodes are:

1) Data Collection state
2) Data Analysis state
3) Data Decision state

Each sensor node Ki performs a particular role at various phases. Each sensor node Ki initially extends an invitation to its neighbours by providing its own sensed data at a specific time t. Ki gathers all accessible sensed cluster data Xj from its neighbours Kj ξ Negi within its communication range (Tr) at the same time t. Then, Ki uses its neighbour's data from the analysis phase to anticipate its likely felt data interval at the regular time instant t.

Following data prediction, it uses comparison of sensed and cluster head's predicted the sense data in the data decision state to determine its status and state, based on which Ki will actively participate in cluster network functioning. Table I provides an overview of all the notations that have been utilised to describe the algorithmic processes. The following list includes the various occurrences that occur throughout the distributed self-detection algorithm's various phases.

B. Data Collection

During this stage, each sensor node Ki ξ K broadcasts the information it has sensed over its transmission or communication of cluster range (Tr). Each sensor Ki locates its surrounding nodes Kj ξ Negi using the reception data. It is expected that all of the sensor nodes in K that are present at deployment are fault free node of sensors with a fault status is 0.

C. Data Analysis

Utilizing the data collected from the surrounding nodes, each cluster sensor node Ki determines its likely probability of cluster sensed data PXi (4). In essence, the Z-score is evaluated by these mathematical equations (l)-(4). DSFDOA algorithm which is Z-test based on a statistical test in which a normal distribution can be used to approximate distribution of the test statistic under the null hypothesis. As a result, it is presumed that the cluster data sensed values collected by the various nodes is independent of one another. When the node's degree is higher, the z-test is preferred. The sensor cluster data obtained by cluster sensor node Ki's mean M is

$$M = \frac{1}{Degree(Si)} \sum_{Sj \in Negi} Xj \quad (1)$$

The standard deviation S is evaluated as

$$S = \sqrt{\frac{\sum_{Sj \in Negi}(Xj - M)^2}{Degree(Si) - 1}} \quad (2)$$

To evaluate the Z-score the following formulas are used

$$SE = \sqrt{\frac{S}{Degree(Si)}} \quad (3)$$

$$pxi = \sqrt{\frac{(Xi - M)}{SE}} \quad (4)$$

D. Data Decision

During the data decision step, each cluster sensor node Ki compares the cluster sensed data Xi with its own computed data PXi. If it falls between 2 and 3, Ki declares itself to be a good node; if not, it is labelled as a faulty sensor cluster node. The key phases of the algorithm that each individual node runs because it is purely distributed are described in the DSFDOA algorithm.

V. INTERMITTENT DYNAMIC FAULT DETECTION IN WSN WITH DISTRIBUTED DSFDOA

Data: Sensor cluster node position (XC0i, YC0i), Sensed cluster node temperature (X_i), KC: - Cluster centres, Number of sensed node (N_i), Transmission range of each centroid (Tr)

Results: Final fault status of sensor node K_i (FKi)

Step-1: K-mean Initialization State: Each sensor node cluster center K_i ε K finds their centroid and keep them in a cluster center KC_i. Set FK_i to 0 (Fault free)

TABLE I. THE ALGORITHM PARAMETER USED TO DEVELOP

Parameters	Description
K	Nodes in a Cluster of Sensors
K_i	Installed sensor node at P_i ($XC0_i$, $YC0_i$)
N	Each sensor node represents a sample of data (Total)
d	Data aspect
T_r	Transmission range of each cluster centroid K_i.
C	Set of nodes in K that contain all of the cluster sensor nodes' communications
G(K,C)	Connection between every sensor node K_i (Each cluster center)
FK_i	K_i calculates the fault state of the sensor node
$CRCD_i$	The total amount of data that was received from each cluster centroid belongs to the K_i sensor nodes
$d(K_i)$	K_i ε K is the cluster sensor node's degree
Xi	Distance is the measurement between samples from each sensed i_{th} sensor node
Threshold	The threshold level over which K_i transmits data is error-free
PX_i	K_i's anticipated computed data during interval t
KC_i	Cluster center accessible through P_i

Step-2: Analysis Phase: Set of cluster center KC_p and it perform here, the enhanced or improved set of cluster centre representatives is produced using the Lloyd iteration method.

KC_i+1 and CRCDNi=0;

For j=1……..|KC_i| and K_j ε KC_i do

$CRCDN_i$=$CRCDN_i$ + X_j;

$CRCDN_i$=$CRCDN_i$/d (K_i);

CKD_i=0

For j=1…….|KC_i| and K_j ε KC_i do

CKD_i=CKD_i + (X_j-$CRCDN_i$)^2

$KD_i = \sqrt{CKDi/(d(Ki) - 1}$

$KE_i = \sqrt{KDi/(d(Ki)}$

PX_i = (Xi-$CRCDN_i$)/Ke_i

Step-3: Data Decision State: Stop if the cluster network hasn't changed much since the prior iteration; otherwise, continue. Set P+1 -> P and go to Step-2

If |X_i-PX_i| ≥ 2 and |X_i-PX_i| < 3 then

Cluster sensor node K_i is expected to be proven to be Incorrect or fault free sensor cluster node of each centroid

FK_i=0

Else

Cluster sensor node Ki is expected to be proven to be Incorrect or faulty cluster sensor node of each centroid

FK_i=1

VI. RESULT AND ANALYSIS

The MATLAB was used to implement the proposed technique (version 18). In the proposed approach MAC layer was analyzed using DCF of IEEE 802.l1a. The CSMA/CA protocol is used by each sensor node to send its data packets. A 200 x 200 square meter area was covered by 2048 sensor nodes, which were randomly dispersed to create the arbitrary network topology. The sensor nodes had fixed cluster head transmission or communication radius of 5 m and were functionally similar.

The consumption of per second 0.5 mJ, 0.10 mJ, 0.15 mJ, 0.20mJ and 0.25 mJ of energy were used for transmission, reception, and standby, respectively. Each sensor node has a set battery power of 1 J allotted to it. Each sensor node's sensed data was evenly divided. Data from broken sensor nodes have mean 50 and variance 0, while data from fault-free sensor nodes have mean 30 and variance 0. The network's performance is evaluated by adding 0.05, 0.10, 0.15, 0.20, 0.25, and 0.30 percent faulty of cluster sensor nodes, which were selected using an established in uniform distribution function.

The different parameter as like false data alarm rate (FDAR) and detection data accuracy (DDA) are used to gauge how well the algorithm is working.

The Fig. 3(a) and 3(b) depict the analysis results for find an average node degree of the sensor network are 7 and 10. The average node degree of the sensor network can be changed in regular time interval by changing the communication radius. It is discussed and shown in the both figures 3a and 3b that the performance analysis of the proposed DSFDOA algorithm is better compared to the DSFDA and JSA algorithm. When the average node

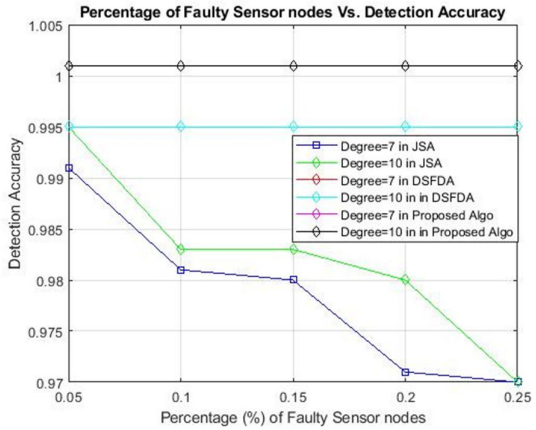

Figure 3a. % of faulty nodes Vs DDA

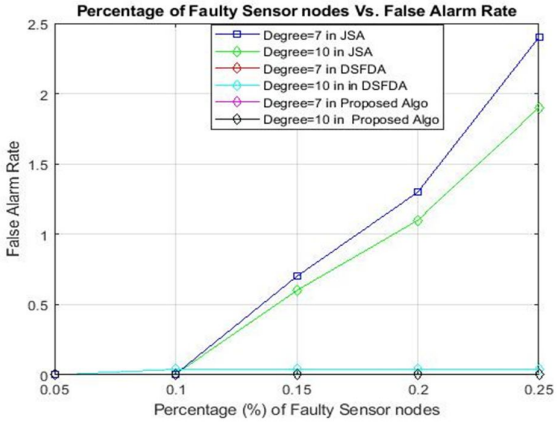

Figure 3. Performance analysis of proposed DSFDOA with JSA and DSFDA

degree of the sensor network is 10, the proposed algorithm represents DDA and FDAR are to be 1 and 0 respectively. This demonstrates shown that if an any node has consists of more degrees, it may only analyse 10 data points for the cluster based neighbours to find out the fault state and may choose not to use the remaining information. In this method, we can determine the minimal amount of information needed to analyse the fault condition and cut down on communication costs.

When the network degree is high, a node has more information to analyse its defective status. If more data are considered, the statistical z-score will be more accurate. This is reflected in the suggested statistical method's calculations for both DDA and FDAR. Additionally, reduced communication overheads are required by the distributed approach to identify the softly broken sensor node.

VII. Conclusion

In this research, a DSFDOA which is z-test-based distributed soft fault detection algorithm for WSNs is developed. The data from a faulty node is regarded as an outlier in the suggested approach. The sensor gathers information from nearby cluster nodes, uses z-test to analyse it, and then determines its own fault state as well as that of its neighbouring nodes. By offering high data detection precision and a low data false alarm rate, the algorithm outperforms.

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Plant Disease Detection using an Image Processing Technique and Machine Learning

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***Abstract*—Food plant cultivation and growth may be prevented in some areas by the presence of plant diseases; alternatively, food plant cultivation and growth may be possible, but plant diseases may attack the plants, destroy some or all of the plants, and reduce much of their produce, or food, before it can be harvested or consumed. The crops contract a variety of diseases as a result of diverse seasonal conditions. The plant's leaves are initially impacted by these diseases, and then contaminated the entire factory, which subsequently impacted the quality and quantity of the crop field. For classifying plant diseases, each algorithm is described along with the relevant processing techniques, such as feature extraction and image segmentation, as well as the common experimental setup. In this paper, we introduce an autonomous plant leaf disease detection and classification system that uses artificial intelligence. This system allows for rapid disease detection, classification, and application of the necessary treatments to cure the disease.**

***Index Terms*— Artificial intelligence, Classification system, Plant diseases, Rapid disease detection.**

I. Introduction

Depending on the type of soil, local climate, and economic value, the rancher selects the best yield. The majority of the time, farmers commit suicide as a result of production loss because they are unable to repay the bank loan they have taken out for farming. Plant diseases have a detrimental effect on agricultural production. Plants with a disease typically have noticeable stains or lesions on their leaves, stems, flowers, or fruits. The majority of diseases and pest conditions exhibit a distinct visual pattern that can be utilized to specifically identify irregularities. Most disease signs may first develop on the leaves of plants, which are typically the main source for identifying plant illnesses.

II. Detection System for Plant Diseases

By looking at the plant's leaves, stem, and roots, one can detect plant illnesses. The shape and color of the damaged area, as well as diseased leaves, stems, fruits, and flowers, can all be detected using digital image processing.
The general procedures used in various image-processing methods are as follows:

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1. Image Acquisition
2. Image Preprocessing
3. Image Segmentation
4. Image Feature Extraction
5. Image-based Disease Identification

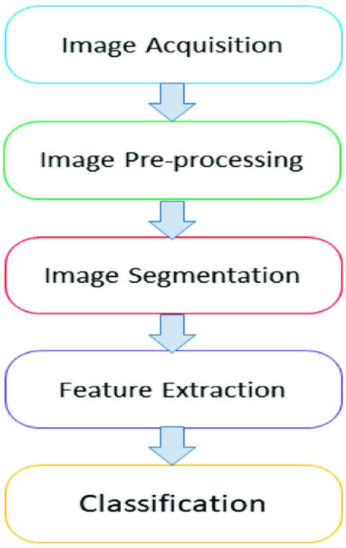

Fig.1 Image-Processing Methodology

- **Image acquisition:** Image acquisition is the process of creating a precisely encoded representation of an object's visual characteristics, such as its internal structure or a physical scene.
- **Image Preprocessing:** Images that have been acquired will be used in pre-processing phases to enhance some picture attributes necessary for additional processing. To divide the plant image into distinct fragments, segmentation is used. This can be used to remove unhealthy tissue from the background of a plant's leaf, stem, or root.
- **Image Segmentation:** Picture segmentation is a technique used in digital image processing and computer vision to separate an advanced image into several pieces. The goal of division is to make a picture simpler and transform its structure into something that is gradually meaningful and easier to understand.
- **Image Feature Extraction:** Using grey level co-occurrence matrix (GLCM), blend vision, and artificial intelligence, among other methods, it is possible to extract the color, shape, and texture characteristics of the diseased area of the plant.
- **Image-based Disease Identification:** This step entails successfully predicting and classifying plant diseases using various machine-learning algorithms.

III. Diagnosis of Diseases

The following objectives are achieved using image analysis:

1. Spotting illnesses on the fruit, stems, and leaves.
2. Calculate the impacted area.
3. Determine the cause of the affected area.
4. Ascertain the hue of the impacted region.
5. Establish the fruits' size and shape.

• **Symptoms of Fungal Disease:** Fungi, such as Late blight, cause plant leaf diseases. It first appears on lower, aged leaves that are wet or have areas of grey-green color. These spots turn dark as the parasite condition progresses, which encourages the growth of fungus.

• **Symptoms of a Viral Disease:** Of all the plant illnesses, those brought on by infections are the most difficult to diagnose. There are no history indications that are constantly observable and mistaken for damage or nutrient deficits. Aphids, Whiteflies, cucumber creepy crawlies, and leafhoppers are frequent carriers of this disease.

Fig. 2 Fungal Disease

Fig. 3 Viral Disease

- **Symptoms of Bacterial Disease:** Pathogenic bacteria can seriously afflict crops. They must enter through wounds or plant holes since they cannot simply permeate plant tissue. Bugs, various infections, and farming equipment used during various chores, such as trimming and plucking, can cause wounds on plants.

Fig. 4 Bacterial Disease

IV. Model Structure using Machine Learning

The vanishing gradients problem, one of the well-known puzzles, is solved by the ResNets Architecture. In ResNets, instead of using a traditional neural network where each layer feeds into the next layer and directly into the layers two to three hops away, we use a network with residual blocks to prevent over-fitting (a condition where validation loss stops decreasing at a point and then keeps increasing while training loss still decreases).

STEPS:

1. Users can load photos in jpeg,png,jpg format and use RGB (red, green, and blue) format.
2. After that, the system creates segment pictures, which may involve converting RGB images to grayscale or grayscale to binary image formats.
3. The user then decides on relevant classification methods (k-means cluster algorithm).

4. Following that, users can obtain classification outcomes and quickly identify leaf illness.

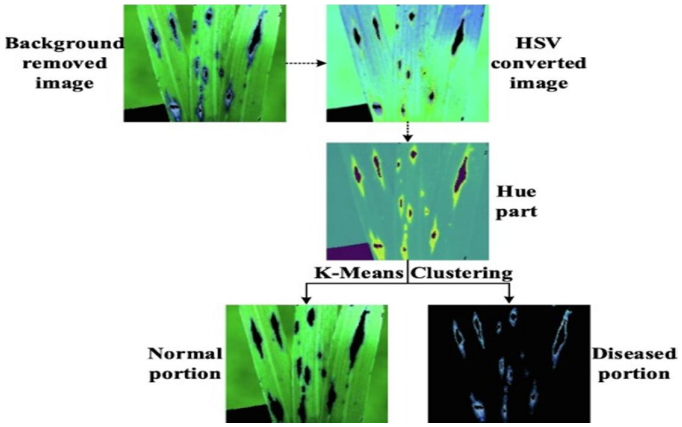

Fig. 5 Gray scale image using K-Means Clustering

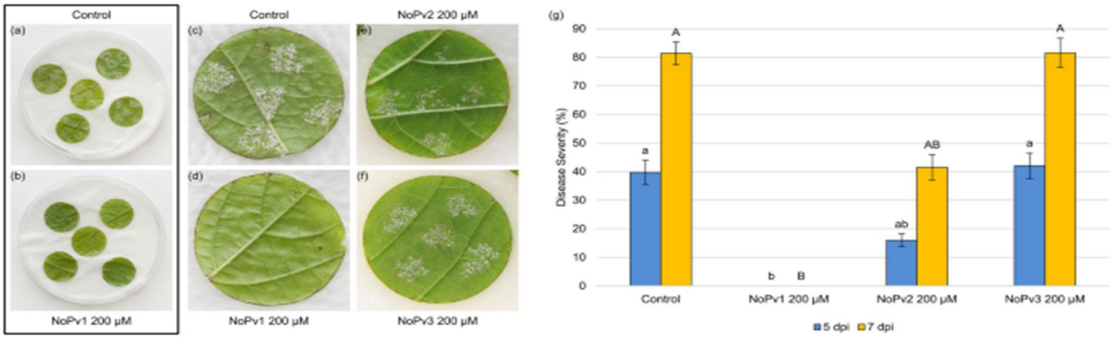

Fig. 6 Diseases Detection

V. Conclusion

The approaches for automatic computerized disease detection in plants that can be carried out utilizing picture segmentation and classification techniques are presented in this research. The creation of automatic detection systems using cutting-edge technology, such as image processing, helps farmers identify diseases at an early or initial stage and provide useful data for their management. The ResNet algorithm produced highly accurate results and was able to identify more illnesses from different harvests. ResNets produce a significantly better classification for images.

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In-Silico Characterization and Homology Modelling of Membrane Bound Proteins in Different Rice Cultivars

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***Abstract*—Various stresses which include majorly drought, salt and metal ions present in the soil adversely affects the growth and survival of the rice cultivars produced by various methods. To combat these researchers and scientist with the help of computational and systems biology are characterizing proteins involved for the resistance of these stresses to have the availability and reach of the rice cultivar across the globe with cost effectiveness keeping in mind. There are many of the proteins which are yet to be discovered, and many of them which have been discovered do not have their 3-D structure determined. So, there comes the application of homology modelling. Another reason for choosing homology modelling is, since proteins which are targeted here are membrane bound, they are hard to crystallize hence homology modelling becomes the most suitable way to determine and study their functionality. Proteins such as remorin 1.4, Phospholipase D, HIR protein LT1A, LT1B are some of the proteins which came into light after some research from already uploaded data from various journals and protein databases such as the UniprotKB. Using the database proteins were characterized based on biotic and abiotic stresses and proceeded accordingly. For modelling, an online software named SWISS Model was used to select the template and even helped in making the whole model with required scores to assess the quality of the model, respectively. To further refine the model modrefiner online software was used to refine the model to the extent where its score is better with bad angles and bonds removed respectively hence giving us a refined version of the model compared to the ones made by SWISS model directly. Templates or reference sequences were chosen based on ideal characteristics seen in Arabidopsis thaliana also seeing their sequence similarity which were automatically shown in the SWISS Model. Managed to model three of the total proteins mentioned which showed great scores after refining models. ERRAT online software was also used to give us the verification of the structure obtained.**

***Index Terms*— UniprotKB, SWISS model, homology modeling, Phospholipase D.**

I. INTRODUCTION

Responses generated by signal cascade due to various abiotic and biotic factors are proven to be in the plasma membrane (PM). Proteome analysis and their response to environmental stresses might lead to a better understanding towards creating cultivars and GMO crops. To study these factors and signals associated with

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ideal crop has been seen in Arabidopsis thaliana. Sub-cellular proteomics approach was applied to identify the proteins responsible for the abiotic and biotic stress responses.

There are many proteins expressed differentially, many of them were membrane transporters for example kinases and ATPases. Only few of them were of our natural interest some of which are remorins 1.4, phospholipases and HIR (Hypersensitive-induced response protein). Their experimental and predicted structural information are stored in public database known as UniProt Knowledge base.

Other proteins like hydrophobic proteins (LTI6A and LTI6B) have a functional role in response to chilling temperatures and salt stress, they were found in japonica rice (Oryza sativa). These responses are due to various signal cascades in which one of them is signaling through production of ABA (Abscisic Acid). The genes responsible for preventing dehydration and salt stress proteins are mainly responsible for cellular defenses against cell membrane and the plasma membrane. Conjunction of both proteins and various chemical signaling gives rise to defense mechanism against stress.

Protein 3D-structure collapsing from a straightforward grouping of amino acids were viewed as an extremely troublesome issue before. Nonetheless, it has advanced during that time into an operable test with agreeable and sensible exact forecasts of the time. To study their structural functionalities homology modelling is done when the model protein (with a known sequence and an unknown structure) is related to at least one other protein with both a known sequence and a known structure. SWISS-MODEL makes it quick and easy to submit a target sequence and get back an automatically generated homology model, provided an empirical structure with >30% sequence identity exists to use as a template.

Without tentatively decided protein 3D constructions, homology modelling displays and assumes a practical part in structure-based applications and the portrayal of protein properties and capacities. SWISS model's results can be verified and checked using ERRAT Save6.0 which checks and verifies the given model and provides with appropriate conclusion.

The purpose of targeting membrane bound proteins in different rice cultivars and modelling for the same is that they are the first and foremost barrier of the cell and are mostly associated with sensing and producing a response for given stress. The plasma layer is the principal site of extracellular biotic or abiotic detecting, so a comprehension of proteome elements may work with the improvement of new techniques for stress obstruction in crops. As the essential natural obstruction, the plasma film of a plant cell controls numerous organic cycles, for example, particle transport, endocytosis, cell separation and expansion, and sign transduction. Nonetheless, useful protein confinement is muddled because some layer proteins are firmly connected with the double lipid centre, while others are freely and reversibly related. Innovative advances in the extraction of sanitized plant plasma film proteins have made it conceivable to profile the proteome of the whole plant layer. Proteome profiling may explain which fundamental defensive reactions are started in plant plasma films presented to ecological pressure. Therefore, this profiling would then help in making various 3-D models using homology modelling through various software such as SWISS model or Modeller which is considered as the best for as it produces better and accurate results without errors compared to SWISS Model. Homology modelling intends to construct three-dimensional protein structure models utilizing tentatively decided designs of related relatives as formats. SWISS-MODEL workspace is a coordinated Web-based displaying master framework. For a given objective protein, a library of trial protein structures is looked to recognize appropriate layouts. Based on a grouping arrangement between the objective protein and the layout structure, a three-dimensional model for the objective protein is created. Model quality appraisal instruments are utilized to assess the dependability of the subsequent models. Homology modelling is as of now the most exact computational technique to produce solid underlying models and is regularly utilized in numerous organic applications.

II. Related Work

Genome sequencing projects are submitted as crude information, from which researcher endeavour to clarify the capacity of the anticipated quality items. The protein arrangements are put away in open data sets, for example, the UniProt Knowledgebase (UniProtKB) [1], where caretakers attempt to add anticipated and test useful data. Protein work forecast should be possible utilizing arrangement similitude look, yet an elective methodology is to utilize protein marks, which characterize proteins into families and areas. The significant protein signature information bases are accessible through the coordinated InterPro data set, which gives an order of UniProtKB arrangements. Just as portrayal of proteins through protein families, numerous scientists are keen on investigating the total arrangement of proteins from a genome (for example the proteome), and there are information bases and assets that give non-repetitive proteome sets and investigations of proteins from organic

entities with totally sequenced genomes [2]. The prediction of the 3D structure of a protein from its amino acid sequence remains a basic scientific problem.

Proteomics and various other methods compiled the study of good number of proteins. But amongst them only some of them played a vital role in response to the given stress majorly salt and metal ion stresses. Two-dimensional electrophoresis uncovered those 24 proteins were differentially separated accordingly to salt pressure. From these [3], eight proteins were distinguished by mass spectrometry examination. Most of the proteins distinguished are probably going to be PM-related and are known to be engaged with a few significant components of plant variation to salt pressure. These incorporate guideline of PM siphons and channels, film structure, oxidative pressure guard, signal transduction, protein collapsing, and the methyl cycle.

Various virus stress-incited qualities have been found as of late utilizing sub-atomic and hereditary methodologies as microarray tests [4-6]. The results of these unique virus stress-actuated qualities are by and large considered to improve cold pressure resistance and regulate quality articulation by means of flagging pathways. Plants react to cold pressure difficulties partially through changing their quality articulation levels, which at long last prompts different versatile reactions at cell and entire plant level [7].

A Material and Methods

All-atom segments that match the guiding positions can be obtained either by scanning all the known protein structures. In addition to that it includes those protein structures that are not related to the sequence being modelled, or by a conformational search restrained by an energy function. Modelling by satisfaction of spatial restraints based on the generation of many constraints or restraints on the structure of target sequence, using its alignment to related protein structures as a guide. Generation of restraints is based upon the assumption the corresponding distances between aligned residues in the template and the target structures are similar. SWISS Model was used to search the appropriate template with optimum alignment with the target sequence as mentioned in the above step [8]. SWISS Model uses HMM (Hidden Markov Model) to search for suitable templates against the built-in template library.

B. Model refinement.

Model refinement is a vital undertaking that requires effective examining for conformational space and a way to precisely distinguish close local constructions. Homology model structure measure develops through a progression of amino corrosive build-up replacements, inclusions, and cancellations. Model refinement depends on tuning arrangement, demonstrating circles and side chains. The model refinement cycle will typically start with an energy minimization step utilizing one of the atomic mechanics power fields and for additional refinement, strategies like sub-atomic elements, Monte Carlo and hereditary calculation-based inspecting can be -applied [9-10] An online software named Modrefiner can be used to refine the model with respect to the reference model given on Uniprot KB which is totally optional. The accuracy of alignment by modelling strongly depends on the degree of sequence similarity. Misalignment of the models some time results into the errors which may be hard to remove at the later stages of refinement.

C. Model validation.

Each progression in homology demonstrating is dependent on the previous cycles. Hence, mistakes might be coincidentally presented and engendered, in this way the model approval and evaluation of protein is vital for deciphering them. Errors in model are usually estimated by (1) superposition of model onto native structure with the structure alignment program Structural and calculation of RMSD of Cα atoms; (2) generation of Z-score, a measure of statistical significance between matched structures for the model, using the structure alignment program CE, scores four indicate good structural similarity and (3) development of a scoring function that is capable of discriminating good and bad models basic necessity for a constructed model is to have good stereochemistry. The Ramachandran plot is probably the most powerful determinant of the quality of protein, when Ramachandran plot quality of the model is comparatively worse than that of the template, then it is likely that error took place in backbone modelling. WHAT_CHECK determines Asn, His or Gln side chains need to be rotated by 180 degrees about their C2, C2 or C3 angle, respectively. Side chain torsion angles are essential for hydrogen bonding, sometimes altered during the modelling process. Conformational free energy distinguishes the native structure of a protein from an incorrectly folded decoy. A distinct advantage of such physically derived functions is that they are based on well-defined physical interactions, thus making it easier to learn and to gain insight from their performance. The validation programs are generally of two types: (1) first category (e.g., PROCHECK and WHATIF) checks for proper protein stereochemistry, such as symmetry checks, geometry checks (chirality, bond lengths, bond angles, torsion angles models. Solvation and structural packing

quality and (2) the second category (e.g., VERIFY3D and PROSAII) checks the fitness of sequence to structure and assigns a score for each residue fitting its current environment.

III. Result

The result has been shown in Fig. 1

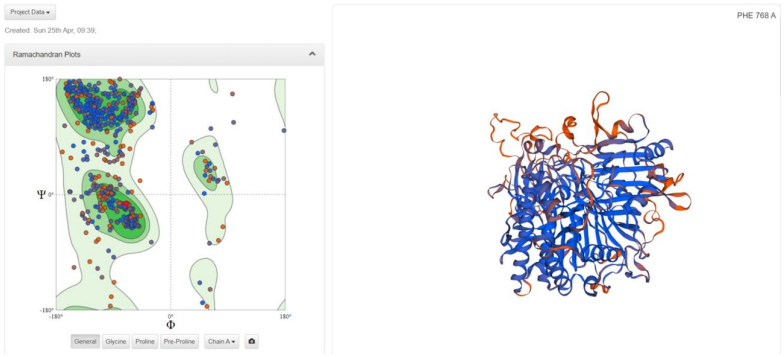

Figure 1 Phospholipase D model with Ramachandran plot

Using an appropriate template from the list provided by the SWISS Model site modelling was successfully completed. The mol probity score is 1.64 and 87.21 percent. The quality estimate is given in Fig 2.

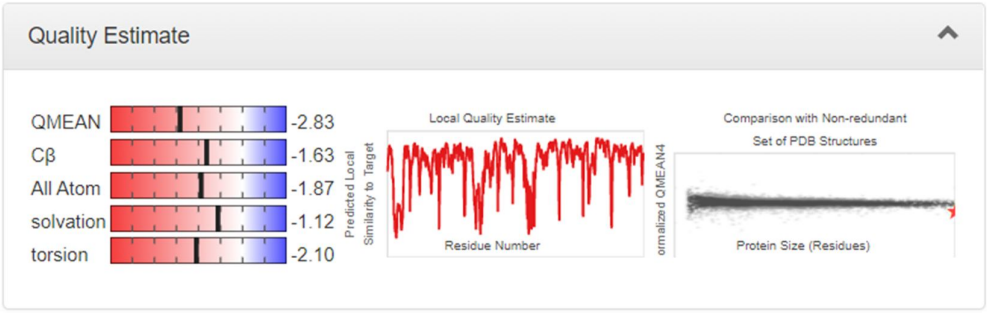

Figure 2Quality estimate scores of the model

The validation report was also generated using the SAVE6.0 server which provided us with ERRAT, verify 3D, PROVE, WHATCHECK, PROCHECK scores as shown in Fig 3.

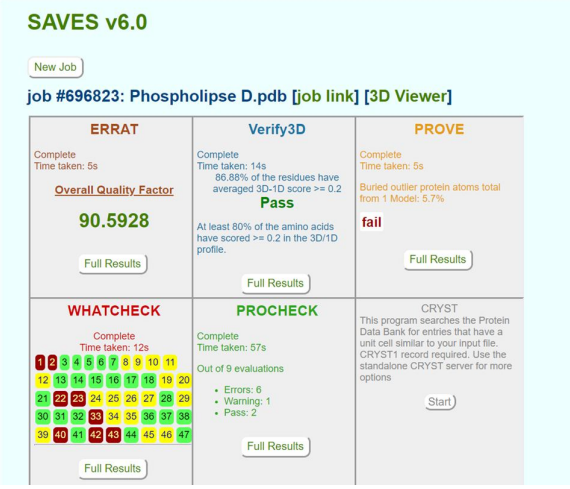

Figure 3 Validation report for Phospholipase D model

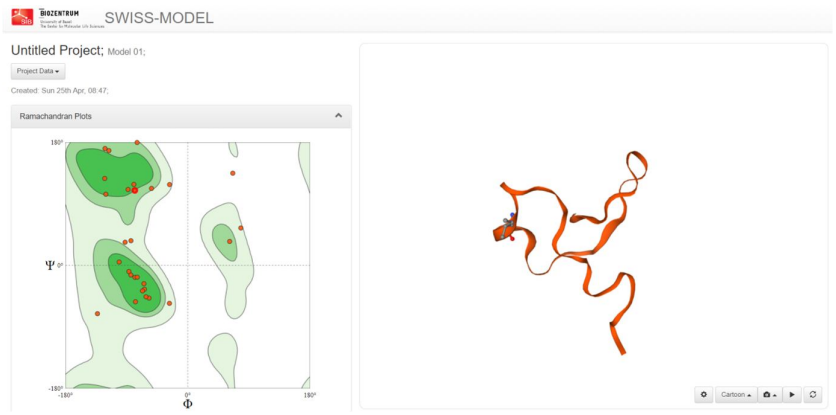

Figure 4 Remorin 1.4 model with Ramachandran Plot

As appropriate template was not available in templates tab in the SWISS model server, we had to move on to proteins present in Arabidopsis thaliana which has close similarity to remorin 1.4 with respect to characteristics and sequence both. Successfully a model was made as shown in the Fig4.

Figure 5Quality estimate with respect to remorin model

With quality estimate given as shown in Fig5, this model has a mol probity score of 1.95 and is 71.43 percent Ramachandran favoured.

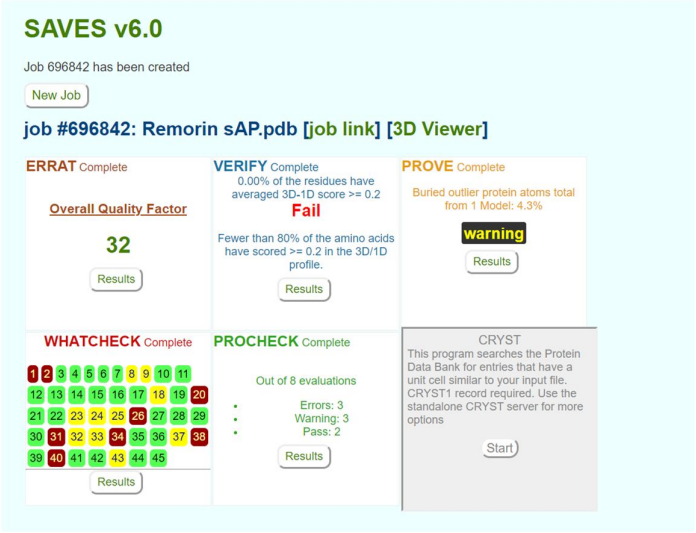

Figure 6Validation report of Remorin 1.4

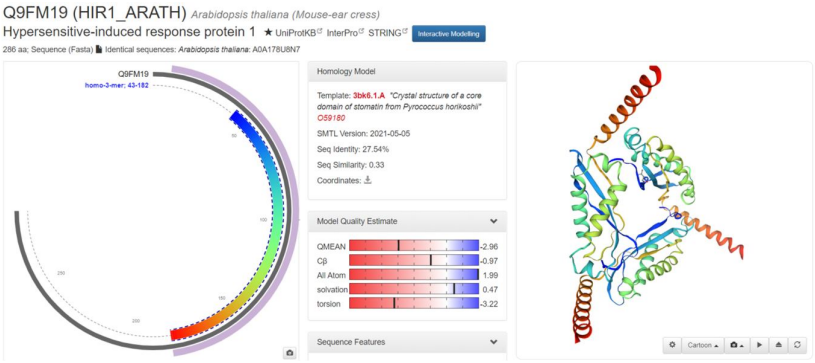

Figure 7HIR homology model with quality estimate

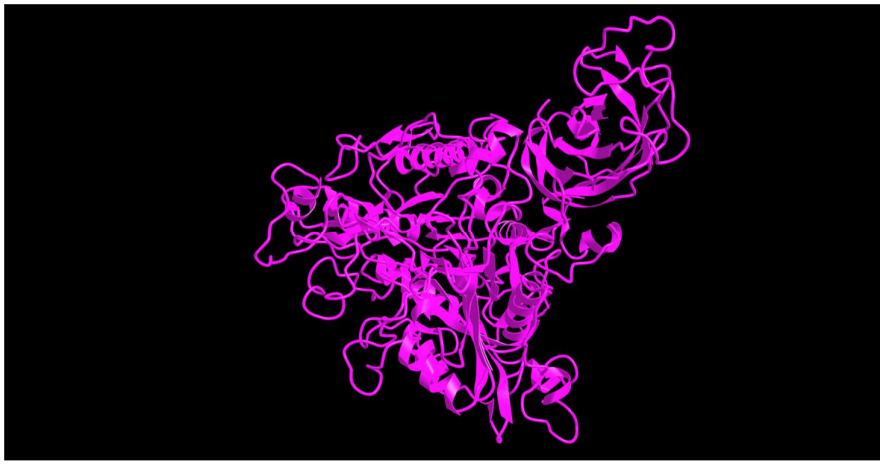

Figure 8 Refined model of Phospholipase D using Modrefiner

IV. Discussion

The model prepared for Phospholipase D has been made with a template named phospholipase D alpha 1 which is a crystal complex with phosphatidic acid. This choice of template comes from the fact that Cd-induced PLD activity and accumulation of phosphatidic acid (PA) is produced in ample amount with respect to PLD activity which is the response to the abiotic stress.

The template used for modelling Remorin 1.4 is Zinc finger AN1 and C2H2domain containing stress associated protein 13 which is responsible for stress associated with increase of abscisic acid, salt stress and metal ions. This is present in Arabidopsis thaliana which is referred as an ideal plant for most of the rice experiments. The validation scores are not up to the mark as they were expected to be but to ensure the hit and trial method for selection of appropriate template for the same would require refinement to some degree which would then tell us to move forward with other proteins related to Arabidopsis thaliana.

HIR protein already had a homology model prepared in SMR database. The details of the template which has been used as shown in the Fig7.

V. Conclusion and Future Work

The models achieved using the steps provided by the SWISS Model itself have relative errors and many of them are inaccurate, to avoid these and to get best fit model, Modeller can be used comparatively with respect to SWISS model. Phospholipase D homology model after refinement had the best results compared to other models (Remorin 1.4) which have their q mean statistics lower than the optimum range which must be considered for further re-modelling and refinement procedure. HIR protein already had its model submitted in SMR database which looks promising and does not need further change of angles or refinement. Template selection is critical in this process, to have a good template we must have amalgamation of both wet and dry computational lab

experiments. There is a need for reference models too which can be used to produce homology models without much haste.

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Road Condition Detection Techniques: A Comparative Analysis based on Supervised Machine Learning Techniques

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***Abstract*—With the advancement in autonomous vehicle and use of intelligent transportation system, road accidents are also increasing at higher rate. Road safety becomes a one of the major concerns for the transportation system and government. Road accident and road death are gaining highest percentage ration in number of deaths. Potholes, road bumps and slippery roads are the prime reason for the road accident. To take the prevention against road accident many technology-based solutions were provided by the research community. These solutions are based on machine learning techniques and smart phone-based technologies. In this paper, machine learning techniques were used to predict the road conditions. Kaggle data set of the road condition is considered for the experiment. Accuracy of Random Forest, Decision Tree, K Neighbors, Naïve Bayesian, Suport Vector Machine and Multi-layer Perceptron Classifier is compared using the vibration dataset of road network. Maximum accuracy of 91.8 percent and F1 score of 97 percent was achieved by the random forest classifier. Whereas minimum accuracy value 25 percent was achieved by the Complement Naïve Bayesian Classifier. Accuracy, F1 score, Recall, Precision and other calculated results can be used by the intelligent transport system to generate the alert to driver about the road condition and further these algorithms can be used by the road authority to identify the road conditions and then to take corrective action like road repair and maintenance.**

***Index Terms*— Support Vector Machine, Pothole, Bayesian Classifier, Bumps.**

I. INTRODUCTION

With the advancement in transport technologies, vehicles are becoming more autonomous and number of vehicles are also increasing. The increase in the count of vehicle also causing large number of road accidents. In India, 449,002 road accidents were reported in year 2019 and out of these accidents 151,113 deaths took placed. Road Condition, Human Error, Vehicle condition and Environmental Conditions are the major factors for the road accidents. According to reports, in 2018 and 2019, 47 percent road accident in open area were caused by the road conditions. In last 5 years, on an average 16 percent accidents (including all type of road areas) were due to the road conditions [1], [2]. Road Accident are highly dependent on road conditions and there is close relationship between road accident and potholes/ humps. Large potholes and bad road conditions leads to high traffic on roads and also creates many problems for the travelers and vehicles. So as to avoid these scenarios, few systems has been developed that provide the details of the road to road authorites so that proper action can be taken. Apart for it, these systems are also capable to share the road information to driver so that they can plan

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their route accordingly. Many road condition monitoring techniques has been proposed by the research community using the stereo camera, sensors, mobile phone, etc. [3], [4].
Number of humps and potholes describes the condition of road. Existence of pothole in road means road condition is not good. These potholes are responsible for the high traffic and congestion, high fuel consumption, bad driving style, irritating driving style and more road accident. Many methods exists to identify the potholes and these methods are categorized into three part term as; vision based, 3D reconstruction based and vibration based methods [5]. Vision based methods uses camera images and videos to identify the potholes in the road. 3D reconstruction-based method uses stereo methods, laser techniques and Kinect sensor for the bump's detections. Vibration based method uses reading of the accelerometer, gyroscope or other sensors of the device. These method records the jumps and vibration of the moving device [6]–[8] . During the initial stage of vision-based techniques, special devices were designed and created using the vision-based devices and computers. These devices used to capture the images of the road and after data collection these images were used for the analysis. With advancement of technology, portable and small monitoring devices were used as a replacement of specially designed heavy devices for the data collection and analysis. After the evolution of mobile cameras, data collection became much easier for the vision-based techniques. Mobile devices act as source of data collection and then neural network and machine learning techniques were being used for the road monitoring and predictions. For vision-based techniques large storage space is required. In addition to space the good image clarity and depth information of pothole is also required [9], [10].

Due to advanced technologies and powerful features of smart phones, smart phones have replaced computers for many activities. Now a day smart phones are being used for data collection, data processing, data conversion and for many other activities. Many studies also used smart phones for the pothole detection and data collection for the road conditions and potholes. Smart phones-based pothole detection techniques are of two type; termed as threshold based and machine learning based. Sensor data of the device is used to identify the vertical movement of the device and this vertical movement can be retrieved from the Z axis reading of the device [11]. Different supervised and unsupervised machine learning algorithms like Support Vector Machine (SVM), Decision Tree, K-Means, Random Forest, Dynamic Time Wrapping (DTW), CNN, Multi-Layer Perceptron (MLP) etc., were used to detect the potholes, bumps, manholes, cracks and rough roads [12]–[15]. Smart phone-based techniques can detect the road anomalies with less resources and with good accuracy. As per the studied literature, few of the combined advantages and disadvantages of smart phone-based road anomalies detection techniques are presented in TableI.
This paper presents an experiment performed to detect the pothole using the sensor dataset. Dataset was captured using the mobile device and data was processed using different machine learning techniques. Random Forest Classifier, Decision Tree Classifier, K Neighbors Classifier, Multinomial Naïve Bayesian (NB), Complement NB, Bernoulli NB, SVM, Linear SVM, and MLP Classifier were considered for the experiment. At the end, an analysis was performed to check the performance and accuracy of machine learning techniques on road dataset.

II. METHODOLOGY

This paper provides the road anomaly detection techniques using machine learning algorithms. For road anomalies and potholes detection a Kaggle dataset was considered in this experiment. Engine reading and sensor readings are the part of this data. In general, the pothole detection techniques using smart phone comprises 5 basic steps, these steps are shown in figure2. The first step is to collect the data using smart phone sensor. For

Advantages	Disadvantages	Reference
• Simple Structure • Less resource Requirement • Fast processing • Efficient in their category • Les power consumption • Easy implementation • Works in real time scenario • No need to have special hardware and software setup • Easy to work with GPS and location aware scenario • Better mapping with road and potholes • Easy for data set collection	• Suffers from accelerometer calibration issues • Orientation and position of smart phone plays important role and also effect the accuracy • Poor accuracy in case of large number of potholes in small region • Sensitive to false positive data • Accuracy is also affected by the vehicle speed and type • Environmental conditions also have impact on accuracy	[5], [12], [16]–[21]

the data collection process, smart phone is placed at stable position and then reading of accelerometer is used to check the vibrations of the device. Vertical movement of the device is captured using the Z axis of the dataset. The capture data may contain some errors, duplicate entries and null values so in the next step data is prepressed. In this preprocessing step, data is cleansed and false positive and true negative values are also filter out. This filtered data is used to train and test the machine learning model. Based on the dataset, the real time smart phone-based pothole detection system monitors the road condition, performed certain analysis and based on this system generates alarm or alert to user.

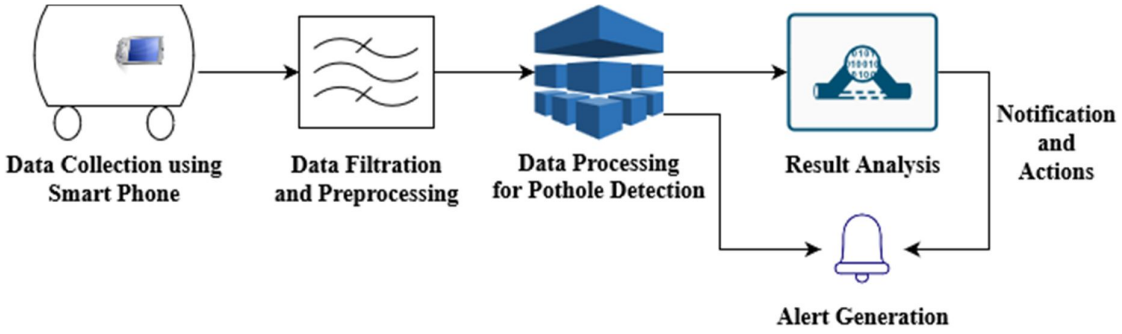

Figure 1 General Steps for the Road Condition Detection Techniques

For this experiment, the first two steps of the figure 2 are not performed because in this experiment Kaggle dataset was used. This data is now processed using different machine learning algorithms. Accuracy is detected for each algorithm and then result analysis performed to check the performance of different algorithms on same dataset. Alarm generation step is also not the part of this experiment as the experiment is only for the purpose of analysis. In this experiment Random Forest Classifier, Decision Tree Classifier, K Neighbors Classifier, Naïve Bayesian classifier, SVM and Multi-layer Perceptron classifier were considered. In NB Classifier, three different model names as Multinomial NB, Complement NB, Bernoulli NB are used. Similarly, both SVM and Linear SVM model were considered for the experiment.

III. Result Analysis

To perform the experiment, Scikit learn library was used. The considered dataset contains 24957 entries and each entry had 14 different values. The field of the dataset were Vehicle Speed Instantaneous, Vehicle Speed Average, Vehicle Speed Variance, Vehicle Speed Variation, Longitudinal Acceleration, Engine Load, Engine Coolant Temperature, Manifold Absolute Pressure, Engine RPM, Mass Air Flow, Intake Air Temperature, Vertical Acceleration, Fuel Consumption Average. Training and Testing data was spitted int0 80:20. 80 percent data considered for the training and 20 percent data considered for the testing. Accuracy of the all models were tested using below mentioned matrices.

Accuracy Score: It measure the matching of predicted labels with actual label. Higher value of accuracy means better classification.

Zero-one loss: It measure the count of wrong classification or misleading classification

Hamming Loss: It counts the wrong prediction of labels.

Jaccard Score: Analyze the correct mapping of label with true score
F1 Score: F1 score can be calculated using precision and recall values. It measures the classification accuracy of the model
F1 Score = 2 * (precision * recall) / (precision + recall)
Table I. shows the analysis of considered machine learning models with respect to accuracy, Zero-one loss, Hamming loss and Jaccard Score.

Algorithm	Accuracy	Zero One Loss	Hamming loss	Jaccard Score
Random Forest Classifier	0.91	0.08	0.02	0.96
Decision Tree Classifier	0.84	0.16	0.03	0.93
K Neighbors Classifier	0.89	0.11	0.03	0.93
Multinomial NB	0.46	0.52	0.18	0.66
Complement NB	0.25	0.73	0.4	0.46
Bernoulli NB	0.46	0.52	0.18	0.66
SVM	0.58	0.42	0.11	0.77
Linear SVM	0.49	0.5	0.15	0.7
MLP Classifier	0.46	0.52	0.18	0.66

Algorithm	F1 Score	Recall	Precision
Random Forest Classifier	0.97	0.96	0.97
Decision Tree Classifier	0.95	0.95	0.95
K Neighbors Classifier	0.95	0.95	0.95
Multinomial NB	0.64	0.74	0.57
Complement NB	0.59	0.59	0.71
Bernoulli NB	0.64	0.74	0.7
SVM	0.81	0.81	0.87
Linear SVM	0.73	0.75	0.76
MLP Classifier	0.64	0.74	0.57

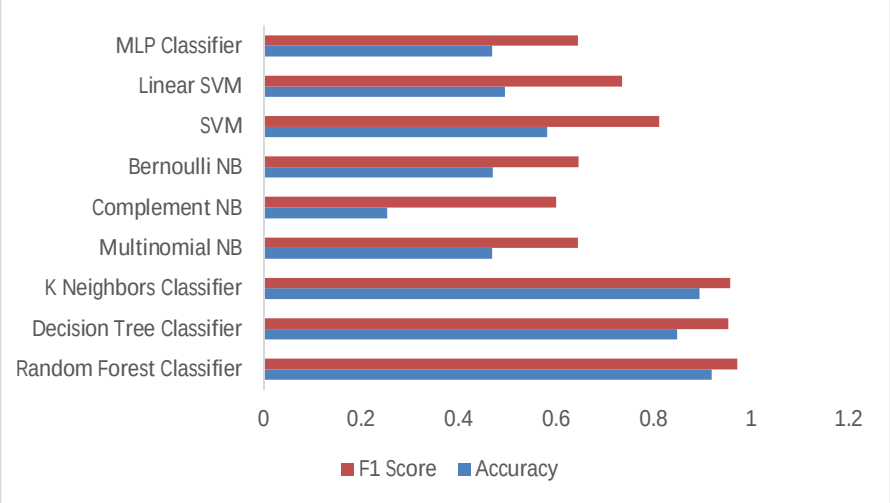

Figure 2 Accuracy and F1 score-based comparison of considered techniques using pothole dataset

IV. Conclusion

Road conditions play important role for intelligent transport system. Bad road conditions are responsible for major accidents and deaths. Many research studies have been done to detect and monitor the road conditions. In this paper, sensor-based data set was considered to predict the road condition and to identify the presence of potholes using machine learning techniques. An experiment was conducted using Random Forest Classifier, Decision Tree Classifier, K Neighbors Classifier, Naïve Bayesian classifier, SVM and Multi-layer Perceptron classifier. These considered machine learning techniques were implemented on same dataset. Accuracy to predict the pothole by each considered algorithm was determine using the accuracy, recall, precision, F1 score,

and Jaccard score. Further prediction error rate is identified using the hamming loss and zero-one loss factor. From the result analysis it has been observed that random forest classifier has highest accuracy (91 percent) and Complement NB (025 percent) has lowest accuracy of pothole prediction among the considered algorithm. This analysis can be further use to select the appropriate algorithm for the pothole detection. In real time application situation, algorithm with best accuracy and lower error rate can be use to generate the alert about the road conditions.

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Scarlett: Virtual Assistant & Browlett (Browser)

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***Abstract*—A personal voice assistant is the software that can perform task and provide different services to the individual as per the individual's dictated commands. In this modern era, day to day life became smarter and interlinked with technology. We already know some voice assistance like google, Siri. etc. This project works on voice input and give output through voice and displays the text on the screen. The main goal of our voice assistance makes people smart and give computed results instantly. The voice assistance takes the voice input through our microphone (such as Bluetooth and wired microphone) and it converts our voice into computer understandable language gives the required solutions and answers which are asked by the user. This assistance connects with the world wide web to provide results that the user has questioned. Natural Language Processing algorithm helps computer machines to engage in communication using natural human language in many forms. To achieve this we are using modules like web browser, speech recognition, python speech-to-text, and Natural Language Processing (NLP) algorithm.**

***Index Terms*— voice assistance,Natural Language Processing(NLP), web browser, speech recognition, python speech-to-text.**

I. INTRODUCTION

This Voice assistants are integrated into many daily devices, such as cell phones, computers, and smart speakers. Because of their vast array of integrations, several voice assistants offer a specific feature set. At the same time, some choose to be open-ended to help with almost any situation. Voice assistants use AI and Voice recognition to accurately and efficiently determine the result the user is looking for. While asking a computer to set a timer may seem simple, the technology behind it is fascinating. So today, we are here to introduce Scarlett. Scarlett is your virtual and personal voice assistant and is available on various devices, such as smartphones, computers, laptops etc. The job of the assistant is to help the user with tasks such as carrying out searches on the internet, opening different applications, setting reminders or alarms, making calls, playing music, sending emails or some simple text messages to someone and many other tasks just through the voice commands thrown by the user. Scarlett helps the user to reduce the efforts of typing through a keypad or a keyboard for searching or using a mouse for browsing or opening any applications or tabs because all of these can happen just by your voice commands and achieve the desired output most easily. Scarlett uses voice recognition, language processing algorithms, and voice synthesis to listen to specific voice commands and return relevant information or perform a particular function as requested by the user. Scarlett

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can return relevant information by listening for specific keywords and filtering out the ambient noise based on particular commands, sometimes called intents, spoken by the user. Objective: We had to learn the language of Technology forever, be it a keyboard, mouse or touchscreen. Voice Assistants have turned this world around us. With voice, Technology has to learn from us to understand us and understand our language. And the best part is that Voice assistants are beneficial for visually impaired people to access critical phone functionalities and do daily tasks. The project's main objective is to make everyone around us adapt to the latest raging Technology of having a voice assistant at every house and reduce the efforts with such innovative Technology, which makes us and our home smart as well.

II. Literature Survey

In 2012, Google announced its Knowledge Graph3 as a new tool to improve the identification and retrieval of entities in return to a search query. Most of the knowledge encoded in Google Knowledge Graph originally came from Freebase which was a crowd- sourced effort to create a base of facts in all possible knowledge domains. Alongside with the development of the above-mentioned initiatives, following the original idea of a Semantic Web , new technologies have been developed and released with the aim of embedding structured knowledge with unambiguous semantics into Web pages in order to allow software agents to consume and elaborate information in an automated way . The original idea has been modified over the years thus making possible the creation of a full stack of semantic technologies and, more remarkably, gave birth to the Linking Open Data initiative4 where a community of researchers and practitioners devoted an enormous effort to build publicly available knowledge bases of machine understandable data.

III. System Study

A. Input Design The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction datain to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. We are using Natural Language Processing with the help of speech_recognition module to take the input, during this stage we have already defined some input commands inside the code such that scarlett can understand what it is that you are trying to ask.

B. Output Design Quality output meets the end user's requirements and presents the information clearly. For the user to have a better experience, we have created this virtual assistant to run in the background while it always listens to what you say and comprehends what you would like to ask. You can open system applications with your customized commands, you can play music, and you can also do Wikipedia searches by just adding the word Wikipedia at the end of your sentence. While Scarlett is a virtual assistant, browlett is a browser representing Scarlett, where the homepage is a website hosted by us at the URL - https://scarlettbrowlett.web.app. It contains the basic features of a web browser, and Our applications do not store user information either in voice assistant or in the browser.

IV. Screen Shots

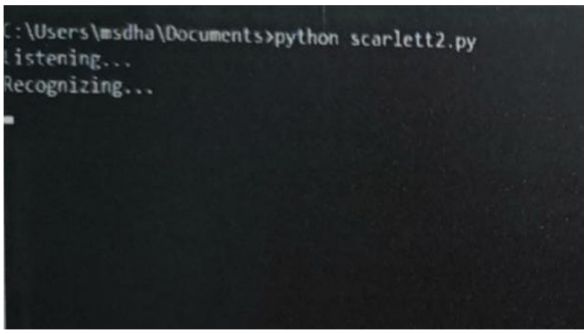

Figure 1. Scarlett User Interface (Voice Assistant)

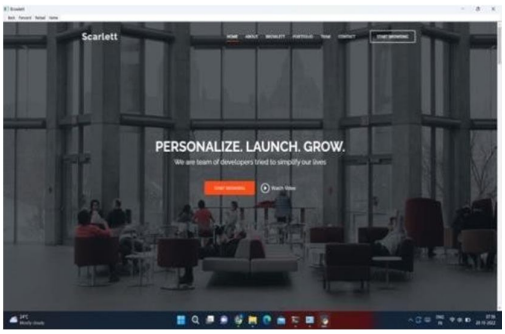

Figure 2. Browlett Homepage (Webpage)

Figure 3. Browlett UI (1)

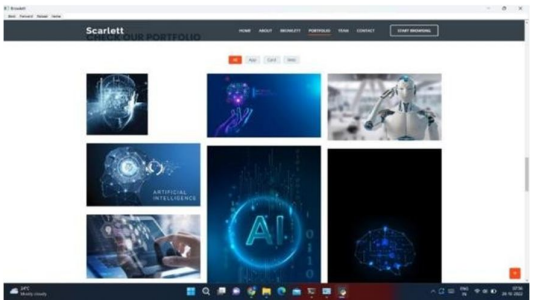

Figure 4. Browlett UI (2)

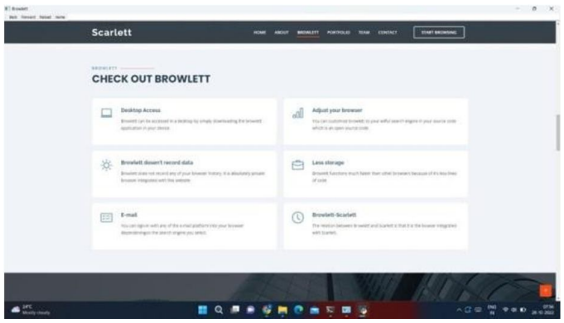

Figure 5. BrowlettUI (3)

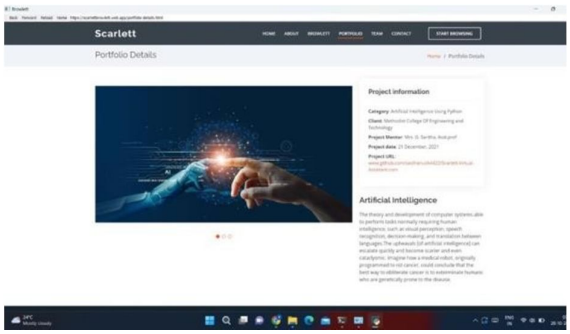

Figure 6. Browlett Additional webpage

V. Conclusion

We have successfully built a user-friendly Voice Assistant “Scarlett”, using python, which helps the user to perform various activities on their laptops or personal computers just by the user’s voice commands, which sounds very simple and it can be easily understood by developers who can customize their applications according to their system’s preferences. As a result, personal voice assistants have spread with impressive speed.

Future Scope

Scarlett can be modified into a complete virtual assistant by creating a GUI for this application. We can integrate Scarlett with browlett and create an icon in browlett so that users can access Scarlett inside browlett. We can also add language options by collecting data worldwide on different languages. There is always scope for Artificial Intelligence in the future.

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A Secure Voting System using Iris Recognition

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***Abstract*—During elections in democratic countries, the voting mechanism is extremely significant.**
India holds elections using either Secret Ballet Voting or Electronic Voting Machines which involves massive costs and manual labor. The election commission is having a lot of problems during the election process. The most common issue that the electoral commission deals with is the polling arrangement and duplicate or voting fraud. Electronic voting machines need more personnel, are time-consuming, and are less reliable. As a result, the system must be tuned to be efficient, leaving no opportunity for poor voting procedures. In this project, a secure and modern voting system employing iris recognition and facial recognition is built to improve the present voting system. The most reliable biometric of human identification is iris recognition. The proposed system allows users to vote only after verifying their iris image Iris recognition system is categorized into Canny Edge Detector, iris Circular Hough transformation, symlet wavelet, iris-based authentication detection.

***Index Terms*— iris, e-voting, secure, hough transform.**

I. INTRODUCTION

In any country, the election process is a major administrative task. It employs a number of processes, all of which require human effort. Voting techniques are now transferred to electronic format and used in a variety of automated tasks. This will save time by reducing traditional paper tasks. E-voting is a computer-assisted voting mechanism that can be used both online and offline. Each voter's information is recorded with a unique ID and saved in a database.
Every voter's information is retrieved and confirmed whenever the ballot method is used. In an electronic voting system, voter identification is crucial.
Existing voting systems' core problem is security. An unidentified person may often cast a vote. Some politicians bid to secure elections by unlawful means. Existing systems are very long, difficult, and with time lags. We use an Iris pattern and as a result, the suggested voting mechanism is more secure than the alternating current system.

II. METHODOLOGY

Canny Edge Detection:
Canny Edge Detection is a popular edge detection algorithm that was developed by John
F. Canny. It takes the Sobel algorithm's output as its input and is a multi-stage algorithm with stages like Noise

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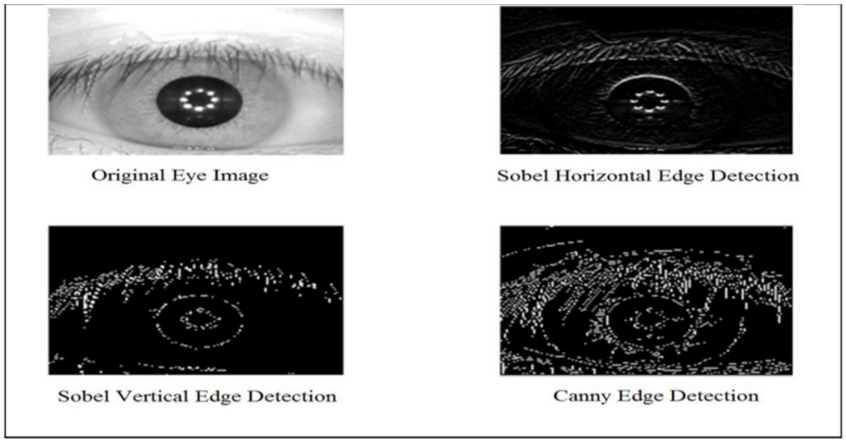
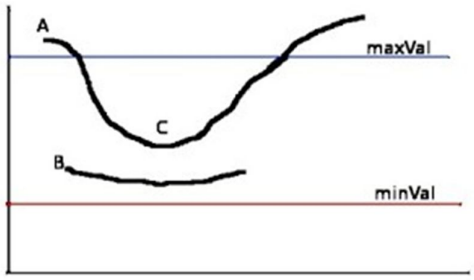
Reduction, Finding Intensity Gradient, and Suppression which gives us a binary image with thin edges. It performs Hysteresis thresholding where the real edges are found by using certain threshold values.



All edges with an intensity gradient above the maximum threshold are considered edges, but edges below the minimum threshold are definitely not edges. The edges whose threshold value lies between the maximum and minimum threshold values are determined as edges or non-edges based on how connected they are to the edges and non-edges. Therefore, those connected to edges are considered definitely edges while the ones connected to non-edges are abandoned. At this stage, small pixel noise is also removed, resulting in an image with strong and fine edges.



A. Hough Transformation

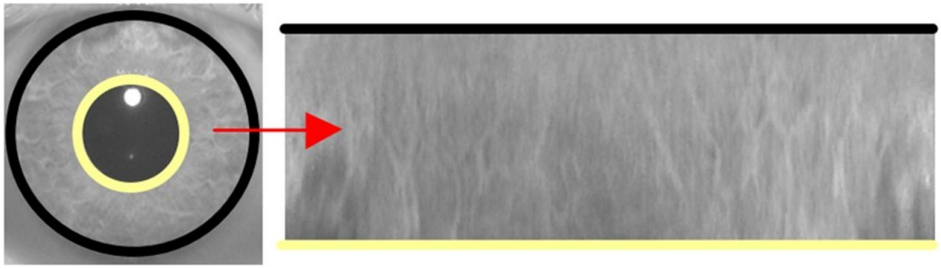
Hough Transformation is done using the Circular Hough Transform algorithm whose main aim is to find the aligned edges in the images that create circles. This is used to perform the segmentation of the image. This algorithm is based on the formula of a circle equation with radius r and center (a, b)

$$(x - a)^2 + (y - b)^2 = r^2$$

In the proposed system, the boundary of the iris and the pupil is determined from the image of the eye using this algorithm. It is also used to find the iris where the pupil junction and the iris boundary are present.

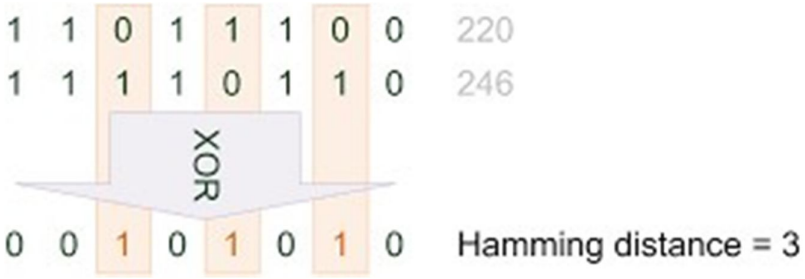
B. Normalization

Daugman proposed the rubber sheet model which is used to do Normalization. This technique transforms each point in the segmented iris region from Cartesian (x, y) coordinates to polar coordinates (r, θ).



C. Hamming distance

The number of distinct bits in two strings of the same length is measured by Hamming distance. In other words, it counts how many bits must be shifted to match two strings. Because the templates are in binary format, Hamming distance has a rapid matching speed. Hamming Distance is calculated by performing the Exclusive-OR (XOR) operation on the two binary patterns. If the hamming distance between two templates is 0, they are a perfect match; otherwise, they are not.

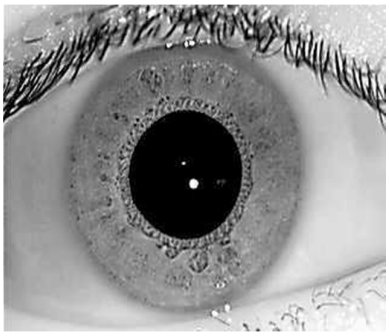


D. Proposed Voting System

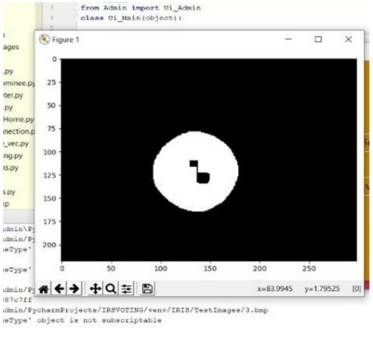
Our proposed voting system has two interface modules - Admin and Voters. Admin is solely for the administrator to register the voters and their iris image and add party candidates with their details. The administrator can also view the number of votes for each party and also the results. On the other hand, the Voter interface is only for the voters to participate in the
election after they have been successfully registered with the system.

- The first step is the registration of voters with the system. The iris image uploaded during this time gets registered and saved with the voter ID in the database.
- When the voter approaches to vote, they are asked to provide their Voter ID and Iris Image. After this, the process of iris recognition starts with segmentation. Algorithms like Canny Edge detection and Hough Transform are used here.
- Normalization is done and the Hamming distance is calculated. This entire process is done for the uploaded iris image as well as for the iris image used while registering.

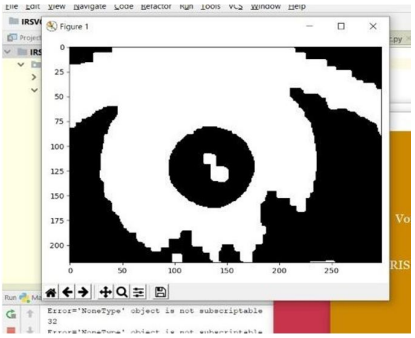
Hence, using Hamming distances of the two, the system is able to check if the pictures are a match. This is also called Matching.

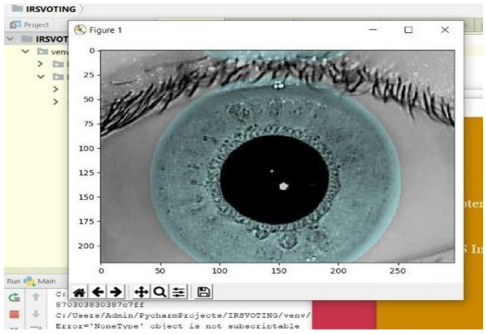


Original Iris Image

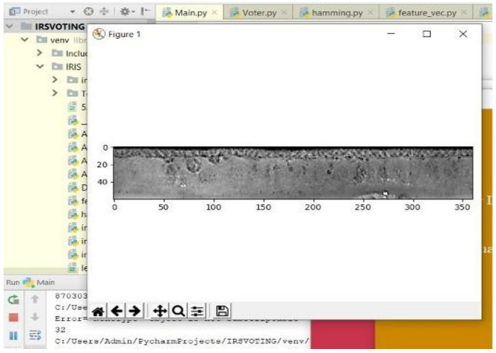


Canny edge detection - for the inner edge





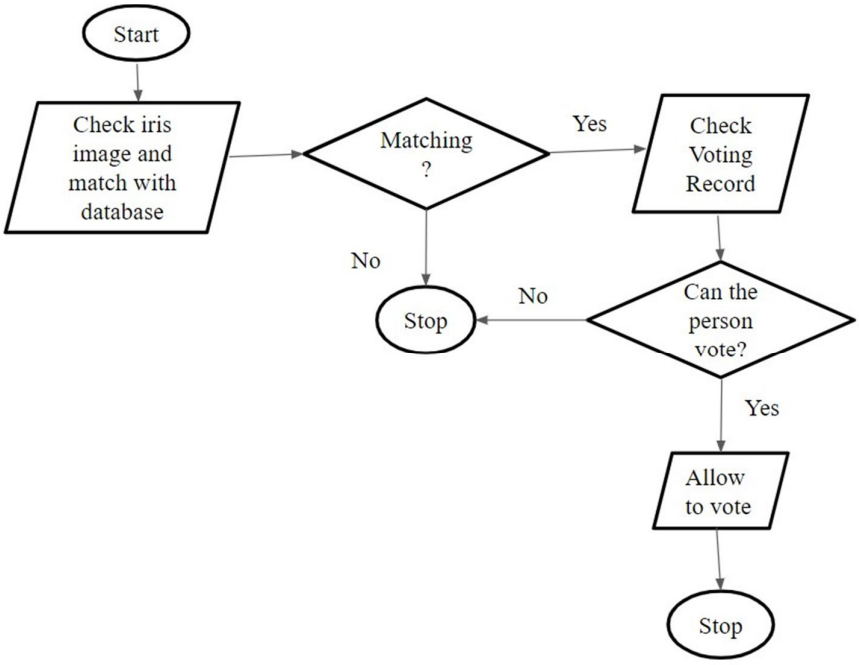
Canny edge detection - for the outer edge HoughTransform-Pupilan



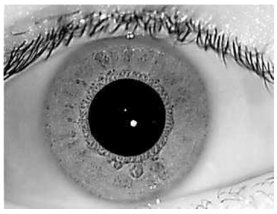
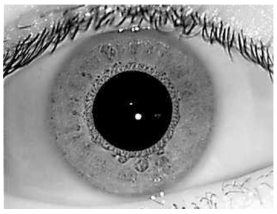
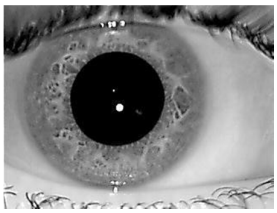
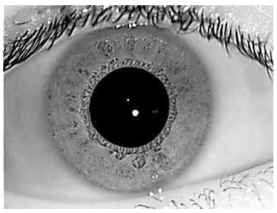
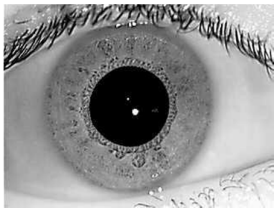
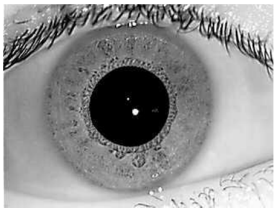
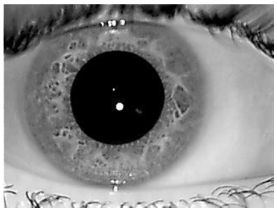
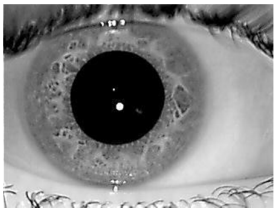
Normalization, converting image to binary

Then the Hamming Distance is calculated using the formula and both the images are checked to see if they are a match or not.

The flowchart of the proposed system is as follows:



E. Observation

Image 1	Image 2	Hamming Distance	Output
		1	Not Matched
		1	Not Matched
		0	Matched
		0	Matched

III. Future Scope and Conclusion

The concept of Iris Recognition is rapidly gaining pace due to the fact that it is meticulous. Despite requiring proper tools to precisely capture the iris image, it provides strong biometric authentication. Our proposed system can be integrated into a real-time application with the help of a high-resolution iris scanner that is able to precisely capture the iris image. In such a scenario, it would be possible to capture the iris image of voters when they come to vote and check if they are eligible to do so. Due to its highly secure and fast computational voting along with improved accessibility, greater accuracy, and lower risk of human and mechanical errors, it is bound to give rise to safe and fair polling.

This project can therefore be easily used in actual situations like student body elections in educational institutes, local neighborhood elections, and also in the near future, Government elections.

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Intelligent Transport Systems for Vulnerable Transport Users: Use of Assistive Technology for Sustainable Development Goal Target 11.2

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***Abstract*—Intelligent transport system (ITS) has got acceptance and applicability in real life with emergence of various disruptive technologies as these technologies are helpful in managing the dynamic real time situation leading to effective utilization of resources. However, there is need to enhance the scope of ITS so that it shall address the issues of the section of the vulnerable transport users for their ease. These vulnerable users include children, women, old, cyclists, pedestrians, or persons with different abilities. Target Sustainable Development Goals (SDGs) 11.2 has focused on the said issue and advocates inclusive transport system that may be helpful to vulnerable users. Assistive technology may play a key role in developing such transport system. The present work is an effort to identify such assistive technologies that shall be incorporated with the existing ITS for Vulnerable Transport User (ITS4VTU). A separate layer for such purpose vehicle-to-vulnerable is also advocated by the present study.**

***Index Terms*— Artificial Intelligence, Intelligent Transportation System, Assistive Technology, Sustainable Development Goal, Vulnerable Transport User.**

I. INTRODUCTION

Sustainability is the key for our survival and our co-existence in this world. It is the collective duties of all to protect the planet earth once it has been set into order. That is why United Nations (UN) has defined a multi-dimensional shared blueprints in the form of 17 Sustainable Development Goals (SDGs) so that everyone in this planet may prosper and live in peace [1]. The SDGs have defined targets to be achieved by year 2030. SDG 11 is focused on achieving safe, resilient, inclusive, and sustainable human settlements and cities. Various targets has been set by SDG 11 and one of them is related sustainable transport systems for vulnerable (Target 11.2) [2]. With the emergence of Artificial Intelligence (AI) [3] and other disruptive technologies, Intelligent Transport System (ITS) [4] has received considerable attention as these technologies are helpful in management of highly interconnected multi-model transport networks leading to safety, efficiency, and sustainability. By deploying traffic monitoring networked devices and by utilizing the services of wireless communication, the real time real time traffic data may be collected. The acquired data is then transferred to the traffic control centers for taking decisions and to do optimization accurately. The offered services may real time response, the traffic flow management, congestion control, resource optimization, and various other targeted & effective transport services. With the conceptualization and development of smart cities [5], the technologies may be utilized in

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multiple dimensions that is an opportunity and will pose challenges in the context of ITS. One such challenge is to address the issues of vulnerable persons and technologies may play a prominent role in it. These vulnerable persons may be children, women, old, Cyclists, pedestrians, or persons with different abilities. The SDG target 11.2 specifically focused on the said issue and AI is the candidate technology for assisting the implementation.

A. Artificial Intelligence and its Applicability

AI came in existence with various approaches and methods to solve the complex problems in a defined manner which human beings are more comfortable with. The evolution of AI and the use of it have been improved and increased with the growth of many sectors [6]. AI refers to the intelligence and set of instructions that are generally given to the robots to operate as per the provided instructions. In today's world, AI has become the most popular with all the advancements and technologies. The simulation of human intelligence by the programmed machines guided by the set of instructions and trained data. These machines help in solving the human tasks and improve the complicated tasks in a pre-defined manner. The AI help in analyzing and present patterns of the datasets and are able predict the future trends. It has a capability of dealing big datasets to solve the problems accurately.

The AI helps many real-time products to improve their capabilities. It also helps in adapting the data by upgrading the real-time datasets with many benefits. The working of AI depends on machine learning, neural networks, and deep learning techniques. All these techniques help to enable the AI approaches and methods to improve the characteristics and features of the technologies which are widely used to growing and enhancing the transportation sector to an extent. Apart from transport system, there exists various applications that uses AI. Few of these are mobile industries, navigation & travel, video gaming, banking sector, and smart home systems.

B. Role of AI in Transport System

AI has been implemented in road transport, aviation, shipping and railways, navigation ports, and numerous transport fields [7]. It helped to increase the functionality and performance of the transportation field and also helps in making accurate decisions on implementing strategies. The main objective of AI in transportation systems is to provide easier, cleaner, and safer modes of transport and to address the problems such as heavy traffic flow, route optimization, road safety and others. It also helps in infrastructural facilities projection [8]. There are various advantages with the implementation of AI in the transportation field such as reducing accidents, decreasing the number of deaths during accidents and helping in detecting and predicting the traffic flow, and examining the activities through the cameras [9]. It plays an important role towards autonomous trucks that reduce the severe impacts and improved the safety measures of the modes of transportation. The real-time example of transportation is the self-driving vehicle which helped in decreasing accidents and injuries.

C. Intelligent Transportation System

The ITS plays an important role in enhancing all modes of the transportation system. It aims to provide all the advanced methods and helps all the citizens to travel more easily and safely. The concept of an ITS is to save the time of all the citizens and to reduce the impacts of traffic problems. The objectives are to make the city smarter and increase the effective implementation methods to solve all the encountering issues that are related to traffic congestion. Automated techniques and technologies usage is to be incorporated for the said purpose. The operational process of an ITS helps in managing all the complicated tasks and accurately solves them. ITS other objectives are to help in improving the safety of the traffic and reduces the pollution of the city. The technology helped in collecting, storing, and analyzing the real-time systems to improve the parameters based on speed, performance, and accuracy.

The intelligent transport system implementation is all about exchanging and handling the instructions to control the systems and appropriately operate the real-world interface. All the applications which are used in architecture are traffic, travelers, and emergency. These applications help to provide all the interfaces and help to provide essentials to the services.

II. REVIEW OF LITERATURE

Several methods and research are carried out on this transportation system to analyze the working of AI systems. Table 1 shows the research and the existing methods that are used for building the model.

TABLE I. LITERATURE REVIEW OF ITS WITH FOCUS AND METHODOLOGY

Research	Country	Main Focus	Methodology/Results
[10]	USA	The author's contributed, mainly on the frameworks that are suitable for smart cities using intelligent traffic management systems. This work mainly focused on enhancing efficiency by using closed-loop management systems.	This framework is based on the multi-agent systems that manage the potential traffic congestions to reduce the overall traffic time in most of the metropolitan cities.
[11]	China	In this paper propose high-speed control systems, especially in trains. They are several operations of the train like GPS, sensor data, train control, GSM signal, etc. The main focus is to provide safety, operations, maintenance, and passengers services, etc.	Fuzzy RDF model is used to improve uncertain reasoning in the context of train control system.
[12]	China	Authors demonstrated new concept, driving the scenario Internet. This is an intelligent vehicular network and referred by author as Cognitive Internet of Vehicles. This project aims to address the person which is previously mentioned while driving.	The research used AI, edge computing alongwith cloud computing, and 5G network slicing. By extracting useful data from both physical and information data space, Cognitive Internet of Vehicles improves transportation safety and network security.
[13]	China	The objective of this research is to improve road safety using the Internet of things. The emphasis has been given on various vehicular communication modes.	To have efficient transmission scheduling, deep Q learning is used. It is an attempt to develop an efficient data communication scheduling technique to overcome the cost of cognitive vehicular networks.
[14]	Hong Kong	This paper providing information about the future transport system. It addresses the facilities provided to the people, such as a smarter vehicleinfrastructure and a good pedestrian environment.	A connected environment is used to overcome the challenges in the transportation system.
[15]	Australia	Authors present the idea that providing an overview of applications in artificial intelligence, especially in the transport system. The main focus is on addressing the challenges of AI in the transport problems such as traffic management, safety, etc.	Research emphasized the role of Artificial Neural networks, fuzzy logic, and genetic algorithms to overcome the challenges in the transportation system.
[16]	UK	The aim of this paper provides information about the novel concept of AI where the transport system affects the urban. The author also states the dimension of the new transport mobility era.	ANN technique is used to analyze the smart city transport system.
[17]	Canada	The study is carried out on sustainability challenges and changes that are happening in the intelligent transport system. This review states the AI usage in different future studies on approaches for system dynamics, design thinking, and so on.	This paper provides the challenges that are faced in the transportation system where ANN is used to analyze.
[18]	China	The technology is updating every day where AI-based efficient protocol is built/developed for intelligent transportation systems. This proposed work implements Distributed Artificial Intelligence (DAI) by combining it with a neural network. This network produces an efficient routing system while compared with the other several existing methods.	This proposed method uses DAI neural network with Self Organizing Map (SOM) which provides the best solution for energy consumption by the network.

III. SDG 11.2 AND VULNERABLE TRANSPORT USERS

Globally, the number of persons that need assistive instruments are more than 1 billion but only 10% of those require have possession due to various factors [19]. To encouraging social inclusion a well-functioning transportation infrastructure is essential at various levels of society. For the said purpose SDG 11.2 is focused. The aim is to provide the transport services with special attention to vulnerable transport users. This study focuses on a ITS for vulnerable transport users. Vulnerable users (as depicted in fig. 1.) include children, women, old, Cyclists, pedestrians, or persons with different abilities. They are all disproportionately represented in road accidents, especially as pedestrians. In addition, because disabled people have reduced mobility and/or sensory perception, a conventional ITS may not fully meet their needs. ITS shall have a special focus to make their travel easier and safer.

The ITS shall identify the pedestrian crossing and shall be able to locate pedestrians with disabilities, identify the precise sort of disability, and deliver adaptive responses based on the disability. Furthermore, by being aware of the location of the crippled pedestrian, the infrastructure can respond in a way that maximises help for the latter. Here are a few examples:

- People with mobility or cognitive disabilities will benefit from a green phase that is tailored to their needs.

Fig. 1. Vulnerable Transport Users

- Additional audio information for pedestrians with visual or cognitive problems, beyond the standard beeps or ticks. The message content and loudness of the audible message can be adjusted based on how close the waiting area is to the impaired pedestrian's current location.
- For pedestrians with hearing or cognitive disabilities, a variety of visual signals are available. It is possible to provide visual assistance to the visually impaired pedestrian as close as possible because of the position of the pedestrian in relation to the system.
- Flashing light systems in the pavement can be used to assist walkers with cognitive or hearing problems in finding their way.

For such vulnerable users Assistive technology [20] may play a significant role. It is an umbrella term that is used to refer the set of technologies used by person with disabilities or old/children/women to the activities that they find it difficult or impossible. Some of the examples are technologies used in automated wheel chair, hearing aid, vision aid, etc.

IV. Assistive Technologies and Its4vtu

Assistive Technology is very much helpful in improving functioning of a person and hence enhancing their well-being and quality of life. One of the main challenge for ITS4VTU is to recognize vehicle-to-vulnerable as an explicit layer of the ITS as depicted in figure 2.

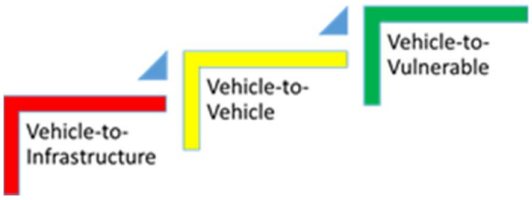

Fig. 2. ITS4VTU Layers

The layer vehicle-to-vulnerable must be able to recognize and utilize the assistive technologies. Some of the useful assistive devices [21] are (also refer fig. 3.):

- ***Mobility Aids:*** The various orthotic devices, and prosthetic devices such as walker, wheelchair etc. may be automated with assistive technology for ease of use.
- ***Assistive Listening Systems:*** FM systems, infrared systems, personal amplifiers may be used to help people assist in more clearly.
- ***Cognitive Aids:*** Memory aid, speech recognition, voice recorder, word prediction software, personal digital assistant and mnemonics are used to help people with attention, memory, or other thinking skills deficiency.
- ***Physical Modifications:*** Modification are required to the provide and environment for vulnerable users such as ramps, wider doorways, grab bars, adapted vehicle, automated kiosk, tactile guiding paver and tactile warning paver to enable access to buildings, and workplaces.

- ***Wearable Technologies:*** Smart watch, smart wrist band, smart jewelry, fitness tracker, smart clothing, various implantable in the body, and head-mounted display are used to allow the person with limited motor skills to accomplish various activities.

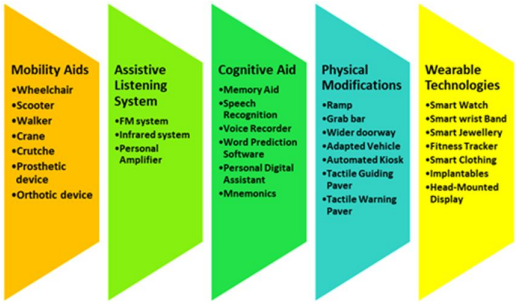

Fig. 3. Assistive Technologies for ITS4VTU

So, to develop an ITS4VTU the provisions must be made where vehicle-to-vulnerable layer shall be be able to identify and utilize assistive technologies as depicted in fig. 4.

Fig. 4. Vehicle-to-Vulnerable layer Assistive Technologies in ITS4VTU

V. Conclusions

The present research work described the role of AI in ITS. It also presented the various works in this direction in different countries. Further, it attempted to identify the various vulnerable users in transport system such as elderly, women, children, differently abled and others. Since vulnerable users need special provisions, it has been emphasized that assistive technologies shall be used in ITS. The research then proposed a vehicle-to-vulnerable layer shall be included in layered architecture of ITS. The vehicle-to-vulnerable layer must be able to recognize and utilize the assistive technologies identified in this research. It has been referred to as ITS4VTU (Intelligent Transport System for Vulnerable Transport Users). This article will also help the new researchers who want to contribute on different dimensions of the transport system.

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The Security Algorithm RBB01 used to Secure the Social Media Analyzed Data

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***Abstract*—The significance of current global information is best understood in light of the reality that life on Earth is impossible without information. This is a lot of information, and it is growing every day thanks to social media sites like "Twitter, Facebook, YouTube, WhatsApp, Instagram, linkedIn", and so on, which just provide a rapid general assessment online. Many more people groups used "this media," notably Twitter. In this manner, "machine learning algorithms" are employed to analyse the public perception expressed in tweets and make predictions about the future. This information under examination has to have a strong extremity score. Since this score may be altered and has the potential to affect outcomes, it is quite vulnerable. Therefore, the current security calculations are "Salsa and ChaCha." The "Salsa" calculation is slanted in a way that pushes initial attributes. Awkward traits are shifted to the first portion of the "ChaCha" computation. The existing computations don't have very good security because they focus mostly on execution rather than security. RBB01 is in this way the intelligent security calculation. Five phases make up this calculation. The first step is to locate the enigmatic "key N, n, and p values" via the lattice. The secret key is applied in condition in the second stage (1). The third stage of PN(n) upto n=1 activity. All PN(n) actions are made into a single line in the fourth step. The fifth stage involves trading and pairing attributes on a grid. In contrast to current calculations, the suggested calculation offers excellent security and execution.**

***Index Terms*— Twitter, Machine Learning Algorithm, Security, Encryption, and RBB01.**

I. INTRODUCTION

In the modern age, social networking sites like Twitter, Facebook, and others are increasing the amount of big data every day. Huge amounts of data are swiftly transported to several fields is what big data refers to. Three characteristics of large data are volume, velocity, and diversity. Data volume refers to data size. The data are being evaluated by velocity. Variety is data that is generated from several sources.

Twitter: Twitter is currently one of the more widely used forms of media in society. Anyone, wherever in the world, may tweet using the internet through this form of communication. Through the application of machine learning algorithms, this tweet was utilised to forecast the future and determine its polarity score.

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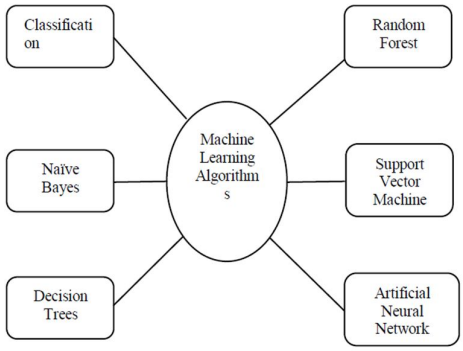

Figure 1. Machine Learning Algorithms [1]

The categorization algorithm's yes or no idea may be shown in Fig. 1. Mean Square Error is the basis of the Random Forest algorithm. Probability of class and condition is the foundation of the Naive Bayes method. Classification and regression are both aspects of the SVM technique, however only classification issues are employed more frequently. The idea of a decision tree is a depiction of a tree. Back propagation is a concept in artificial neural networks.

The fastest way to share peoples' opinions in the public today is via social media. People utilise platforms like "Twitter," "Facebook," "WhatsApp," "YouTube," "Instagram," "LinkedIn," etc. to disseminate information on sports, entertainment, politics, government employment, etc.

Twitter is one of these media that is specifically chosen for study since it is crucial for making predictions. Because this data might alter the future, it is less secure; thus, “apply the existing security algorithm is Salsa and ChaCha”. These algorithms run in quarter-round manner and provide quick encryption performance. Because they primarily concentrated on efficiency rather than security, current algorithms do not have acceptable security. RajBagathBasha (RBB) 01 is the innovative security algorithm in this case.

II. Related Work

The performance of more methods using sentiment analysis and machine learning was compared, and it was discovered that the classification technique is extremely simple to comprehend [1]. Salsa's execution time was compared to that of the proposed algorithm CBB21 [2]. They speak about the CBB20 security algorithm and the tweets. Salsa is used to compare the encryption time of the CBB20 proposed method [3]. They researched Twitter's security system and analysis. SRB21, a suggested security method, was used to compare Salsa's running time for encryption [4]. They mostly focus about security and future predictions made on Twitter. Salsa's encryption running time is compared to SRB18's security algorithm [5]. They investigated the RBJ25 cryptography algorithm and contrasted its encryption efficiency with that of “ChaCha and AES” [6]. Also in the recommended “security algorithm RB20”, it compares Salsa and AES in terms of speed while calculating the running time of encryption [7]. The CBB22 method is suggested and offers extended data security [8]. The “SRB21 Phase 1 algorithm” is suggested for twitter data confidentiality. Salsa20/4 is used to compare the encryption and decryption running times of this algorithm [9]. Through classification and SVM algorithms, sentiment analysis is mostly used to analyse movie reviews [10]. They outlined 7 steps for ensuring data security [11].

III. Encryption Algorithm

- Obtain the data that have been generalised and convert it into matrix form.
- Determine the matrix's N, n, and p values.

$$P_N(n) = (N!/(n!*(N-n)!))\, p^n (1-P)^{(N-n)}$$

do $P_N(n)$ operations upto $n = 1$ Equation (1)

where N is the size of the matrix
n is upper triangel values, n is upto 1
p is lower triangle values

- Combine all values from PN (n) into a single line of activity.
- In Step 4, two values from each pair upon left.
- In Step 6, the matrix's values via Step 5 must be replaced.

IV. RESULT AND DISCUSSION

$$P_{BD}=\begin{bmatrix} 2101/7 & 2102/7 & 2103/7 & 2104/7 & 2105/7 \\ 2106/7 & 2107/7 & 2108/7 & 2109/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

where P_{BD} is Probability of Bernoulli Distribution

Step 1: n=4

"N= 5, p=7, N!=120, n!=24"

- Using "Equation (1)"

$$P_5(4) = (5!/(4!*(5-4)!))(7^4((1-7)^{(5-4)}))$$

$$P_5(4) = (120/(24*(1)!))(7^4((-6)^{(1)}))$$

$$P_5(4) = (120/(24*1))(2401(-6))$$

$$P_5(4) = (120/24)(-14406)$$

$$P_5(4) = (5)(-14406)$$

$$P_5(4) = 72030$$

Step 2: n=3

"N= 5, p=7, N!=120, n!=6"

$$P_5(3) = (5!/(3!*(5-3)!))(7^3((1-7)^{(5-3)}))$$

$$P_5(3) = (120/(6*(2)!))(7^3((-6)^{(2)}))$$

$$P_5(3) = (120/(6*2))(343(36))$$

$$P_5(3) = (120/12)(2058)$$

$$P_5(3) = (10)(2058)$$

$$P_5(3) = 20580$$

Step 3: n=2

"N= 5, p=7, N!=120, n!=2"

$$P_5(2) = (5!/(2!*(5-2)!))(7^2((1-7)^{(5-2)}))$$

$$P_5(2) = (120/(2*(3)!))(7^2((-6)^{(3)}))$$

$$P_5(2) = (120/(2*6))(7^2(-216))$$

$$P_5(2) = (120/12)(49(-216))$$

$$P_5(2) = (10)(10584)$$

$$P_5(2) = 105840$$

Step 3: n=1

"N= 5, p=7, N!=120, n!=1"

$$P_5(1) = (5!/(1!*(5-1)!))(7^1((1-7)^{(5-1)}))$$

$$P_5(1) = (120/(1*(4)!))(7^1((-6)^{(4)}))$$

$$P_5(1) = (120/(1*24))(7^1(1296))$$

$$P_5(1) = (120/24)(7(1296))$$

$$P_5(1) = (5)(9072)$$

$$P_5(1) = 45360$$

P_5=720302058010584045360

P_5=(7,2), (0,3), (0,2), (0,5), (8,0), (1,0), (5,8), (4,0), (4,5), (3,6), 0

Pair 1: (7,2)

$$P_{BD}=\begin{bmatrix} 2101/7 & 2102/7 & 2108/7 & 2104/7 & 2105/7 \\ 2106/7 & 2107/7 & 2103/7 & 2109/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 2: (0,3)

$$P_{BD}=\begin{bmatrix} 2104/7 & 2102/7 & 2108/7 & 2101/7 & 2105/7 \\ 2106/7 & 2107/7 & 2103/7 & 2109/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 3: (0,2)

$$P_{BD}=\begin{bmatrix} 2108/7 & 2102/7 & 2104/7 & 2101/7 & 2105/7 \\ 2106/7 & 2107/7 & 2103/7 & 2109/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 4: (0,5)

$$P_{BD}=\begin{bmatrix} 2106/7 & 2102/7 & 2104/7 & 2101/7 & 2105/7 \\ 2108/7 & 2107/7 & 2103/7 & 2109/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 5: (8,0)

$$P_{BD}=\begin{bmatrix} 2109/7 & 2102/7 & 2104/7 & 2101/7 & 2105/7 \\ 2108/7 & 2107/7 & 2103/7 & 2106/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 6: (1,0)

$$P_{BD}=\begin{bmatrix} 2102/7 & 2109/7 & 2104/7 & 2101/7 & 2105/7 \\ 2108/7 & 2107/7 & 2103/7 & 2106/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 7: (5,8)

$$P_{BD}=\begin{bmatrix} 2102/7 & 2109/7 & 2104/7 & 2101/7 & 2105/7 \\ 2106/7 & 2107/7 & 2103/7 & 2108/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 8:(4,0)

$$P_{BD}=\begin{bmatrix} 2105/7 & 2109/7 & 2104/7 & 2101/7 & 2102/7 \\ 2106/7 & 2107/7 & 2103/7 & 2108/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 9: (4,5)

$$P_{BD}=\begin{bmatrix} 2105/7 & 2109/7 & 2104/7 & 2101/7 & 2106/7 \\ 2102/7 & 2107/7 & 2103/7 & 2108/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 10: (3,6)

$$P_{BD}=\begin{bmatrix} 2105/7 & 2109/7 & 2104/7 & 2107/7 & 2106/7 \\ 2102/7 & 2101/7 & 2103/7 & 2108/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

Pair 11: (0,0)

$$P_{BD}=\begin{bmatrix} 2105/7 & 2109/7 & 2104/7 & 2107/7 & 2106/7 \\ 2102/7 & 2101/7 & 2103/7 & 2108/7 & 2110/7 \\ 2111/7 & 2112/7 & 2113/7 & 2114/7 & 2115/7 \\ 2116/7 & 2117/7 & 2118/7 & 2119/7 & 2120/7 \\ 2121/7 & 2122/7 & 2123/7 & 2124/7 & 2125/7 \end{bmatrix}$$

The 3x3=>24 bytes , 6x6=>76 bytes, 10x10=> 312 bytes, 15x15=> 812 bytes, 20x20=> 1531 bytes, 40x40=> 6580 bytes as displayed in the Table I.

Table I. RBB01 encryption performance

File Size	ChaCha	Salsa	RBB01
24	1.69	3.4	4
76	1.29	2.2	4.2
312	2.73	2.3	4.5
822	2.64	3.9	4.9
1531	3.4	9.1	9.6
6580	2.27	10.5	12.5

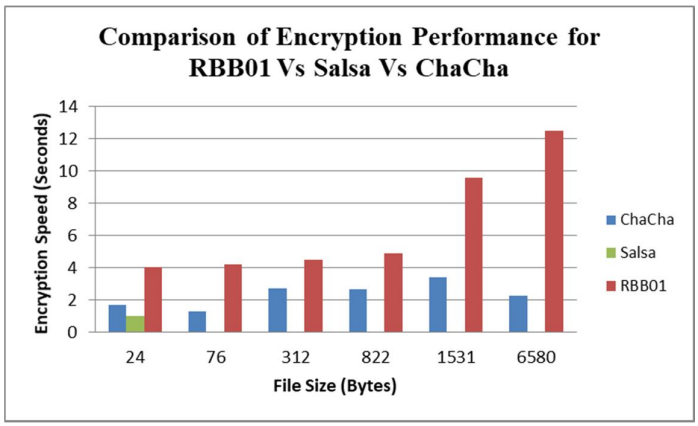

Figure 2. Encryption performance

In Fig.2, the RBB01 methodology and quickly examined the cypher speed. The authentication execution of "3.4 (s), 2.2 (s), 2.3 (s), 3.9 (s), 9.1 (s) and 10.5 (s) for the Salsa" and "4 (s), 4.2 (s), 4.5 (s), 4.9 (s), 9.6 (s) and 12.5 (s)" for the RBB01. When compared to current approaches, the RBB01 offers greater insurance of the information.

IV. Conclusion

In this day and age information is most significant in open on the grounds that, without information can't live on the planet. This information is enormous information and that information day to day increment through Social handles like "Twitter, Facebook, Youtube, WhatsApp, Instagram, linkedIn", and so forth… From this media, more number of people groups utilized particularly Twitter. As a necessary consequence, media is used to examine the overall evaluation of "tweets" and envision the "future through Machine Learning Algorithm" and used to make it extremity endlessly score seems to have exceptionally less security because this score can be changed and have an impact on fates, so implement the current security calculations is "Salsa and ChaCha". Since they focused only on execution rather than security, their estimates don't provide very effective security. Furthermore, RBB01 is the suggested security calculation. There are 5 steps in this calculation. Finding the mysterious "key N, n, and p values from" framework is the first step. Employing the mysterious key to the situation is the second step (1). The third stage of PN(n) upto n=1 activity. All PN(n) operations are made into one line in the fourth stage. The fifth stage involves trading and pairing attributes on a grid. In contrast to other computations, the RBB01 calculation has provided excellent security and execution. To boost the number of numerical security models in the future.

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Enhancement Techniques for Underwater Images

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***Abstract*—In this paper we present techniques for enhancement of underwater images that have been degraded because of scattering and absorption in the medium. These require only image processing software Without the use of any specialized hardware. The scene's organizational pattern or the situation under the sea changes as we go deeper into the waters. Merging two images that are at once created from the same source version of the image that has been contrast corrected and white balanced is performed on the original image. The two images are produced by the fusion process, in addition to the weightsthat are associated with them. The aim of using maps is to improve the way the colours and borders are transferred to the enhanced image. A detailed weight map is used to avoid thelow-frequency components, transitions, and variations which may cause artifacts.**

In addition to this, the paper makes use of a multi-scale fusion approach and uses the images when they were recreated. The comprehensive approach to qualitative and the result of the quantitative study also presented. Images with dark components have improved visibility, the overall contrast has been enhanced, and the edges now have a greater degree of sharpness. Our investigation has also shown that proves that our method was designed correctly. It is not very unaffected by the settings of the camera and improves several aspects of the precision of the picture processing program. For example, in a picture,two strategies that can be used are segmentation and key point matching. It has the potential to enhance the image's current quality. In confirming the order to get these improved outcomes, we have employed PSNR, Mean Squared Error(MSE), as well as the Structural Similarity Index (SSIM), in addition to the histogram analysis as quantitative metrics

***Index Terms*— Image Processing, White Balance, Gamma Cor- rection, Multi-scale Fusion, Normalization, Contrast Limited Adaptive Histogram Equalization (CLAHE).**

I. INTRODUCTION

Due to poor visibility, not much is known about ocean ecosystems throughout the world. To know more about ocean, use of underwater image enhancement techniques are nec- essary. This is because water covers more than 70% of the Earth's surface and underwater images have become more significant in the study of marine life, underwater mountains, flora, and fauna. Due to this increased interest in what lies under the surface and for further exploration, we need High- Quality under water images. But due to the Light reflection, scattering the light penetration is hindered. The quality of the image depends heavily on the structure of the water (i.e., the medium in which the image is taken) and the water's properties, such as dust sprinkling and distorting and refracting light. As you go inside waters in sea, the reflections are polarised horizontally while some are polarised vertically. With vertical polarisation, objects seem darker and more subdued, making it feasible to capture richer tones that could otherwise be lost in the mix. Seawater is 800 times denser than air [5], making it a common problem for

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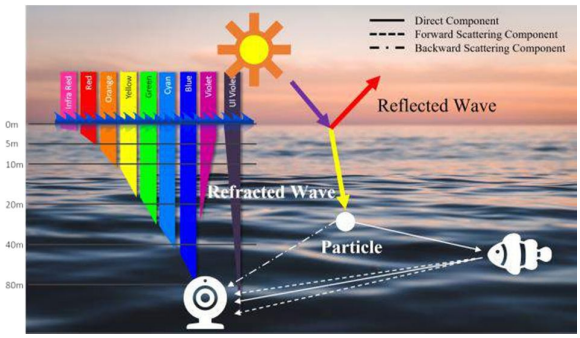

Fig. 1. Schematic Of Underwater Image

underwater photography. Thus, light beams from the air are partially reflected and partially absorbed [3] as they travel to the water. As you get further into the ocean, the amount of light entering the water decreases. Similarly, water molecules are capable of absorbing part of light. As a result, the underwater sights get darker and darker as the ocean depth increases. The quantity of light beams decreases as we travel deeper, but the colours likewise do so one by one, as their wavelengths decrease. For example, a depth of 3 meters causes first, the colour red to disappear from the sky. Second, the orange hue gradually fades away. The orange colour disappears about 5 meters below the surface. Similarly, the majority of the colours get absorbed leaving behind Blue and Green colours as shown in Figure 1. Lastly, the yellow fades away completely at a depth of 10 meters [3]. To counteract the blue color's dominance, anything submerged changes its natural hue. As a result, blue dominates underwater photographs. Brightness, contrast, and other factors abound in those fuzzy images with lots of blue hues. The two-step image enhancing-improving method for underwater photography combines white balancing and fusion to enhance the images without explicitly inverting the optical model. Color casts induced by selective absorption of colours with depth and back-scattering are compensated for using white balance and image fusion techniques, respectively inour method of image processing.

II. Enhancement of Under Water Images

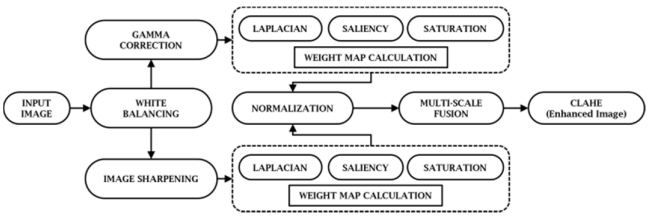

Fig. 2. Block Diagram

To overcome the hazing effect in underwater images, a fu- sion, white balancing techniques can also be effectively used. Colour casts generated by varying illumination or medium at- tenuation can be eliminated by the process of white balancing. Seeing green or blue underwater is a genuine issue that must be addressed addressed since it affects images at depth as shown in Figure 1.

The wavelength spectrum is selectively affected by the attenuation process as light travels through water, which affects both the intensity and looks of a coloured surface. Because long-wavelength light is less susceptible to scattering than short-wavelength light, our ability to discern colour varies as we dive deeper into the water.

In reality, the amount of separation between the observer and the scene affects how much colour is attenuated and lost in the image (Figure 1). Many current white balancing techniques have been examined, and some of them are found to be successful and suited for the above enhancement. After that, going through these approaches [15] and there is still a need for enhancement of undersea image processing approaches are to be improved. Based on a predetermined assumption, these methods estimate the light source colour and then use the normalized light source intensity to ensure colour constancy. As an example, the Gray-world method [15] assumes that the scene's average reluctance is colourless. Each channel may be averaged to decide how much illumination is being dispersed. A two-step procedure, as indicated, is used to improve underwater images

without explicitly inverting the optical model. The white balancing method that is being employed looks to correct the colour cast those results from the selective absorption of colours with depth, while the fusion method we use aims to improve the scene's edges and details while reducing the loss of contrast caused by back-scattering. The Detailed flow of the enhancement technique can be seen in
Figure 2.
White Balancing is the main emphasis for image enhance- ment. Cutting the unwanted colour casts caused by different lighting or medium attenuation qualities attempts to improve the image's aspect. A major challenge in underwater colour feeling is a green-bluish look that needs to be corrected. The attenuation process alters the hue and intensity of a colourful surface by selectively altering the wavelength spectrum when light passes through water.

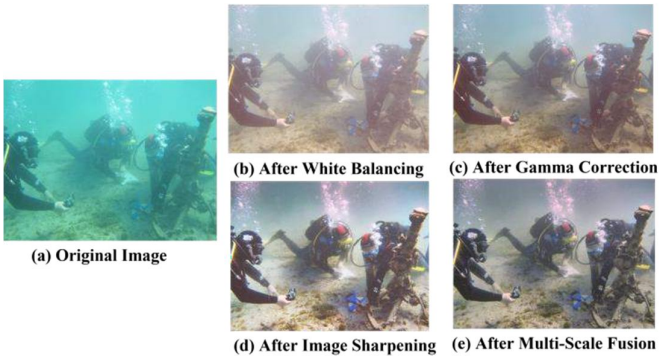

Fig. 3. Different techniques for dehazing of images

While traveling deeper into the water, the ability to see colour changes because the scattering weakens long wave- lengths more than short ones. Attenuation and loss of colour are also affected by how far away the observer is from the scene they are looking at. So have a look at a wide range of white balance approaches [15], and it found that some are both successful and appropriate for our situation. The new solution for underwater scenes is based on the following ideas:
For underwater scenarios, it found that the well-known Gray- World method [11] performs well in terms of visualquality. When it comes to significantly damaged underwater scenarios, typical solutions fail miserably. However, the hue shift stays, and as a result, it seems blue. Although the Gray- World approach cuts the blue tone best, we see strong red artifacts when using it. A low mean value for the red colour channel causes overcompensation in areas where the red colouris present (since the Gray-world separates each channel byits mean value). As a result, compensating for the loss ofthe red channel is our primary goal. As determined by prior underwater study. Gray World will be used in the second stageto compute the white balance picture.
To compensate for the lack of red channel, the following two observations and concepts are used:

- The green channel is considerably better preserved in water compared to the red and blue channels.
- The green channel carries opposite colour information to the red channel.

So it is more important to compensate for the large attenu- ation caused by red compared to green when moving through the clear water. As a result, a small part of the green channel is mixed with the red channel to compensate for red attenuation. Initially, using the ratio of green to blue was thought to be the most efficient way to compensate for the loss of colour information in the red channel, It allows better restoration of the full-colour spectrum using only the green channel information while preserving the natural appearance of the background (water area).
Red channel information should not be sent where the green channel information is still relevant. Therefore, we want to avoid the reddish colour of the Gray-world method in the overexposed parts of the image. The red channel should only be corrected in areas where the red channel is significantly attenuated (see Figure 2). Pixels with significant values in all three channels show that they are in regions close to the observer or artificially illuminated and do not need to be reconstructed. This argument follows statement in [11] [8] [10].
To represent the adjusted red channel $I_{rc}(x)$ at each pixel position (x) as per the observations [1] given below:

$$I_{rc}(x) = I_r(x) + [\alpha(\bar{I}_g - \bar{I}_r)(1 - I_r(x))I_g(x)] \quad (1)$$

Colour channels of image I's red and green colour channels are represented by $I_g(x)$ and I_r and I_g, respectively. A constant parameter is used in Equation 2 to show that each element in the second term is a direct outcome of one of the observations listed above. For varied lighting circumstances and acquisition settings, we've found that $\alpha = 1$ value works well. The unsharp masking notion is employed, therefore. Similarly for the Blue channel,

$$I_{bc}(x) = I_b(x) + [\alpha(\bar{I}_g - \bar{I}_b)(1 - I_b(x))I_g(x)] \quad (2)$$

III. Multi-Scale Fusion

Here, Figure 3 shows how dehazing can be performed uisng a technique based on multi-scale fusion. Authors in [6] have discussed color restoration of under water images. Image fusion has been proved to be very much useful ina variety of applications, including vision compositing [7], multi- spectral video enhancement [9], defogging [4], [1], and HDR photography [2].

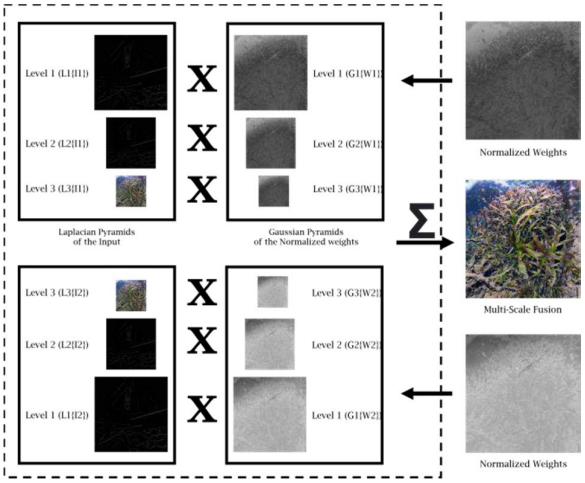

Fig. 4. Schematic Of Multi-Scale Fusion

The main focus of this paper is to obtain a quick solution that can improve scene visibility in a variety of underwater images. This work, like those of [4] and [1], is based ona collection of inputs, produced from a sole source picture. However, unlike
[4] and [1], those two were picked especially,to get the most out of the white balancing strategy described in the preceding section. A pair of inputs are included to improvethe colour contrast and edge sharpness of a white-balanced image, respectively.

A. Inputs of the Fusion Process

By applying the **White balancing** approach to the input images because colour correction is very important under- water, This phase seeks to improve the image quality look by removing colour casts created by different illumination components. White balance suffers from obvious impacts at water deeper than 10 feet since the absorbed colours are difficult to restore.(Refer Figure 3 (b))
As a consequence, its necessary to perform a **Gamma correction** on the white balanced image version to produce required initial input. It is important since white-balanced underwater images tends to seem overly bright in general. This adjustment enhances the contrast between darker andbrighter areas at the expense of features in the underwaterand overexposed areas. This requires a secondary input that relates to a sharper variant of the white balanced image tocompensate for this loss. (Refer Figure 3 (c))
As a result of this, emulating the reversal of Laplacianin the second input, the disparity between a white-balanced picture and its Gaussian filtration counterpart causes undesired artifacts [13]. The **Multi-scale fusion** approach will help to keep the final blended image free of these artifacts.(Refer Figure 3 (e))

B. CLAHE [16]

Histogram Equalization (HE), an antiquated contrast en- hancement technique, performs well in typical images like human representations or everyday photographs. By spreading out the most regular power values, this

technique develops a picture's universal distinction. In any event, it endures more commotion in confined spaces. The HE has been reduced to a nearby histogram levelling, or "variable histogram levelling". CLAHE depends on HE, the flexible approach that creates each histogram of a sub-picture to reposition the beautifulupsides of the images.

The CLAHE computation differs from traditional HE in that it uses tiny regions of the image called tiles and calculates several histograms, each of which is compared to a distinct section of the image and is used to reorder the image's softer edges.

The CLAHE enhancement computation may be performed in a variety of different spaces, including the RGB, YIQ, and HSI spaces. A variety space is defined by red (R), green (G), and blue (B) elements in the RGB variety model. These three segments are power images in monochrome.

In this sense, the RGB model is an ideal tool for different age groups when images are captured by various camcorders or displayed on various displays. CLAHE may be used oneach of the three components separately in the RGB variety model. The R, G, and B separate portions can be combinedto provide the result of a full-variety RGB image.

Before Applying a Histogram to an Underwater image, The RGB colours are not Uniformly Distributed over Image pixels. So, the Quality and the Contrast in the Image become poor. So, Applying CLAHE to an Image result in the Uniform Distribution of RGB Colour patterns over the entire Image. It is possible to improve the final image based on the improved image results using the HE adjusted contrast limit. If the contrast that its photograph captures is really dark, the contrast value on the final image will be lighter. On the other hand, if the image that was caught was exceptionally bright, the contrast value would have decreased and the image would have became darker.

IV. Subjective Measurements

A. Red Channel and Blue channel correction

As said earlier we perform the color correction by keeping the value of correction factor-alpha in the range of [0,1]. By this, we can achieve the enhancement of the red channel and the blue channel as shown in Fig 1(b).

B. Evaluation of white balance & Gamma Correction

As said earlier in the paper to perform the color correction by keeping the value of correction factor-alpha in the range of [0,1]. By this, one can achieve the enhancement of the red channel and the blue channel as shown in Figure 6.

C. Evaluation of white balance & Gamma Correction

In white balance, we concatenate the corrected or enhanced RGB channels and we Linearize gamma-corrected RGB values i.e., the gamma correction of the sRGB values in input so that output contains linear RGB values. Then we estimate the illumination using the Gray-world algorithm afterward we adjust the color balance of the RGB image with chromatic adaption finally once again we Adjust image intensity values or color map to get the white balanced image which is depicted in Figure 3b and Figure 3c

D. Evaluation of Image Sharpening

Here we perform 2- D Gaussian filtering of images by filtering input image witha 2-D Gaussian smoothing kernel with a standard deviationof

0.5 and return the filtered image then we do Normalization and Histogram Equalization This process is done to enhance the contrast of the image. This series of processes is termed Image sharpening and this can be seen in Figure 3d.

E. Evaluation of Multi-Scale Fusion

By using the Gaus- sian Pyramid and the Laplacian Pyramid. An image processing technique known as the Gaussian pyramid breaks an image into smaller and smaller groups of pixels to blur it. The name was inspired by German mathematician Johann Carl Friederich Gauss.

Using the Laplacian pyramid, we may assess the degree to which the low-pass filtered image differs from the original MR image. A Laplacian filter is used to calculate a picture's second derivatives, which gauges how quickly the image's first deriva- tives change. If the values of neighboring pixels are changing, it's because of an edge, but if they're not, it's because of a gradual progression. During the pyramid reconstruction, both Gaussian and Laplacian pyramids contribute to Multi-Scale fusion. In Figure Figure 4, this may be observed.

F. Evaluation of CLAHE

In contrast to Contrast-Limited Histogram Equalization (CLAHE), which decreases noise by lowering local histogram Equalization(HE), which distin- guishes between the two, splits the images into neighbour- hoods and applies neighbourhood. Bi linear insertion is used to conceal district borders. In a trial of improvement in Contrast, A function now uses a scalar quantity in the range [0, 1] as existing with the Contrast upgrade limit. If the traits that follow the cut-off are superior, we want to introduce more differentiation. The contrast Limit function has a difference that helps to preserve the over saturation of the image [16]. The overall processing of underwater image enhancement is summarized in Figure 5.

V. Objective Measurements

This section provides the objective evaluation after the enhancement techniques applied on the underwater images. These metrics are available as provided in [12]

Image Quality Original White Gamma

A. Peak Signal to Noise Ratio: PSNR

Using image as a reference, calculates the peak signal-to- noise ratio (PSNR) for image. Better image quality is indicated by a higher PSNR value [12].

B. Structural similarity index: SSIM

To assess image quality, SSIM computes the structural similarity index (SSIM) for gray-scale image.A value near one suggests higher image quality [12].

C. Mean-squared error: MSE

It computes the mean-squared error (MSE) between the arrays X and Y to assess image quality. A lower MSE score shows that X and Y are more comparable [12].

D. BRISQUE

Blind/Reference less Image Spatial Quality Evaluator (BRISQUE) no-reference image quality score is used to compute the no-reference image quality score for image. It contrasts A with a default model built from images of natural situations with comparable aberrations. A lower scoresuggests improved perceptul quality [12].

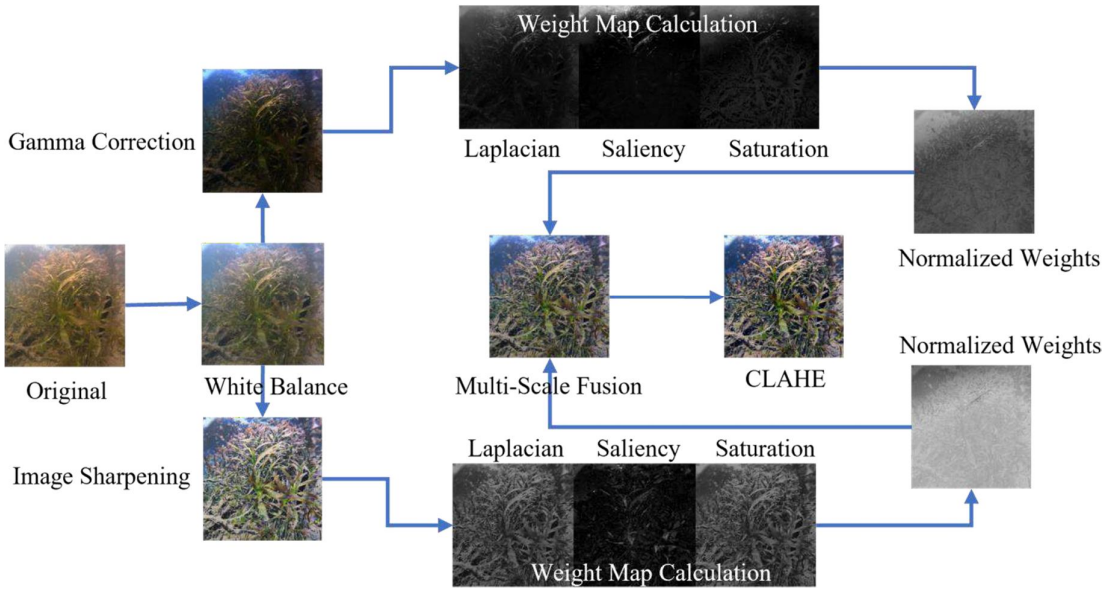

Fig. 5. Summary of under water image enhancement. Using Gamma correction and edge sharpening, the (too pale) white- balanced picture is split into two separate images, Input 1 and Input 2. Two images are supplied into the fusion process,which creates weight maps based on normalization and mixes the inputs using a multi-scale method. Multi-scale fusion is demonstrated using only three layers of Laplacian and Gaussian pyramids

E. NIQE

Naturalness Image Quality Evaluator no-reference image quality score: Using the Naturalness Image Quality Evaluator, compute the no-reference image quality score for image A. NIQE compares to a standard model built from images of natural settings. A lower score suggests improved perceptual quality . [12].

VI. Results

This paper discuss the various methods for enhancing under- water images. The single original image is all that is needed for this method, which is based on the fusion principle. With the ability to recover significant faded details and edges. During trials our approach can enhance a wide variety of underwater images with excellent accuracy. This paper describes howthe suggested image enhancement approaches work for a variety of difficult underwater computer vision applications. The results are shown in Figure 6.
Figure (5a & 5f) are obtained from [2] where as Figure 5b, 5c, 5d & 5e are captured with the help of Insta 360 camera with specifications wide angle 5.7k panoramic video capturingwith 4k resolution which improves the image quality. [14] From figure 6, one can observe the enhancement of underwaterimage by reducing the haziness and removal of noise in the images with the series of processing. The Image quality can be observed objectively in the table 1. It compares the different image quality matrix with the different enhancement techniques.

VII. Conclusion

Innovation in image processing extracts data from images and uses it in a variety of applications. Here, this paper highlights the most important applications for image handling that could offer important benefits. The advancement of under- water robotics has made underwater exploration much simpler and less difficult. However, the reason these robots are so expensive is primarily due to the sophisticated cameras that are attached on them. in order to develop more effective, reliable, and camera-independent algorithms with more study in this area. When these algorithms are built into the robots, they will not only help obtain better, enhanced underwater exploration images but also dramatically lower the cost of these robots.

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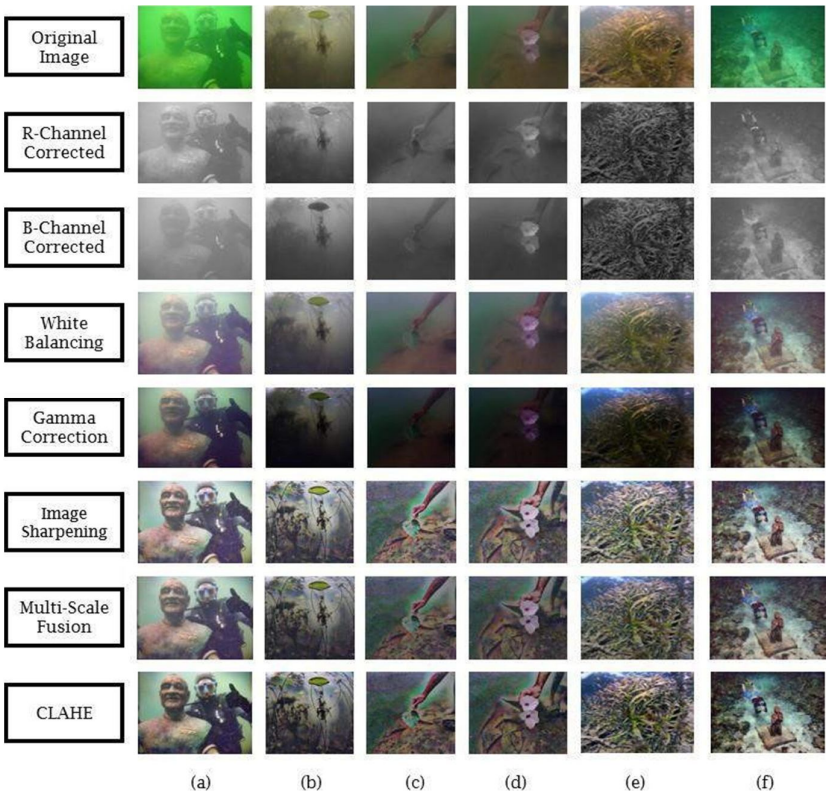

Fig. 6. Comparison over different enhancement Techniques

TABLE I. EDGE AND PIXEL-BASED IMAGE QUALITY ASSESSMENT

Image Quality Matrix [Accepted Range]	Enhancement Techniques					
	Original Image	*White Balancing*	*Gamma Correction*	*Image Sharpening*	*Multi-Scale Fusion*	*CLAHE*
Red Channel Mean (≤ 0.5)	0.1753	0.4962	0.2585	0.5002	0.4226	0.3826
Green Channel Mean (≤ 0.5)	0.5064	0.4886	0.2562	0.4963	0.4191	0.3992
Blue Channel Mean (≤ 0.5)	0.3092	0.4952	0.2559	0.4996	0.4215	0.3898
PSNR (in dB) (¿30)	–	61.4986	64.2340	60.4674	62.9768	63.2066
Average SNR (in dB) ($\geq 4dB$)	–	4.8356	7.5710	3.8044	6.3139	6.6854
Structural Similarity (SSIM) Index Value (~ 1)	1	0.9724	0.9947	0.9667	0.9785	0.2038
Mean Squared Error (MSE) (~ 0)	0	0.2743	0.1480	0.3319	0.2496	0.0301
No Reference Image Quality Score (BRISQUE) (≤ 30)	45.1850	45.0421	44.4191	48.4987	45.9127	28.3506
Naturalness Image Quality Evaluator (NIQE) (≤ 2.5)	2.5815	2.5022	2.6058	2.5487	2.4522	2.6267

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Wireless Network Intrusion Detection System: Techniques, Systems and Future Challenges

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***Abstract*—Our daily lives are gradually getting more and more permeated by information technology. It becomes more crucial to protect these systems as their interconnectedness expands. Most of these systems are now networked wirelessly since doing so reduces the time and money required for both installation and maintenance. We conduct a literature review to locate knowledge gaps and suggest future research objectives in the field of wireless network intrusion detection. We take a methodical approach to categorising current wireless IDS methods according to their respective levels of sophistication, scope of coverage, target wireless network, data gathering procedure, trust model, and analysis method. In this article, we provide a concise overview of the benefits and drawbacks of various approaches to wireless intrusion detection, taking into account the unique characteristics of various wireless networks like WLANs, WPANs, WSNs, ad hoc networks, mobile telephony, WMNs, and cyber physical systems (CPSs). We then provide a brief overview of the most and least explored wireless IDS strategies, highlight the gaps in the current research, and critically examine the reasoning behind the varying levels of attention paid to each. We conclude by pointing out areas deserving of further study that have received relatively little attention and offering suggestions for doing so.**

***Index Terms*— IDS Techniques, Wireless Networks, Classification, , MANETs; Intrusion Detection Security Attacks and IDS architectures.**

I. INTRODUCTION

Intrusion detection systems aid in the protection and defence of computer networks. They do this by gathering data from numerous systems and networks, and then analysing that data to look for vulnerabilities in the system's defences.

A. The benefits of intrusion detection include:

- Keep an eye on user and system behaviour and analyse it
- Configuration and security auditing
- Verifying the safety of vital data and system files
- Comparison of observed behaviour to previously recorded attacks for statistical analysis
- Detection and Analysis of Abnormal Behavior
- Verification of the Operating System

The core of an intrusion detection system consists of three parts.

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A Network Intrusion Detection System (NIDS) monitors all traffic in and out of a network for signs of intrusion. Promiscuous mode operation that compares subnet-passed traffic to a database of known threats. The alert is sent to the administrator after the assault is detected or unusual behaviour is noticed. A common use case for NIDS is to monitor the subnet where firewalls are located for intrusion attempts.
An NNIDS, or network-based intrusion-detection system, examines data travelling between a network and a certain host in order to spot potential security breaches. When comparing NIDS with NNIDS, it's important to note that the former simply monitors traffic on a single host, while the latter does so for an entire subnet. By way of illustration, the NNIDS might be set up on a VPN endpoint so that the decrypted traffic could be inspected. Observing whether or not a person istrying to access your virtual private network
With a Host Intrusion Detection System (HIDS), a snapshot of your current system files is taken and compared to a previous snapshot. The alert is delivered to the administrator in case any of the essential system files were altered or removed. Mission-critical computers, which are not supposed to malfunction, are a prime example of a system that uses HIDS.

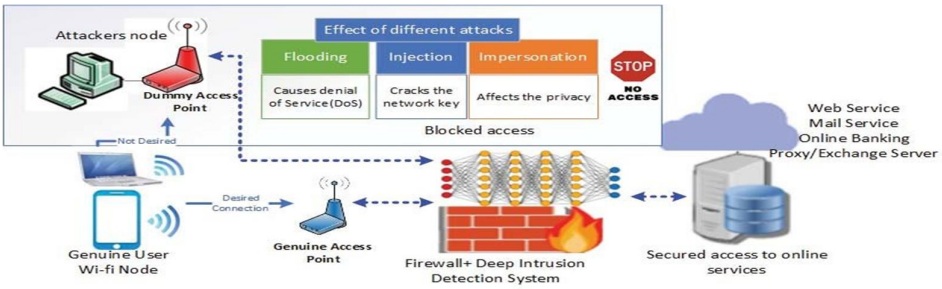

Figure 1: Network Intrusion Detection System

B. What Can and Cannot Be Expected from an Intrusion Detection System

However, the IDS is not the solution to all of our security concerns.
We need to know the limits of your IDS so that we know what to expect from it. Each network environment is unique, and so each Intrusion Detection System must be customised to match the requirements of our organisational environment. I will provide some instances of what these systems are capable of in the following sections.
The IDS can give these things:
Identify instances in which your system is being attacked; Find any mistakes in the configuration of your system; Assist the system administrator in completing the crucial step of formulating a policy for our computer resources; Reduce the complexity of managing security.Unfortunately, the IDS is unable to supply:
Deal with some of the modern hardware and features of networks; Analyze all of the traffic on a busy network; Handle problems involving packet-level attacks; Compensate for weaknesses in identification and authentication mechanisms; Investigate attacks without human intervention; Deal with weaknesses in network protocols; Deal with problems in the quality or integrity of the information the system provides.

II. Related Work

This chapter provides an overview of the research done on the hybrid network IDS that has been published so far. In addition, this section explains why a hybrid intrusion detection system is preferable to a more conventional one.
Based on vectors, Ijaz et al. [9] present a genetic algorithm. Vector chromosomes are used in this method. This technique is novel in that it displays training data as metrics and chromosomes as a vector. It paves the way for a fitness function to be attained in a variety of ways. In this study, we compare and contrast three different feature selection methods: the forward feature selector algorithm (FFSA), the linear correlation feature selector (LCFS), and the modified mutual information feature selector (MMIFS). Two datasets, CDU-13 and KDD-Cup '99, are used to evaluate the proposed approach. Metrics show that the vector genetic algorithm has a very low false positive rate of 0.17% and a very high detection ratio of 99.8% when it comes to DoS attacks. Important metrics in the IDS, such as U2R, Probe, and R2L assaults, are not evaluated by the authors.
To aid the DT, Alauthaman et al. [4] suggested a P2P bot identification method based on a feed-forward neural network. After that, we use CART as a feature selection technique to pick out the most important ones. Six rules

were used to determine which characteristics were most important, resulting in network traffic reduction measures being used. A total of 29 characteristics are chosen based on adherence to 6 criteria. Because of this, the proposed method was able to
99.20% precision and 99.08% detection rate. One drawback of using a CART is that it divides the variables one by one, which could make the decision tree unstable.
In [6], Kumar and Kumar present a hybrid NIDS model that relies on artificial intelligence. The model incorporates a neurofuzzy genetic algorithm, an adaptive neurofuzzy interference system, a fuzzy logic controller, and multilayer perception. The use of fuzzy logic for selecting relevant features was employed by the writer. In order to collect and sort network traffic, classify the data, and get ready to make the final decision based on an assumption of the correct assault, the suggested system relies on three main components: an analyzer, a collector, and a prediction module. As for the experiment itself,
is evaluated using the KDD-Cup '99 data set, and it increases the rate at which genuine attacks are detected while decreasing the rate at which false alarms are generated to within 1%. Results in fuzzy logic are observed based on assumptions, which might lead to inaccuracies in the results.
In a wireless sensor network IDS, Safaldin et al. [24] used the enhanced binary grey wolf optimizer as a feature selection approach and support vector machine for classification. The suggested method has a 0.96 accuracy rate, an FPR of 0.03, a detection rate of 0.96, and an execution time of 69.6 hours. The most significant drawback of the SVM classifier is how difficult it is to select a suitable kernel function. As a result of needing more space for the many support vectors generated by SVM, training on large datasets might take significantly longer.
In an Internet of Things (IoT) setting, Vallathan et al. [46] provide a deep learning-based method for dubious action detection. Deep learning methods and RFKD are used to make predictions about anomalous behaviour observed in footage collected by N/W surveillance tools. In order to categorise
purposes, while DNN is utilised for training and learning from data. In addition, the kernel density method is used for both predictive and cluster analysis purposes. The suggested method selects subsets of features using a standard merge-sort tree. The HHAR data sets are utilised for testing and grading. There was a 98.4 percent success rate and a specificity of
On the HHAR data set, the accuracy was 99.8%, while the sensitivity was 96.02%. One major limitation of neural networks is the length of time it takes to train a model because of how many hyperparameters must be tuned.

III. Classification

The diagram depicts a tree structure for organising the many wireless network IDS methods now in use. We divide the research on intrusion detection into six categories, or "dimensions":
The first criterion is the system that will be monitored by the IDS, known as the "target system."
Secondly, the method used for detection is a key differentiator amongst IDSs;
Thirdly, the IDS's collection process is compared in this criterion, which distinguishes between traffic-based and behavior-based IDSs.
The fourth criterion, "Trust Model," differentiates between independent IDSs and those that collaborate on data collection and processing.
The fifth criterion is the method used for analysing data, which can differentiate between more basic methods like pattern matching and more complex methods like data mining. Analysis Technique specifies how an IDS performs its search, while Detection Technique describes the specific items for which the IDS will seek.
Considering both active and passive stances, this criterion compares and contrasts the two.

IV. Quantifying the Effectiveness of Intrusion Detection Systems

Researchers in the field of intrusion detection systems (IDS) typically utilise FPR, FNR, and DR to evaluate performance [11, 18]. Specificity is inverse of FPR, which occurs when an IDS incorrectly detects a trustworthy node as an invader. When an IDS incorrectly labels a hostile or selfish node as benign, this is known as a false negative, or in the literature as a failure to report [1,5]. Detection, on other hand, is achieved when an IDS accurately detects a malevolent or selfish node [6,7,8]. the true positive rate is equivalent to the sensitivity and recall. Accuracy, defined as 1 minus the difference between the false positive and negative rates, is one way that scientists evaluate performance.
Efforts are being made to improve IDS research by establishing new, more precise measures, and this is the subject of some current study. Detection delay is an underutilised yet crucial metric for evaluating IDS

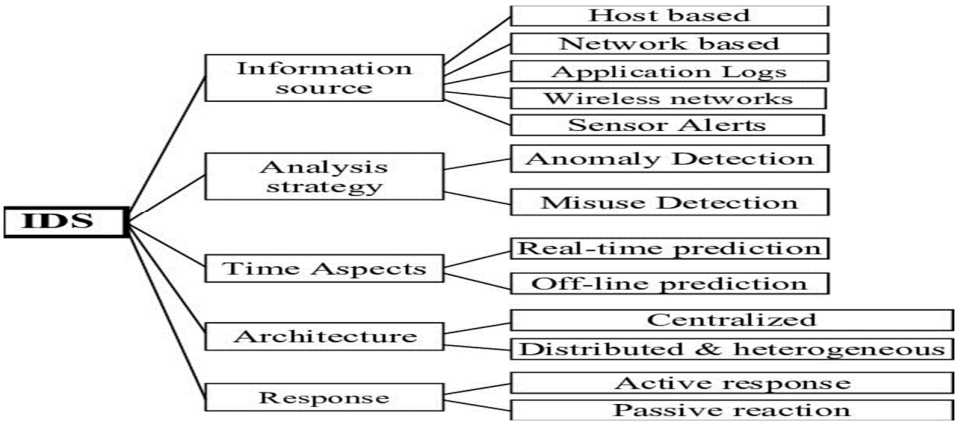

Figure 2 Classification of wireless network IDS

effectiveness [17, 18]. It doesn't matter if an attack is passive or aggressive; quicker detection means faster countermeasures.

Power consumption, communications overhead, and CPU load are also critical parameters for resource-constrained target systems. Many variants on this topic exist. Using a specific method, Ma et al. [25] calculate how long it takes for a particular number of nodes to run out of juice. Performance in packet sampling has been quantified by Misra et al. [26]. The effectiveness of a packet-sampling IDS is measured by the fraction of suspicious packets it correctly identifies after analysis.

The premise is that it is inefficient to sample many packets if only a small number of them actually cause an intrusion to be detected. The design by Misraet al. raises sampling rate if detection rate is higher than forfeit upper limit, and lowers it if it is lower. This means that the sampling efficiency of packets must be adjusted in relation to the detection rate. The detection rate is proportional to the inverse of the forfeit upper limit, but the efficiency of packet sampling is directly related to the threshold. It's preferable to have a high packet sampling efficiency, but that can't be at expense of a high detection rate. The main challenge is distinguishing between low detection rates caused by robust intrusion detection parameters in a peaceful environment and low detection rates caused by relaxed ID parameters in a hostile environment. Time spent on IDS training and test data analysis are quantified by Farid and Rahman [21]. However, there are studies that try to construct measures that are strong in theory but fall short in practise.

The resilience of a system is quantified by Foo et al. [25] as its capacity to both meet consumer demand and withstand intrusion attempts. Both the analyses by Shin et al. [21] rely on trust or reputation that is unique to the application being studied. With these indicators, we can evaluate how well a network performs in accordance with the unique set of regulations governing any given application. In addition to this metric, Shin et al. [29] include the amount of incorrect content sent and the balance of workloads. These measures have been developed for specific purposes, and it is unclear how they may be generalised to the field as a whole. all claim that survival, application-specific trust, and reputation are important, they do not provide convincing arguments for doing so. Last but not least, some researches try to construct measures that have not yet proven beneficial. To quantify performance, Li et al. [23] adapt a metric from biometrics called EER, which is the rate at which false negatives (reject error) and false positives (accept error) are proportional to one another [22]. It is a bold assumption on the part of Li et al. to claim that these rates are inversely connected; if they are directly related, then EER is undefinable since there may be numerous instances in which false negative and positive rates are identical. Haddadi and Sarram [23] devised a test to see if a certain IDS method could identify a variety of different kinds of cyberattacks. Although this statistic is beautifully simplistic, it is incomplete without more information.

V. WIDE-OPEN PROBLEMS AND NEEDS

An extensive taxonomy and state-of-the-art survey of the most prominent intrusion detection techniques/systems suggested for MANETs is presented in this study. Detection methods and systems are typically sorted into groups according to the type of detection engine they use. There is a comparison of the various detection methods by highlighting their own strengths in each classification. We also covered their operational benefits and drawbacks. Existing intrusion detection systems (IDSs) are incapable of fending off the threats that will be

targeting networks in the future. IDS approach, then, necessitates an efficient adaptation to shifting networking technologies. Finally, we use the results of our survey to propose a number of avenues for further study into the development of an effective IDS for MANETs.

Metrics, First: Several intrusion detection methods and systems have been presented for MANETs over the years. But there is no universally agreed upon criterion or metric to evaluate detection system performance [9]. A crucial metric for judging an IDS is its detection latency [18,19]. The receiver operating characteristic (ROC) curve is extensively utilised by researchers for accurate evaluation of IDSs; nevertheless, the results may be deceptive or insufficient [15]. For the purpose of comparing and contrasting different IDSs for MANETs, measurements and standards related to resource utilisation, power consumption, communication overhead, and CPU processing load can be useful. Accordingly, researchers have some leeway in defining the criteria that will be used to assess the IDS.

IDS sensor nodes can be rendered ineffective by flooding attacks (in which a large number of non-attack packets are sent), which produce a flood of false positive alerts and hence crash the sensor nodes' alert processing functionalities. In order to carry out malicious actions, an adversary needs to breach the monitored host and then gain control of it. Therefore, the IDS needs to be able to protect itself from intrusion attempts. The IDS needs to be able to keep an eye on itself and defend itself.

As network topology and routing information available at each node is constantly evolving, accuracy and efficiency of detection procedures might be negatively impacted by anomaly-based detection engines' reliance on normal profiles of the nodes. Since traffic profiles are always shifting, and there is a lot of negative data (noise) in network traffic, it is important to identify the thresholds between "normaltraffic profile" and "abnormaltraffic profile." An adversary is able to adapt attack patterns to look like typical network activity. Finding "attack invariant" characteristics is thus essential for MANETs. High-velocity data in the network makes it difficult to maintain a flexible detection model that accurately reflects the typical operation of the system. A continual process to update the baseline model of behaviour is essential for any detection system to function properly.

The connection among attributes has a vital influence in the detection accuracy [27], making attribute selection one of the important elements that affect the performance of IDS. As a result, from a design perspective, picking the right atomic properties across the network and establishing a relationship between them that works with the detection model are crucial and difficult challenges. The decision-making process and the segregation process can be improved with the use of well chosen qualities.

Lack of a standardised dataset for evaluation purposes; currently, there is no data out there that can adequately mimic the conditions found in MANETs. Making a better dataset for testing IDS on MANETs is, thus, a difficult undertaking.

When it comes to application-level actions, a skilled hacker will always look for ways to make his or her assault look innocuous and evade detection by intrusion detection systems (IDSs). As a result, IDS audit data should place greater emphasis on application layer activities than on the lower layers because attacks tend to target the former.

The environment is always changing, making it difficult for intrusion detection methods [16,17] to keep up. As a result, the intrusion detection process's capacity to adjust to a constantly shifting context is a crucial characteristic. The malicious and harmless actions of users, systems, and networks are always evolving

Find the invaders' point of origin (9) Even if intruders are discovered, the majority of the proposed solutions [11,12,15] are unable to pinpoint where the intrusions originated. As a result, detection techniques need to be able to handle a broader variety of security assaults at a similar cost and pinpoint the origin of attacks.

Theoretically, a more secure and dependable system can be created by combining different detection systems into a hybrid approach. While hybrid systems theoretically have the potential to outperform more traditional approaches, additional computing complexity means this isn't necessarily the case in practise. When looking for malicious activity, various detection technologies use various methods of monitoring and analysing system and/or network traffic. Some of the proposed detection strategies combine IDS's foundational capabilities with data privacy and authentication at the network node level, using preventative measures like cryptography and authentication. Researchers face a difficult trade-off when attempting to simultaneously build IDS that use prevention-based strategies to guarantee data security without compromising IDS capabilities. Instead of using two distinct security models, it would be preferable if these systems operated as a hybrid.

Scalability: In environments with many mobile nodes, the detection accuracy can suffer from some recommended techniques. MANET's key features are their portability and scalability. As a result, MANET IDS should be scalable to accommodate vast number of nodes, the dynamic nature of the networks, and to generate little communication and computation overhead.

Inter-layer IDS: While most of the proposed work addresses specific types of attacks (such as wormhole, black hole, rushing, and spoofing assaults), it fails to account for the full range of attacks that can occur at the application, transport, network, and data-link layers . However, most security assaults against the various layers of a communication protocol stack can be detected by using a cross-layer intrusion detection system. So, a potential topic of study is the implementation of a cross-layer mechanism capable of detecting attacks at lower layers.

IDS synchronisation . IDSs built on stand-alone architectures can be easily compromised by adversarial behaviour such as a Byzantine attack. When a malicious node is detected, these safeguards often initiate a local response system and punish it without alerting the rest of the network. Attacks such as "man in the middle" and "blackmail" can compromise IDSs based on distributed and cooperative design. To identify coordinated attacks on the network, it is necessary for the detection activities of separate IDSs to be properly synchronised with one another. So, it's a tough challenge for academics to figure out how to coordinate the detection operations of separate IDSs to spot coordinated attacks while keeping the communication load to a minimal.

For example, the genetic algorithms, hazard theory, artificial neural networks, and cutting-edge subjects in evolutionary computation are all examples of heuristic-based approaches to intrusion detection. Gaining a deeper knowledge of immunology allows for more precise data while developing new AIS models. Methods of detection based on heuristics are becoming increasingly useful in complicated systems. Therefore, the creation of IDSs inspired by cutting-edge findings in immunology and improved biological understanding could be a promising area of study.

In reaction to an intrusion, the local detection system reports an anomaly with low confidence due to the scarcity of relevant local data. Therefore, to attain high detection accuracy, global integrations of many local detection systems are required. A number of pieces of supporting evidence from local detection agents or from internationally collaborating detection agents are used to establish the alert's confidence level. As a result, it is recommended to implement a differentiated intrusion response mechanism that responds differently depending on the certainty of alerts, it's important to remember that the standard trade-offs between system security, performance, complexity, and so on, still apply.

VI. Conclusion

Network assaults are undeniably a major concern in the IT industry and question its rapid expansion and the widespread support it enjoys from the general population and official institutions. We aimed to provide a comprehensive picture of intrusion detection system (IDS) and attack in this research. We gain a more refined understanding of the issue, which aids in our search for workable solutions to IDS issues. There are attacks that can be employed against a network IDS because of these fundamental flaws. These attacks include insertion attacks, evasion attacks, and sophisticated assaults, all of which can trick the IDS into inaccurately reconstructing information from network packets. The development of IDS classifications has many benefits, one of which is the increased possibility of researchers working together to identify and address other gaps in the IDS area. In order to keep up with the ever-evolving nature of threats, it is essential that these categorizations be regularly revised and augmented.

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Coarser to Finer Level Document Classification through Recurrent Attention Mechanism using RL Agent

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***Abstract*—Document Classification is a Natural Language Processing task, which generally uses deep neural networks to extract features from full textual information. The extracted features may or may not be relevant for classification of a document. We propose a framework to address the classification of long documents from coarse level to finer level by combining recurrent attention mechanism. It constructs the discriminative features with fewer words. The main idea is to train the recurrent neural network which focuses its attention on distinct parts of the document. It includes reinforcement learning agent at the word level for emitting the next block location to be glimpsed. Convolutional neural network (CNN) is used to extract glimpsed features from focused words. Both sentence and document representation can be obtained from word level and sentence level respectively. Experiments conducted on our collected 5-class arXiv papers dataset, the proposed method surpass the existing methods with less observed words.**

***Index Terms*— Document classification, deep learning, recurrent attention mechanism, deep reinforcement learning.**

I. INTRODUCTION

Document classification is a task of assigning pre- defined labels to text. It is a classic problem of information retrieval. Documents generally consist of structured textual information such as journal papers, books, business reports etc. Document classification is necessary for identifying and preventing the inappropriate content present in the document from distribution among people. With the advent of deep learning, document classification methods have been proposed, such as the convolutional neural networks, recurrent neural networks to comprehend text representations. In the first place, convolutional neural networks were mostly used for deep learning exploration. Hoa T et al [1] shows that deep models give better performance than shallow and wide convolutional neural networks when the input is a sequence of characters. Kim [2] proposed a new model by altering the CNN architecture; it extracts the relevant words of a sentence and converts them into vectors for classification. There are certain limitations exist with CNN. After additional exploration, new model like RNN or LSTM is perceived for remembering information for long period. Zhou et al [3] have combined both CNN and RNN architectures into new model called C-LSTM for document modeling. It outperforms both CNN and

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LSTM; achieve excellent results on sentiment classification. Although, these approaches have been effective for short text classification.

Although, the document comprises textual data, but document classification cannot be considered as the summation of the different text classification results. Sentiment classification and topic labeling is mainly intended for short text. But for lengthy textual documents such as novels, academic journals etc., directly employing the deep learning based methods would not be suitable. Because a long document would produce the very large word vector which burdens the memory.

In order to overcome the above limitation, the recurrent attention learning is combined with the deep learning and reinforcement learning is introduced. It requires only few glimpses to extract the meaningful features for classification [4]. It does not focus its attention from coarse level to finer level in a document.

Because the documents have a hierarchical structure, a document representation can be constructed by first creating representations of sentences and then aggregating them. An attention mechanism is included in the document hierarchical structure to pay more or less attention at both words and sentences in order to obtain document representation for classification [5]. This hierarchical attention network does not extract the most relevant parts from a lengthy document. Then in this regard, how to classify the lengthy documents by learning optimal policy through attention mechanism from coarse level to finer level is essential to design an effective model for classification.

In this paper, we propose a new model for document classification which does not make use of complete information present in the document; instead it only uses few glimpses to construct the distinguishing features for classification. For the purpose to determine the best position of glimpses, we confront this issue as reinforcement learning problem. We aim to obtain better classification accuracy by training a smart agent, which regulates how to glimpse the next position within a document and get better document representation. Our objectives are, to design a framework based on hierarchical attention mechanism and reinforcement learning for lengthy document classification, to classify the documents based on the designed framework and to analyze the performance of existing methods with the proposed method.

Our main contribution is the hierarchical recurrent attention learning framework with policy network. We train a smart agent in order to find the most distinguishing blocks of words for classifying the lengthy documents from coarse level to finer level that improves the classification accuracy. We conduct experiments on datasets; the results show that our model outperforms the baseline models.

The paper is arranged as follows: in section 2, we summarize the literature related to our work. Section 3 presents the proposed method framework and details of each of the module. Section 4 presents the classification. In section 5, we discuss about the experiments that is datasets and implementation details. Section 6 presents the results and discussion. Section 7 presents the conclusion and future work.

II. Related Work

Document Classification is essential to assemble documents for extraction, exploration, selection and annotation. Traditional methods used for feature extraction such as bag of words (BOW)[6], n-grams[7], term frequency-inverse document frequency (TF-IDF)[8] which represents the document as feature vectors. The classification algorithms such as Naïve Bayes [9], Support vector machine [10]; logistic regression [11] uses the feature vector as input and predicts the document class label as output. Though the traditional methods are simple and robust, but unable to capture the contextual information or the order of words which effects the classification accuracy, and also lengthy document have the problem of sparsity. The distributed word to vector (Word2Vec) [12] representation captures the semantic information of words.Word2Vec is an embedding model which is trained on the adjacent words over big corpus and employed by neural networks. GloVe [13] is another method of word embedding which is based on global matrix factorization and local context window. Both Word2Vec and GloVe generates word vectors with quiet differences. Recently, deep learning models [14] are developed for numerous text classification problems comprising news categorization, question answering, natural language inference, sentiment analysis, topic classification etc. which automatically extracts the features from input text. Convolutional Neural Networks (CNN) has achieved great success in the field of Computer Vision. CNN has also been applied to the field of natural language processing. For example, Xiang et al. [15] have applied ConvNets on characters, a sequence of characters are converted to some fixed size vectors. Analysis shows that the character level ConvNet is an implicit method for classification. But CNN is only suitable for short text classification. Recurrent Neural Networks (RNN) have been successfully applied for sequential data. RNN based models captures word dependencies. For example, Lai et al [16] have proposed a RNN model which bags the contextual information and constructs the textual representation using CNN. A variant of RNN called LSTM

[14] is used to capture long term dependencies in text. It also tackles the gradient vanishing and exploding problems. For example, Wang et al [17] have proposed a classification model based on CNN and LSTM which connects the extracted local features effectively and improves the classification accuracy. A sequence-to-sequence model comprises of an encoder-decoder architecture [18]. Attention has been successfully applied to NLP tasks. Attention mechanism [19] allows the model to pay attention to only specific parts of the input. Recently, Yang et al [5] proposed a hierarchical attention networks. It has two distinguishing characteristics: (1) a hierarchical structure which reflects the hierarchical structure of documents (2) two levels of attention (at both word and sentence). It performs remarkably better than previous models but cannot be applied to lengthy documents. Seq2seq models [20] experience the problem of exposure bias and instability between train/test estimation. These problems can be addressed by combining the Reinforcement Learning (RL) methods with seq2seq models that remembers long-term memories. Liu et al [21] proposed a new framework based on cognitive technique of reading called JUMPER, which represents the text classification as a sequential decision process. It has the property of making decision whenever the affirmation is sufficient, reduces the reading by 30-40% and achieves the better classification accuracy. Jun He et al [4] proposed a new approach for document classification which needs only the few glimpses of word blocks. It employs the RL agent along with recurrent attention learning. An agent is trained to control the consequent glimpses of locations in a long document to make the correct predictions. However, it is limited to only word representation. Distinct from existing methods, our paper represents document classification as a sequential decision approach. It is similar to the controller in Jun He et al [4] and hierarchical structure in Yang et al [5] which is not applicable to lengthy document. We propose a new decision making model which pays attention from coarse level to finer level in a document and is trained by reinforcement learning.

III. The Proposed Model

The proposed system is influenced by both recurrent attention model (RAM) [22] and hierarchical attention network (HAN) [5]. It employs a smart agent to regulate the attention for next glimpse part related to the context and policy that is learned through experience. It chooses the more appropriate words blocks that constitutes the attributes of the document. The overall framework of proposed model is shown in figure 1. It consists of various modules at both word level and sentence level. A document is divided into subsamples by choosing several word blocks from it.

Consider that a document consists of S sentences s_i, where each sentence consist of W_i words. Then, w_{it} depicts the words in the i^{th} sentence.

A. Glimpse Module

At each time interval, the glimpse module perceives a set of words identified and converted into word vectors through embedding layer at the location loc_t. A glimpse module is basically a convolutional neural network (CNN) which consists of convolutional layer and max pooling layer. The word vectors are mapped to get feature vectoro_g.

B. Word Level

This level consist of two parts: a word encoder and a word attention layer, which are recurrent module and attention module respectively. The word-level attention module consists of a PolicyNet which is basically a reinforcement learning agent. We represent the details of all distinct modules below:

I. Recurrent Module

At time step *t*, the recurrent module takes the feature vector o_g generated by the glimpse module as input, then combines o_g with its hidden state h_{t-1} to induce its next state vector h_t according to LSTM mechanism as shown below:

a) *LSTM based encoder*

Long Short Term Memory has three gates, they are input gate, output gate and forget gate. The forget gate looks at the previous hidden state h_{t-1} and input x_t. In the cell state, for each value it produces number between 0 and 1. f_t closer to 1 denotes retain the information. f_t closer to 0 denotes omit the information.

The input gate has two layers, they are a sigmoid layer and a tanh layer. First, a sigmoid layer decides which values will be updated and then a tanh layer creates a vector for new values, $\tilde{C}_t$ which could be added to state.

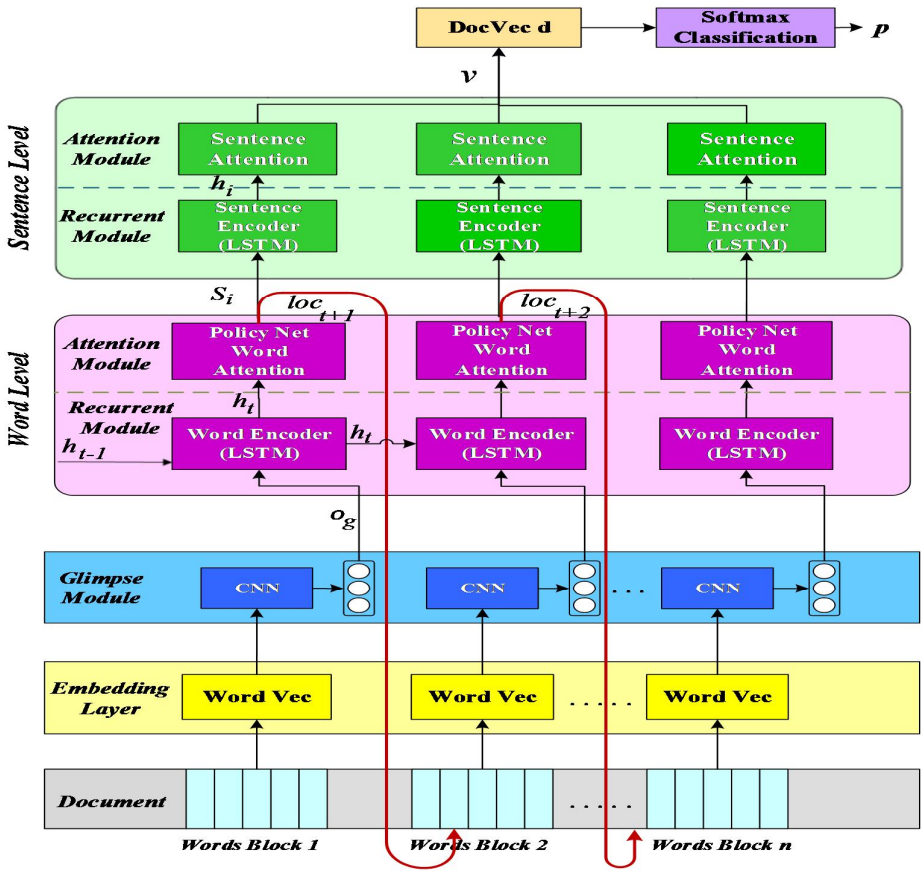

Figure 1: The Proposed Model Framework

Multiply both f_t and old state to forget the values. By adding $i_t \times \widetilde{C_t}$, a new candidate values are obtained, which decides on how much update in state value is required.Finally, the output gate decides what to output based on cell state, ouput is the filtered version. First, the sigmoid is executed. Then, the cell state is passed through tanh and multiplied with the ouput of the sigmoid, which leads to the next hidden state h_t according to LSTM as shown in Equation (1).

$$\begin{cases} f_t = \sigma_o\left(W_f \cdot \left[h_{t-1}, o_g\right] + b_f\right) \\ i_t = \sigma_o\left(W_i \cdot \left[h_{t-1}, o_g\right] + b_i\right) \\ \widetilde{C_t} = \tanh\left(W_c \cdot \left[h_{t-1}, o_g\right] + b_c\right) \\ C_t = f_t * C_{t-1} + i_t * \widetilde{C_t} \\ o_t = \sigma_o\left(W_o \cdot \left[h_{t-1}, o_g\right] + b_o\right) \\ h_t = o_g * \tanh(C_t) \end{cases} \quad (1)$$

a) Word Encoder

In word encoder, a BiLSTM is used to get word annotations by summing up information from both forward and backward word directions. Annotation represents the contextual information. The BiLSTM consists of forward LSTM, which scan the sentence s_i from first word to last word and backward LSTM scans from last word to first word as shown in Equation (2).

$$\begin{aligned} \vec{h}_{it} &= \overrightarrow{LSTM}\left(o_{git}\right), t \in [1, T] \\ \overleftarrow{h}_{it} &= \overleftarrow{LSTM}\left(o_{git}\right), t \in [T, 1] \\ h_{it} &= [\vec{h}_{it}, \overleftarrow{h}_{it}] \end{aligned} \quad (2)$$

For a given word w_{it}, an annotation is obtained by combining both the forward and backward hidden states. h_{it} sum up the whole sentence information surrounded by w_{it} .

2) Attention Module:

Here, attention mechanism is introduced to gather the informative words that are important to form a sentence vector.

a) Word Attention

It is basically a policy network called PolicyNet, where a deep reinforcement learning agent is employed to sample the word block of the document to be glimpsed next.

b) PolicyNet

A deep neural network (DNN) acts as a policy network which takes action by emitting the location loc_t after examining present glimpsed feature o_g and its hidden stateh_t. It utilizes the hard attention mechanism to extract important phrases or words in a lengthy document. It is designed as a partially observable markov decision process (POMDP) [23] including reward scheme. It is accompanied by RAM.

At each time interval, a policy network gains an observation s_t *(loc$_t$)* from the environment, which is the glimpsed feature o_g, then the policy network takes an action a_t by emitting the next location using the bellman's equation shown in Equation (3).

$$Q(s_t, a_t) = Q(s_t, a_t) + \alpha[r_{t+1} + \lambda max_a Q(s_{t+1}, a) - Q(s_t, a_t)] \quad (3)$$

Where α is the learning rate, which determines how much previous Q-value retained for the new Q-value for the same state-action pair at a next time interval. λ is the credit assignment attribute which is assigned to states and actions.

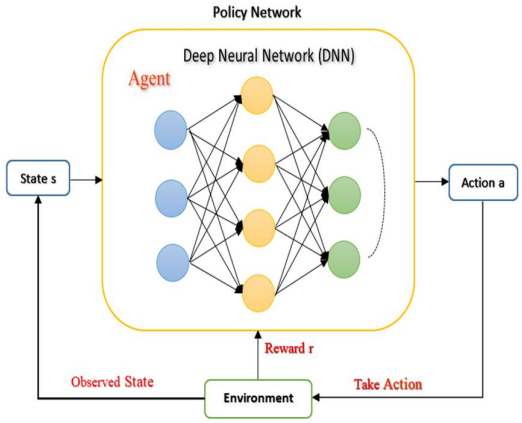

Figure2: Policy Network

Upon taking an action, the policy network acquires a latest observation s_{t+1} and a reward signal r_{t+1}. The intention of the policy network is to maximize the reward [24] defined as shown in Equation (4).

$$R = \sum_{t=1}^{T} r_t \quad (4)$$

At each time step, after obtaining the feature vector from the word encoder, we combine the representation of the factual words to construct a sentence vector. Particularly, as shown in Equation (5).

$$y_{it} = \tanh(W_w h_{it} + b_w)$$
$$\alpha_{it} = \frac{\exp(y_{it}^T y_w)}{\sum_t \exp(y_{it}^T y_w)} \quad (5)$$
$$s_i = \sum_t \alpha_{it} h_{it}$$

y_{it} is the hidden representation obtained by feeding h_{it} to one layer perceptron. The importance of the word is measured as the similarity of y_{it} with the context vector y_w, the context vector is the effective representation of informative words [25] and it is randomly adjusted and mutually learned through training. An importance weight α_{it} is obtained through softmax function. Subsequently, a sentence vector s_i is computed which is a summation of attention weights.

C. Sentence Level

This level consist of two parts: a sentence encoder and a sentence attention layer, which are recurrent module and attention module respectively.

1) Recurrent Module(Sentence Encoder)

After getting the sentence vectors s_i, the document vector is obtained in the same way. Here, sentences are encoded using BiLSTM as shown in Equation (6).

$$\begin{aligned} \vec{h}_i &= \overrightarrow{LSTM}(s_i), t \in [1, S] \\ \overleftarrow{h}_i &= \overleftarrow{LSTM}(s_i), t \in [S, 1] \\ h_i &= [\vec{h}_i, \overleftarrow{h}_i] \end{aligned} \quad (6)$$

The sentence annotation h_i is obtained by concatenating $\vec{h}_i$ and $\overleftarrow{h}_i$. It summarizes the surrounding sentences of sentence *i* but yet put attention on sentence i.

2) Sentence Attention

Sentences are indications of correct classification of a document. We again take advantage of the attention mechanism and initiate a context vector y_s at sentence level, which is used to quantify the significance of the sentences.

$$\begin{aligned} y_i &= \tanh(W_s h_i + b_s) \\ \alpha_i &= \frac{\exp(y_i^T y_s)}{\sum_i \exp(y_i^T y_s)} \\ v &= \sum_i \alpha_i h_i \end{aligned} \quad (7)$$

v is the document vector that represents the summary of the sentences as shown Equation (7). Likewise, the context vector at sentence level y_s is randomly adjusted and mutually learned through training.

IV. ALGORITHM

The pseudo code for the proposed system is given below:

Input: Document D

Output: The probability of predicting category for document D

1. **Initialize the module parameters [$\theta_{gm}, \theta_{rm}, \theta_{am}$] [$\theta_{gm}$ for glimpse module, θ_{rm} for recurrent module, θ_{am} for attention module], no._of_ glimpse G and maximum iterations Max.**
2. **for i=0,1,2,…Max do**
3. **for j=0,1,2,…G do**
    a. **Derive words around the location loc_t and use word embedding to obtain the word vectors.**
    b. **Use the glimpse module $f_{gm}(\cdot|\theta_{gm})$ which is basically CNN, to extract the feature vector o_g.**
    c. **Input o_g to the recurrent module $f_{rm}(\cdot|\theta_{rm})$ to obtain a new hidden state h_t.**
    d. **Predict the next location loc_{t+1} using attention module with reinforcement learning using h_t.**
4. **End for.**
5. **Obtain the representation S_i of glimpse with the input o_g in the recurrent module.**
6. **End for.**
7. **Obtain the representation d of document D with the input S_i.**
8. **Employ the softmax classifier on document representation d.**
9. **If predicted label is correct get reward=1 otherwise get none reward.**

V. CLASSIFICATION

The high level representation called document vector v is obtained after integrating all the sentence representations, which is used as input by softmax classifier for classification as shown in Equation (8).

$$p = softmax(W_d v + b_d) \quad (8)$$

After T time intervals, if the predicted category is correct, a positive reward *r=1* is given, otherwise reward =0 is given. Thus, our intention is to maximize the expected cumulative reward of the policy network by finding the optimal policy.

VI. Experiments

We determine the significance of our approach by conducting experiments on the collected dataset.

A. Data Sets

We gathered different classes of papers from arXiv dataset for long document classification. The papers comprising cs.AI, cs.CV, cs.DS, math.ST and math.GT, and the sum of documents per class is 2995, 2525, 4136, 3025, 3065 respectively as shown in Table I.
All pdf documents are converted to text format, then text files are preprocessed and kept only relevant words useful for classification. The documents were diminished to the first 5000 words.

B. Implementation details

1. Configuration

The propose model is implemented by Tensorflow 2.3 and were trained on NVIDIA Titan X GPU with 32 GB system memory.

2. Embedding

The word embedding used is GloVe. We choose to represent each word with 100-dimension due to memory constraints.

Table I: Data Interpretation: Total Number of Documents in Each Class and an Average Number of Words in Each Document

Class Name	Number of documents	Average words
cs.AI	2995	6212
cs.CV	2525	5630
cs.DS	4136	7439
math.ST	3025	6983
math.GR	3065	6642

3. Hyper parameters

Our proposed model is trained using the Adam's optimization technique. For the convolutional neural network, the kernel sizes ranging from 2 to 4, with 128 convolutional kernels are used. Each BiLSTM cell is set to 256. The learning rate is 0.001.

VII. Results and Discussion

A. Baseline Model

We utilize the proposed HAN model in the literature [5] as first baseline model. Another baseline model used is recurrent attention learning with reinforcement learning [4].We compare our model with these baselines by using the classification accuracy as performance metric.

B. Results Analysis

For each model, it is demonstrated that more words the model is exposed to, more the classification accuracy is. If we define window size as 40, then the total number of words considered for HAN model are 80, 160 and 320. For the second baseline model, the glimpses taken are 1, 2 and 4 glimpses which observe 80,160 and 320 words respectively. Our model also takes 1, 2 and 4 glimpses and observes 80,160 and 320 words respectively.
Table II show the classification accuracy obtained for the baseline models and our proposed model. The window size 20 is applied for all the models, from the below table , we can understand that the total number of words extracted is more, means more word blocks are sub-sampled which is related to number of glimpses taken. The experimental results demonstrate that the more number of words observed means the better classification

TABLE II: COMPARISON OF BASELINE MODELS WITH THE PROPOSED MODEL

Method	Observed Words	Glimpses	Accuracy
Baseline Model (HAN)	80	-	67.33
	160	-	72.52
	320	-	74.86
Baseline Model (Recurrent Attention Learning-RL)	80	1	75.44
	160	2	78.34
	320	4	79.31
Our Model (HAN-RL)	80	1	78.51
	160	2	80.34
	320	4	88.00

accuracy obtained. Because, for a given window size the words have local correlation and the Significance is substantial. Therefore, we can state that for fixed window size and varying glimpses, the observed words varies and gives the better experimental results.

C. Performance Analysis

The comparison of our proposed model (HAN-RL) and the baseline model is shown in the below figure 3.

Figure3: Classification Accuracy on 5-Class arXiv dataset

We can observe that the results of our model are better than the baseline model on the chosen arXiv dataset. By fixing the window size as 40, and varying the number of glimpses as 1, 2 and 4, the observed words varies and thus the classification accuracy differs substantially. It shows that the RAM mechanism applied for hierarchical attention mechanism is well trained and can locate the most significant group of words within a lengthy document.

VIII. CONCLUSION AND FUTURE WORK

This paper introduces a new model for classification of lengthy documents using convolutional neural networks (CNN), recurrent neural network (RNN) and hard attention mechanism. Our model focuses its attention from coarse level to finer level by employing a smart agent that is capable of locating the most discriminative blocks of words. Our model significantly improves the classification accuracy compared to the two baseline models

with less observed words. In our future work, we plan to apply different window sizes, glimpses and improve the policy network using optimization methods [26].

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Autonomous System for Hotel Industry using Robotics

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***Abstract*—In Internet of Things network, a number of smart devices which are embedded with sensor technology integrate real data information and help in data exchange and it is helpful in robotic assistance. This integrated information can be used for number of tasks like sending alerts/e-mails, data mining, machine controlling by intelligent decisions etc. to give safe and secure environment in IOT architecture based applications. Number of professionals, entrepreneurs has accepted the three layer architecture of IOT but for smart applications like robot designing in hotels, this chapter presents four layered and five layered architecture of IOT. This paper defines the current knowledge regarding implications of robotics within the smart hotel which will provide the assistance system that interacts with number of guests and provide services to them.**

***Index Terms*— Internet of Things, Robotics, Smart devices, Sensors, Smart Hotel, Safety and Security.**

I. INTRODUCTION

A simple real-life example- Ram, between his road trip notices some problem with the check engine light, however, he doesn't know the intensity of the problem. The good part is that the sensor that triggers the check engine light monitors the pressure in the inner brake line. This sensor is one among many sensors present within the automobile that perpetually communicate with one another. A part known as the diagnostic bus gathers the information from these sensors then passes it to the entryway within the automobile. The entryway collects and kinds the information from totally different sensors. Before this association to happen, the car's entryway and platform should register with one other and make sure a secure communication [1]. The platform keeps on perpetually gathering and storing information from many cars worldwide, building a record in a database. The manufacturer has other rules and logic to the platform. The platform triggers an alert in his automobile, once sensing the brake fluid has borne below the counseled level. The manufacturer then sends him a meeting for servicing of his automobile, and the car's downside is corrected. This is all possible due to IOT. The web of Things (IOT) is a network of things used in everyday's life which are connected together through the Internet. This idea was proposed in 1999, its aura has been in continuous development and expansion. IOT's concept was first come from RFID (Radio Frequency Identification) fields. It is considered to be the information network constructed by the radio frequency identification technology and communication technology. The main function of an IOT system is to check the world around itself, to enable and aid, or to automate a response to changes in

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the system's environment. The primary purpose of an IOT system is to improve the life's quality by providing the best response to an environmental change by giving responsive services which are specific to the needs of the end-users. The research presented in this paper is towards the designing of assistance system in hotels where the robots will work automatically to execute number of things like to guide guests for their room and for other special points in the hotel, to deliver items to guest's rooms.

A. IOT Components

There are four fundamental components of IOT system as shown in figure 1.1, which tells us how IOT works [2].

Sensors/Devices

First, sensors or devices ease in aggregation very minute knowledge from the encompassing environment. A device will have multiple sensors that may bundle along to try to do more than simply sense things. As an example, phone could be a device that has multiple sensors like GPS, accelerometer, and camera however our phone doesn't merely sense things.The most rudimentary step can forever stay to choose and collect knowledge from the encompassing environment be it a standalone sensor or multiple devices.

Connectivity

In this part, shipping is done from collected knowledge to a cloud infrastructure with the help of the sensors by using various mediums of communications like WAN, Wi-Fi, mobile or satellite networks, Bluetooth etc.

Data Processing

In data processing, role of software starts i.e. the knowledge which is collected, it will go to the cloud and then processing is performed. For example, to check the temperature, device reading for AC or heaters.

User Interface

Now, final step is the availability of information for end users either by alarm triggering on phones or by e-mail notification. The user generally might need an interface that actively checks their IOT system. As an example, the user incorporates a camera put in his home. He desires to use video recording and all the feeds with the assistance of a web server.

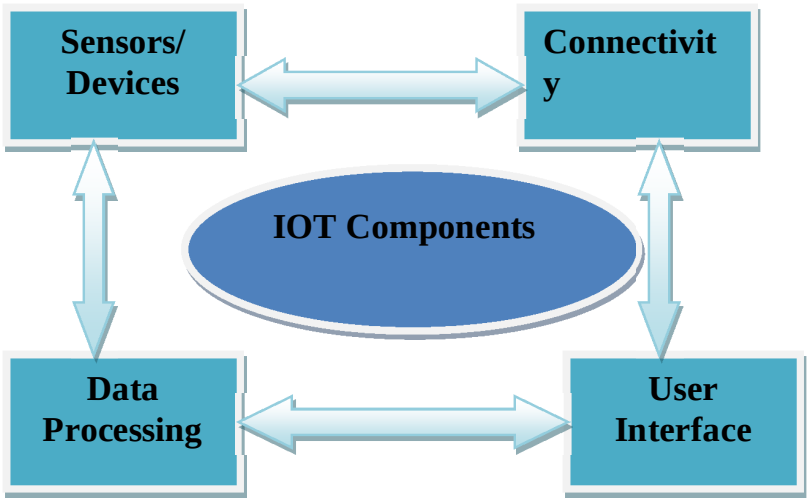

Fig 1.1 Components of IOT

B. Different IOT Scenarios

Imagine a situation when:

- You are on your way while getting back from work and you use an application on your cell phone to change on the lights, the AC in your house, and tune the Television to your number one.
- What would very make a fridge "smart" would be on the off chance that it might check labels and alert home proprietors once their food is near arrive at their ending date, For instance, or then again perhaps it might talk with the web schedule and manufacture orders consistently in a way that things will be delivered surely.

This innovation has a ton of uses in different fields. The following are some possible zones where web of Things (IOT) can be used to solve every day issues.

Smart Cities- IOT is regularly monitoring the vibrations of landmarks, bridges, and buildings just in the event that the structure material is undermined or overburden. Noise contamination can be controlled around clinics and universities. It tends to be used to oversee traffic especially all through traffic jams, top hours, mishaps, and rains. Another sensible application is making the authorities aware of empty the garbage cans once loaded with waste [3].

- House automation- IOT is often accustomed remotely management and program the appliances in your home. It is often helpful in identifying and keeping away from robberies.
- Industrial automation- By exploitation this innovation, we can robotize creating measures distantly. It can even prove supportive in improving the production measures. We can able to manage the inventory and the supply chain. It can also be checked that if there is any discharge of harmful gases to evade injury to labourer's wellbeing and furthermore the surroundings.
- Smart environment- In this, we are able to check the emissions from factories and vehicles to attenuate pollution. It is possible to additionally keep tabs on the standard of water being equipped for drinking. We are able to send warnings of earthquakes and tsunamis by sleuthing tremors. We are able to keep the water level of rivers and dams beneath police investigation to be ready just in the event of floods. The discovery of forest fire is moreover can be done with this innovation.

II. Literature Review

Omar Said and Mehedi Masud introduced a paper named as "Towards Internet of Things: Survey and Future Vision", this paper [1] presents the historical backdrop of IOT, various models of IOT, where he referenced about the advantages and parts of a smart building and introduced a Quantitative estimation of a building intelligence. In paper [2], Internet of Things: Architectures, Protocols and Applications, an overview of condition of art methods, conventions and applications is presented. This paper presents an application to have any kind of effect in human life, especially for elder and disabled people. In this, a wide clarification of sensors is given as they are the main segment of smart things. For making any smart application, various sensors are characterized in detail. In paper [3], a spite of positives about IOT, number of negative things has been examined w.r.t malicious users. This paper describes the disadvantages of security in IoT. Utilizations of IoT are wide in reach and use of the IoT characterized with the assistance of various functions and functions are treated as layers. Three-layer architecture of IOT (Internet of Things) is defined in paper [4]. As per the genuine demand of lodging chain industry for improving visitors living environment, the paper likewise discusses about the plan of IOT application scheme. The plan may successfully meet the administration necessities of lodging chain industry. There are number of disadvantages in the Three-layer architecture of IOT (Internet of Things) as mentioned in [5]. In this, the real interest of hotel chain industry for improving visitor's living climate is defined; the paper additionally examines the plan of IOT application scheme with utilising the IOT gateway as a bridge. The plan may adequately meet the administration pre-requisites of hotel chain industry. In a research [6], the creator has explored the utilization of web of things. Two principal factors on which this paper has focused are: security and protection. Because of these components, IOT is received widely. This paper presents a review of structure of layered architectures of web of Things with their attacks about security. With this, a survey of systems that gives answers for these issues is given with their limitations. This paper proposed another protected layered architecture of IOT to defeat these issues. This paper [7] gives a point to point architecture of IoT as layers. The paper covers layers beginning from business to perception layer. Both hardware and software assume a significant function in the IoT, so the paper covers details of the hardware just as software along the difficulties of web of Things.

Research Gaps: From the related literatures reviewed so far, the following gaps have been identified with respect to using embedded IoT in mitigating fraud in the hospitality industry:

- Embedded IoT technology has not been applied in enforcing integrity of stored data in hotel DBMS in order to reduce fraud in room bookings. Appropriate software engineering principles and patterns have not been adequately applied in developing fraud reduction/elimination system for hotel room reservations using embedded systems and IoT technology.

The real-time properties of entities constituting of the hotel DBMS have not been adequately considered as factor for checkmating and enforcing data integrity and consistency

Research Objectives: To evaluate the procedures involved in hotel room bookings and reservations and determine possible causes of fraud in hotel management.

To model the system by adopting object-oriented system analysis and design techniques. To develop an embedded IoT system that enforces access control in hotel door locking systems.To develop a web application and a secured database for checkmating the integrity and confidentiality of data relating to hotel room allocations and associated funds. To build a prototype system by integrating the embedded IoT system and with the web application and secured DBMS.

III. Layered Architecture of IOT w.r.t Attacks

There are number of architectures which have been proposed by analysts. As per a few analysts, IOT architecture has three layers; however a few specialists upload the four-layer architecture. They imagine that, because of upgrade in web of Things, the design of three layers cannot fulfill the requirements of usages [4]. Because of a challenge of IOT as for security and protection, the engineering of five layers has similarity been proposed.

A. Three Layered Architecture

This includes three layers named as: perception, network and application layer as shown in Figure 3.1.

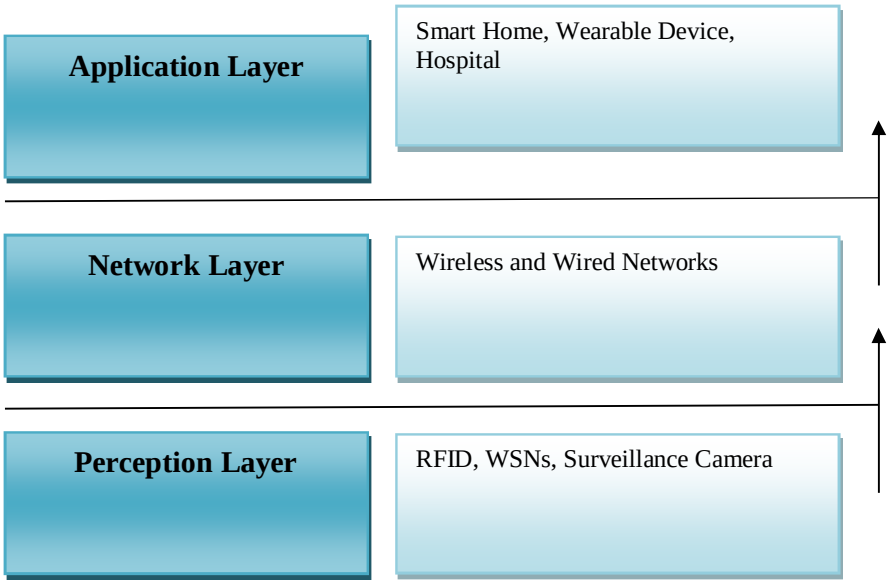

Fig 3.1 IOT Architecture (Three layered)

Perception Layer

The other name for this layer is sensor layer and it will work according to person's eyes, ears and nose. There are categories of sensors used for information collection according to the need of users. The collected information from the sensors can be about zone, changes noticeable all around, atmosphere, movement, vibration and so forth. Most of the dangers are related to the sensors. Ordinary security dangers of this layer are:

- **Eavesdropping**
- **Node Capture**
- **Fake Node and Malicious**
- **Replay Attack**
- **Timing Attack**

Network Layer

This layer is also named as transmission layer. It is actually an extension between the perception layer and application layer. Its role is to send the data which is gathered from sensors embedded objects by using two ways: i.e. remote or wire based. Different security threats and issues to network layers are:

- **Denial of Service (DoS) Attack**: It is an attack to shield genuine clients from getting to gadgets or other organizational assets.
- **Main-in-The-Middle (MiTM) Attack**

- **Storage Attack**: The information of clients is taken care of on storage gadgets or the cloud.
- **Exploit Attack**

Application Layer

The role of this layer is to describe the applications that utilize the IOT innovation in number of fields like: smart homes, smart cities, smart health, animal tracking, etc. It has the obligation to bring to the types of sorts of help to the applications.

Essential security dangers and issues of application layer are:

- **Cross Site Scripting**
- **Malicious Code Attack**
- **The capacity of managing Mass Data**

A. Four Layered Architecture

Previous to this, most fundamental architecture was three-layer design in which all the prerequisites of IOT were not fulfilled. This is the reason for the introduction of four layered design. It works in the same way as three layered architecture with additional one layer: a support layer [5]. Below Figure 3.2 presents the design for this 4 layered architecture with its recommended security system.

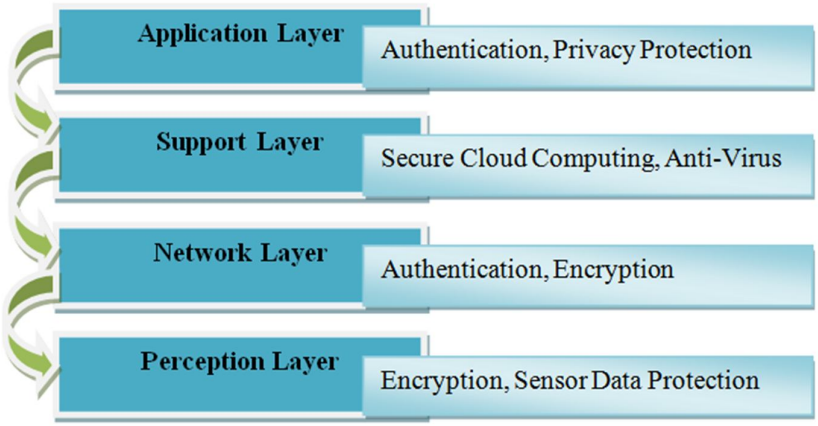

Fig 3.2 IOT Architecture (4 layered) with security mechanisms

Support Layer

The introduction of fourth layer is due to the security in plan of IOT. In light of sending information clearly to the network layer, the odds of getting threats increase. The support layer is providing two functions: valid customer's certification and risk protection. Other duty of this layer is to send data to the network layer. Regular threats and issues of this layer are:

- **DoS Attack**: This attack is mainly identified with respect to the network layer. In this, to make network traffic drenched, an attacker sends a ton of information. This is the reason for huge utilization of system assets depletes the IoT and makes the client not prepared for getting into the framework.
- **Malicious Insider Attack**: This attack occurs from inside an web of things environment for getting the individual data of users. This function is performed by an approved user in order to get the other user's data. This is actually a totally different and complicated attack which requires number of mechanisms to prevent the threat.

B. Five Layer Architecture

The significant part for web of things advancement is four-layer architecture. There were some issues with respect to security mechanism and storage system in four-layer architecture. So, due to the factors, Researchers proposed five-layer architecture in a way to make the web of things secure. It is actually having three layers like past frameworks with additionally two more layers: processing and business layer [6]. The functions of processing and business layers with their security attacks are described under:

Processing Layer

The other name for this layer is middleware layer. The function of this layer is to collect the data which is sent from a transport layer and then this collected data is processed. The major duty is to eliminate additional data

that has no significance and then extracts the useful data. Be that as it may, it additionally eliminates the issue of large information in web of things. In enormous information, a lot of data is received which can influence execution of IOT. There are various attacks that can influence the processing layer and disturb the performance of IOT. Normal attacks are:

- **Exhaustion**
- **Malwares**

Business Layer

It alludes to a planned behavior of an application and acts like an administrator of a complete system. From this layer, it is to be decided that how the data is created, its storage system and how it will be modified. Basic issues with respect to security of business layer are:

- **Business Logic Attack**: It takes advantage of a defect in a programming. It controls and deals with the exchange of data between a client and a supporting information base of an application.
- **Zero-Day Attack**

In Figure 3.3, a hierarchy is shown which relates all proposed layered architecture of Internet of Things (IOT).

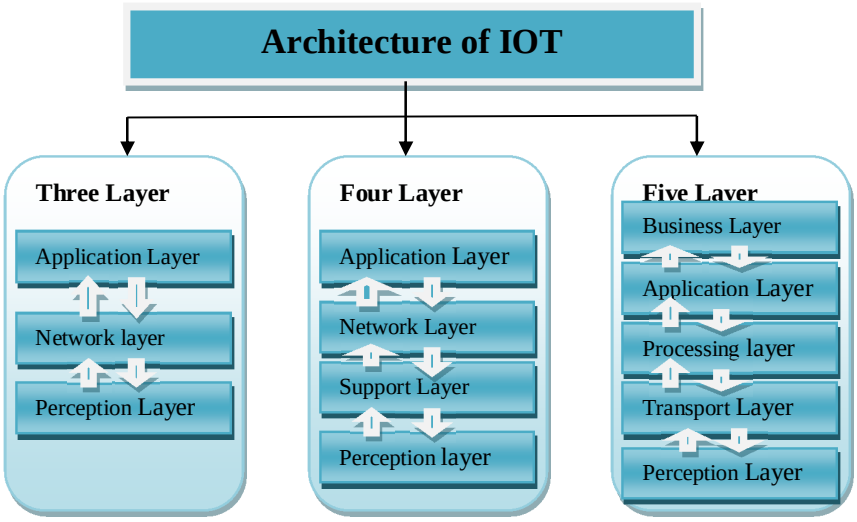

Fig 3.3 The layered architectures of IOT (three, four and five layers)

This figure 3.4 shows the architecture that how robots are integrated in hotel industry and how they are connected to a central server using WiFi. The process will be like: firstly the users will request ant type of service like a newspaper, any snacks, bottle etc. from the terminal in the room and second option is to interact directly with the robot. Next step is of server which will receive the request and decide itself that which robot can be send to fulfill this request.

IV. IOT IN HOTEL INDUSTRY

It is an association of number of computerized gadgets and machines which are interrelated with the help of web for improved progressed expenses and guest experience. There are number of cases in hotel industry like: An IOT engaged lodging in Goa named as Le Meridian, which diminishes usage of energy and it passes on awesome guest experience. These things are refined by Schneider Eco structure which is interoperable and it passes on updated an incentive around security, proficiency and accessibility for the clients. Second is JW Marriott Inn which made IOT space for the customers by worked together with Legrand and Samsung and this room can do number of modified exercises like a guest can demand that the virtual helper will give update at 7.00 am for yoga or he/she can demand for starting shower at a particular time with voice request or by using application [7].

A. Benefits of IOT Solutions for Hotels

Number of focal points is there if IOT is applied in lodging industry-

- *front work zone executives*
- *housekeeping*

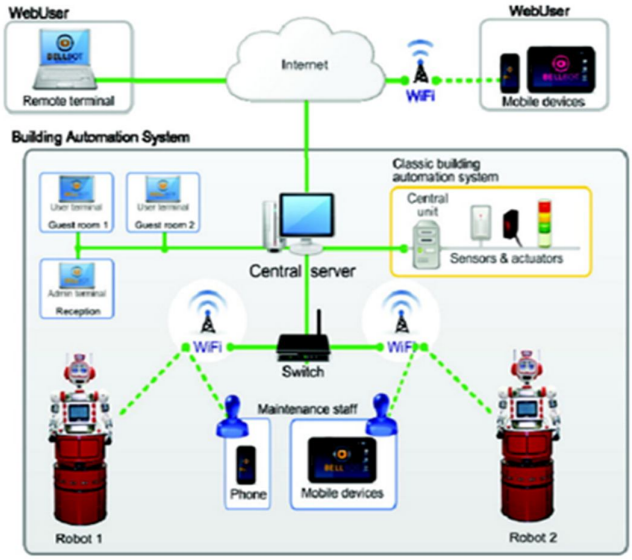

Fig 3.4 Connections in architecture

- More number of positive studies and composed customer commitment; in this way more pay generation.
- Lesser interferences at work on the ground that there is less unpredicted extraordinarily appointed uphold calls. Likewise, planned support is more affordable, does not eat a great deal of time and is definitely not hard to anticipate.

B. Benefits of IOT in Hotel Industry concerning Visitors

The basic goal of lodging industry is extreme Guest experience which can take your hotel to heights [8]. They do not look for long enlistment lines or hold on to get the room of choice. There are number of preferences for the guests when IOT is applied in hotels:

- Customized offers/food as indicated by guest's cooking decisions.
- Room settings customized by the guest's liking.
- Turn on the guest's number one TV channels or music.
- Remember the standard request for breakfast for the guest.
- Ideal water temperature at whatever focuses the guest needs to shower.

C. Where IOT can be utilized in Hotel

- Guestroom automation for room service upgrades- It offers guests accurately what they have come for to hotel, a wonderful and customized stay. They favor an absolutely extraordinary experience that has everything tuned as they would like. IoT gives you an incredible opportunity to improve the room organization from different viewpoints. Guests would love on the off chance that hotel recollect their loving and preferences. Their food and room choices, their main coffee, practices that they like to appreciate, etc.
- Smart hotel upkeep- The hospitality industry spends a ton on maintenance. Consider a situation where sensors can distinguish the difficulty zones in the hotel and fix them naturally or if nothing else prompt or advise the hotel before the guest does. Since, assuming that the guest faces a broken machine, it sure will impact his experience and hotel's reputation. There are models where guests complain of faulty lights or spilling water in the lodging. Sensors can be acquainted to recognize spilling taps or defective lights which can trigger exercises to one or the other fix [9].
- Cross property combination- It will be very extraordinary if properties of a chain share visitor's details and inclinations associating IOT frameworks. Preferably, the visitor information ought to be brought together in hotel network scenarios.
- In-room highlights-Rooms are the appeal of a property. IoT can change the visitor experience in the room. Keyless entryways that open consequently when the visitor shows up is one thing that is in pattern now days. Some different instances of in-room highlights are: Set temperature in the indoor

regulator according to the visitor's inclinations, showing his number one channel on TV, proper lighting in the room could be not many experiences conceivable with IoT [10].

- Amazon Alexa, a voice-based communication assistant is the ideal case of IoT used in the hospitality industry.
- **Smart answers for building and coordination's-** IoT can likewise help improving and keeping up the structure and give smart coordination's. Foreseeing what the visitor is searching for and giving an experience better than expected will assist an individual with making an edge in visitor satisfaction.

V. CONCLUSION

The arising thought of Internet of Things (IoT) is rapidly discovering its way all through the advanced life, meaning to upgrade the life quality by interfacing number of smart devices advances and applications. By and large, the IoT would take into account the automation of all the things around us. This paper introduced a diagram about different layered designs of IoT with security attacks. In this paper, a system is introduced that could be utilized by hotels to execute the idea of robots in smart hotels. This system permits the hotels to offer complex administrations to their visitors while regarding the visitor's security. It introduced two instances of how advanced administrations could be offered through the joining of smart specialists and IoT devices. The main service helps the visitor to give access to different visitors in the hotel to his/her room depending upon their associations with the visitor and the visitor's timetable. The subsequent service empowers the visitor to be awakened progressively utilizing music and light rather than the annoying buzz of a morning timer. This exploration is likewise a case of how the incorporating among AI and IoT advancements could provide clients with a superior quality of service, consequently expanding the clients' satisfaction and expanding the pace of bringing customers back.

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GLCP: Grid-LEACH Clustering Protocol for Wireless Sensor Networks

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***Abstract*—Due to scarce battery power of Sensor Node(SNs) in Wireless Sensor Networks(WSN), number of energy efficient protocols has been proposed in literature. Clustering is energy efficient technique in which Sensor Nodes (SNs) are grouped into cluster and in every cluster, Cluster Head (CH) is responsible for transmitting aggregated data of its member SNs to Sink. In this paper we present Grid-LEACH protocol that implements LEACH protocol on grid-based network. Simulation results shows that Grid-LEACH protocol improve network lifetime in terms of overall energy consumption as compared to LEACH by reducing the number of transmitted packets to Base Station (BS).Main feature of Grid-LEACH protocol is that in case any grid left without CH then secondary CH is fixed for that grid.**

***Index Terms*— Clustering, LEACH, Wireless Sensor Network, Cluster Head.**

I. INTRODUCTION

Due to advancement in wireless technologies, WSN is considered as new technology for monitoring surroundings. Major applications of WSN includes military surveillance, forest fire detection, Habitat Monitoring, Home Control and industrial automation etc. [1]WSN consists of large number of SNs equipped with sensors, processor and radio unit. One of the major challenges[2] of WSN is to effectively utilize battery power of SN. Many energies efficient clustering protocols[3] has been proposed in literature to improve battery utilization of SN. This paper surveys the proposed clustering protocols during last few years.

Clustering is a process to divide SNs in clusters and every SN transmit its sense information to CH. Transmission is done by CH in order to reduce communication energy. Further CH sends aggregated data of its cluster to BS as shown in Figure 1.

Section I gives introduction of WSN and clustering process.Section II describes literature survey of Clustering protocol. Proposed Grid-LEACH clustering protocol has been discussed in section III. Section IV gives simulation and results. Conclusion and possible future research are proposed in Section V

II. LITERATURE SURVEY

This section discusses clustering protocols of last few years. Grid-based clustering protocol using hierarchal routing protocol has been proposed in [5]. Authors in [6] proposed chain-based clustering protocols. CH is selected based on energy, distance and node density parameters. Data transmit to CH through normal nodes

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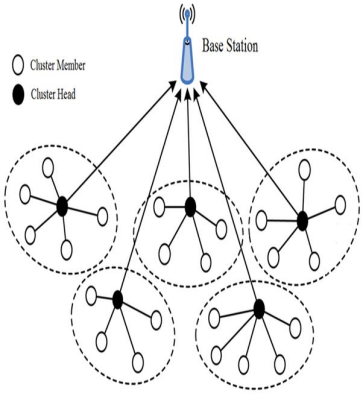

Figure 1: Clusters in WSN[4]

using single hop approach. Data transmitted to base station through cluster coordinator in type of chain. Authors compare proposed Improved CBCCP clustering protocol with CBCCP. Number of alive nodes are more and dead nodes areless in Improved CBCCP as compare to CBCCP.In [7] Heterogeneous clustering protocol has been introduced which divides SN into three groups normal, middle, and super based on their energy level. CHs are elected based on the probability function which is input of probability, total count and energy of normal, middle and super node.Proposed protocol performs better then LEACH,SAP and DEEC in terms of network lifetime and total count of CH and alive nodes.Multi-hop clustering protocol in [8] elect the CH based on genetic algorithm fitness function.Authors [9] presented the survey of improvements in LEACH protocols implemented during last few years.

III. GRID-LEACH CLUSTERING PROTOCOL

LEACH [10] is the most popular clustering protocol of WSN. Many LEACH based grid clustering protocols[11-13] has been introduced in literature to enhance network lifetime. LEACH clustering protocol consists of set-up phase and steady phase.The main drawback of LEACH protocol is that some area left without CHs due to its random nature.Clustering protocol Grid-LEACH is proposed to overcome this limitation up to some extent.
Grid-LEACH protocolconsists of two phases set-up phase and steady phase. In set-up phase monitoring area is divided into equal size virtual grids and large numbers of SNs are deployed throughout the grids.In set-up phase primary CHs are selected based on the LEACH protocol equation shown in following equation

$$T(n) = \begin{cases} \dfrac{P}{1 - P * \left(r \bmod \frac{1}{P}\right)} : if\ n \in G \\ 0: \quad otherwise \end{cases} \qquad (1)$$

Where P is desired percentage of SNs to become CHs.
r is current round
G is the set of SNs that have not participated in CH selection process in previous $1/P$ rounds.
SN is elected as CH if its random number is less than threshold value $T(n)$.
SN is selected as secondary CH for every grid randomly. Secondary CH will act as primary CH only in case any grid left-out without CHselected through LEACH protocol.
Main feature of Grid-LEACH protocol is that in case any grid left without CH then secondary CH is elected for that grid.
Steady state phase: In steady phase CH collects data from its member sends aggregated data of its cluster to BS.

IV. SIMULATION AND RESULTS

Grid-LEACH protocol is implemented on MATLAB-R2021a. Simulation Parameters are shown in Table I.
After implementation of Grid-LEACH protocol, Simulations are shown in figure 2.

TABLE I: SIMULATION PARAMETERS

Simulation Parameter	Value
No. of Nodes(n)	500
Network Size	300*300
Base Station Position	150*150
P	0.3
Initial energy	0.5
Number of rounds	50

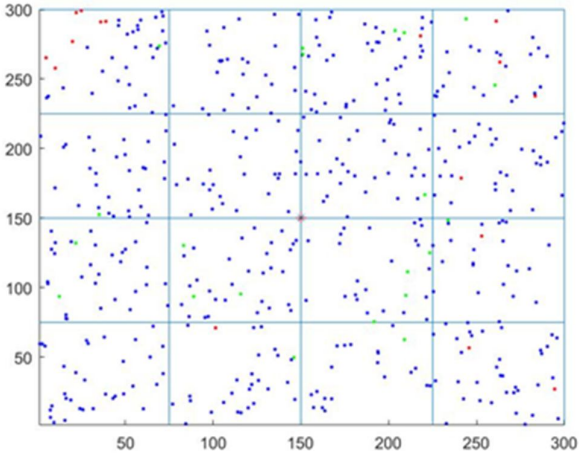

Figure 2: Network Topology

Simulation Results: Proposed Grid-LEACH Protocol is compared with LEACH protocol in terms of network lifetime. Network lifetime [14-17] is defined as average number of rounds until first node die. The comparison between LEACH and Grid-LEACH is shown in following figure 3: which shows that Grid-LEACH protocol has better network lifetime as compared to LEACH protocol because for every grid, CH is responsible for transmitting data to BS. As in case of LEACH if any grid left without CH; then nodes itself transmitted their sense data to BS thereby increasing the number of packets transmitted to BS and reducing energy efficiency of network.

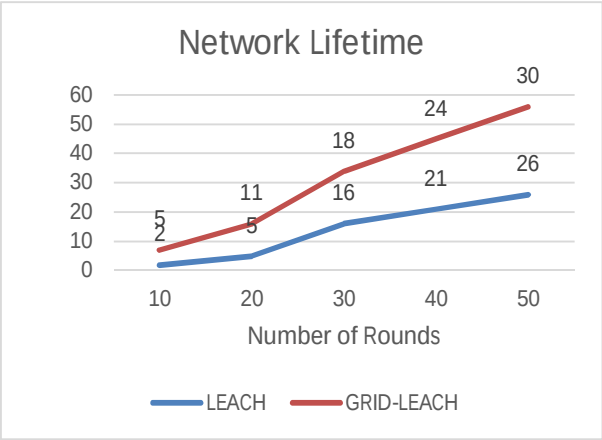

Figure 3: Comparison of Network Lifetime

V. CONCLUSION AND FUTURE WORK

In this paper we proposed a protocol named Grid-LEACH that mixes LEACH protocol with grid topology. Grid topology improves the energy efficiency by reducing communication energy. Main feature of Grid-LEACH

protocol is that in case any grid left without CH then secondary CH is responsible for transmitting aggregated data to BS. Simulation shows that Grid-LEACH perform better as compared to LEACH in terms of network lifetime by reducing the number of packets transmitted to BS and enhance the energy efficiency of network Future work include implementation of Grid-LEACH protocol for heterogenous WSN.

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Frequency Domain Feature Statistics for Cardiovascular Disease Diagnosis on Low-Computational Devices

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***Abstract*—Towards providing a low cost and readily available healthcare intervention system for rural India, we propose novel methods to analyze ECG on Android mobile devices for diagnostic purposes. In the proposed system, ECG is compressed to reduce the volume of input so as to enable processing on a low computational mobile device. Morphological, wavelet and statistical features are extracted directly from the compressed ECG. The subset of most discriminative features is extracted using information theoretic Dynamic Weighting based Feature Selection. Hybrid classification using majority voting-based classifier fusion is applied to enhance the classification performance. For the 14 MIT Arrhythmia classes, the proposed system achieved classification accuracy of 99.3% and a sensitivity of 100 % and a specificity of 98.9 %. Comparison with other existing methods shows better performance of the proposed method.**

***Index Terms*— Android App; ECG Analysis; Feature Extraction; Feature Selection; Hybrid Classifier; Mobile Telecardiology.**

I. INTRODUCTION

Cardiovascular diseases (CVDs) are the major cause for morbidity and mortality in developing nations as India. Cardiovascular disease encompasses all types of abnormalities affecting the Heart muscles, Valves and/or the blood vessels. These can be diagnosed using the Electrocardiogram (ECG), which is a device for recording the electrical impulses of the heart. The analysis if ECG demands expert knowledge which is not readily available in rural areas. In order to overcome this, mobile based healthcare intervention strategies were proposed. The two major challenges in mobile based ECG analysis systems include those inherent to mobile applications and ECG Classification.

Challenges inherent to mobile applications for analyzing ECG in a real-time environment are limitation in: storage, computational capacity, bandwidth and associated delays. Accordingly, general mobile based telecardiology architecture has evolved incorporating ECG Compression, low computation methods for feature extraction and classification and strategies to mitigate delays [1]. Despite the risks of losing of clinically significant data, lossy compression was used [2]. Features are generally extracted in time or frequency domain. In realization of the computational capacity of these devices, mobile based systems extract the key features in the time domain only and overlook frequency domain feature extraction methods. Time domain feature extraction methods adopted by many mobile based systems include the Pan Tompkins [3] algorithm for QRS detection and

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the ‘So and Chan’ algorithm [4] for QRS detection. Low computational methods compromise the accuracy of detection of CVDs due to limited storage and computational resources characterizing maximum accuracy of 96% in these systems. Low computational feature extraction methods proving higher accuracy are demanded.

The key challenge inherent to ECG Classification is the wide variety of ECG morphologies even among those samples that belong to the same class. We focus to address these challenges through the novel proposed framework. Challenges for real time CVD diagnosis on mobile devices drill down to: data loss due to compression, intricate feature extraction methods and efficient classification methods. The inherent diversity in morphology of ECG data belonging to the same class poses much challenge for extraction of discriminative features and efficient classification. We address these challenges in our proposed system with novel methods for compression, feature extraction and classification.

The first phase of the work involves a novel framework for classification of ECG on mobile devices and the second phase involves cross database evaluation of the developed classification model. In order to classify ECG on mobile devices, we propose a framework that compresses the ECG and extracts features from compressed ECG for detection of abnormality on the mobile phone. The framework was verified and validated using the MIT ADB and the cross-validation approach. On the validated framework, the second phase of work involves real-time validation of the developed ECG Classification model using the collected dataset using the cross-database evaluation approach. In this phase we aim to improve the performance of the classification model by training and testing on the real time dataset. Section 2 describes the material used, Section 3 elaborates the proposed framework and the methods proposed for compression, feature extraction and classification. Section 4 presents the methods for generalization of the developed classification model using the cross-database evaluation approach. Section 5 discusses the results and section 6 concludes the work.

II. Materials Used

The Massachusetts Institute of Technology-Beth Israel Hospital Arrhythmia Database (MIT-BIH ADB) [5] is widely used in analyzing automated methods for cardiovascular diseases. In this work, we have adopted the same for training of our system. The MIT ADB contains 48 select two channel ECG recordings including 23 random recordings and 25 selected recordings having clinically significant arrhythmias. Arrhythmia is any abnormality in the cardiac rhythm and leads to Stroke and Myocardial Infarction (Heart Attack). Each recording is sampled at 360 Hz. The database is available for free download at the PhysioNet Repository (www.physionet.org). For our work we have purposefully omitted records 102 and 104 as they were measured in Lead II (V2) and not Modified Limb II (MLII) as the other records in the dataset and thus cannot be morphologically compared.

To test the proposed methods on real-time data, we have collected 324 ECG samples in collaboration with the Government Rajaji Hospital, Madurai, India. The Ethical Committee at the institution approved the protocol of the study and each patient gave his or her informed consent to participate in this study. The acquisition device used was BPL CARDIART 9108. The device records 12 lead data simultaneously, each sampled at 1000Hz.In this work, we analyzed the ECG of 371 subjects (181 male and 190 female) who were referred for clinical suspicion of cardiovascular diseases. The patients were consecutively enlisted from the outpatient ward. Subjects ranged in age from 17 to 83 years, with an average of 53 years. The patients included normal subjects (15) and having cardiovascular abnormality (356). The rhythms were analyzed and classified into 15 classes as in the MIT BIH arrhythmia database as listed in Table I. The table also shows the distribution of subjects according to the cardiovascular pathology. Over 2000 data samples were collected and 371 samples were selected as for further analysis so that the number of samples for each MIT Class remains almost the same. This dataset is called MIT_RT_CC (MIT-Real time-Class-Compliant) The data was independently diagnosed by three cardiologists and conflicts were resolved by consensus. The diagnosis provided by the experts was used for validating the results of the proposed method.

Training of the system is performed using the MIT BIH ADB. In the training phase, the data is compressed and features are extracted from the compressed ECG, key features are identified using feature selection and classification model is deducted using a hybrid classifier. The deduced classification model is converted into set of decision rules and accumulated in the knowledge base. The knowledge base is directly used in the Android application in the testing phase. The system is tested using the collected real-time data. During the testing phase (executed on an Android Mobile device) data is compressed and only those features identified as discriminative in the training phase are extracted from the compressed ECG. The knowledge base is used to diagnose the cardiovascular disease in the test data. Each of these processes is detailed in the following sections.

TABLE I. DESCRIPTION OF REAL-TIME COLLECTED DATA USED FOR TESTING

S. No	MIT Class	Number of patients encountered		
		Male	Female	Total
1	Atrial bigeminy	13	12	25
2	Atrial fibrillation	15	14	29
3	Atrial flutter	13	16	29
4	Ventricular bigeminy	10	17	27
5	2° heart block	8	11	19
6	Idioventricular rhythm	16	7	23
7	Normal sinus rhythm	9	6	15
8	Nodal (A-V junctional) rhythm	11	16	27
9	Paced rhythm	12	10	22
10	Pre-excitation (WPW)	6	15	21
11	Sinus bradycardia	11	16	27
12	Supraventricular tachyarrhythmia	17	9	26
13	Ventricular trigeminy	14	12	26

III. PROPOSED METHODS FOR MOBILE BASED ECG CLASSIFICATION

In the initial stages, we developed a ECG classification model and developed novel feature extraction methods for extracting multi-domain features directly from the compressed ECG targeting on low computational methods for feature extraction and classification executable on mobile phones. The architecture of the proposed system is given in Figure 1. The process for diagnosis of cardiovascular diseases involves the steps shown in Figure 2. The steps include: lossless compression of ECG, novel methods for extraction of features from losslessly compressed ECG, selection of most discriminative features and a hybrid classifier for diagnosis of cardiovascular diseases. The development of the framework for ECG analysis is presented in section 4.

Training of the system is performed using the MIT BIH ADB. In the training phase, the data is compressed and features are extracted from the compressed ECG, key features are identified using feature selection and classification model is deducted using a hybrid classifier. The deduced classification model is converted into set of decision rules and accumulated in the knowledge base. The knowledge base is directly used in the Android application in the testing phase. The system is tested using the collected real-time data. During the testing phase (executed on an Android Mobile device) data is compressed and only those features identified as discriminative in the training phase are extracted from the compressed ECG. The knowledge base is used to diagnose the cardiovascular disease in the test data. Each of these processes is detailed in the following sections.

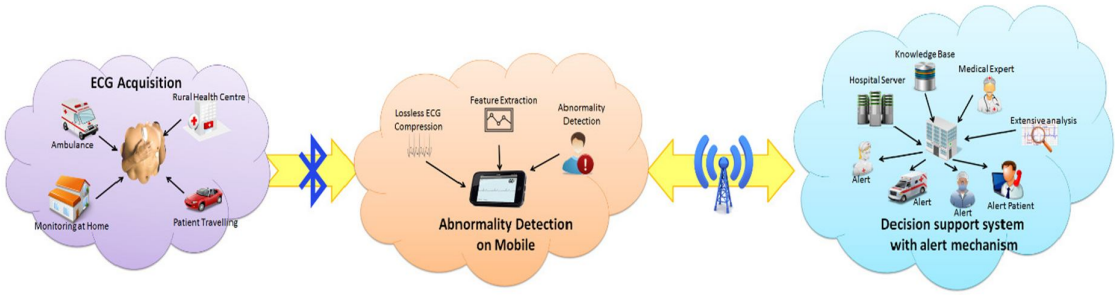

Figure 1. Proposed Mobile Telecardiology System Architecture

A. Lossless ECG Compression using Symbol substitution (LECS)

It is crucial to reduce the volume of the input to complete the analysis of ECG on a mobile device. Generally, lossy compression is adopted for this purpose. However, to avoid the loss of clinically significant data, it is very important to adopt a exclusive compression technology such as Lossless ECG Compression using Symbol substitution (LECS demonstrated in our earlier research in [6]). LECS compresses the ECG without any loss on mobile devices.

The main steps in LECS algorithm are Normalization, Differencing, Sign Epoch Marking and Compaction functions [6]. Demonstration of LECS for MIT ADB 100 is shown in figure 3. The algorithm uses preliminary mathematical computations without floating point data operations, and hence it was successfully deployed on a mobile device. The LECS Compression reduces the input size from 14.4KB (for 10 sec ECG recording) to nearly 2KB. This makes the extraction of multi-domain features on a low computational mobile device feasible.

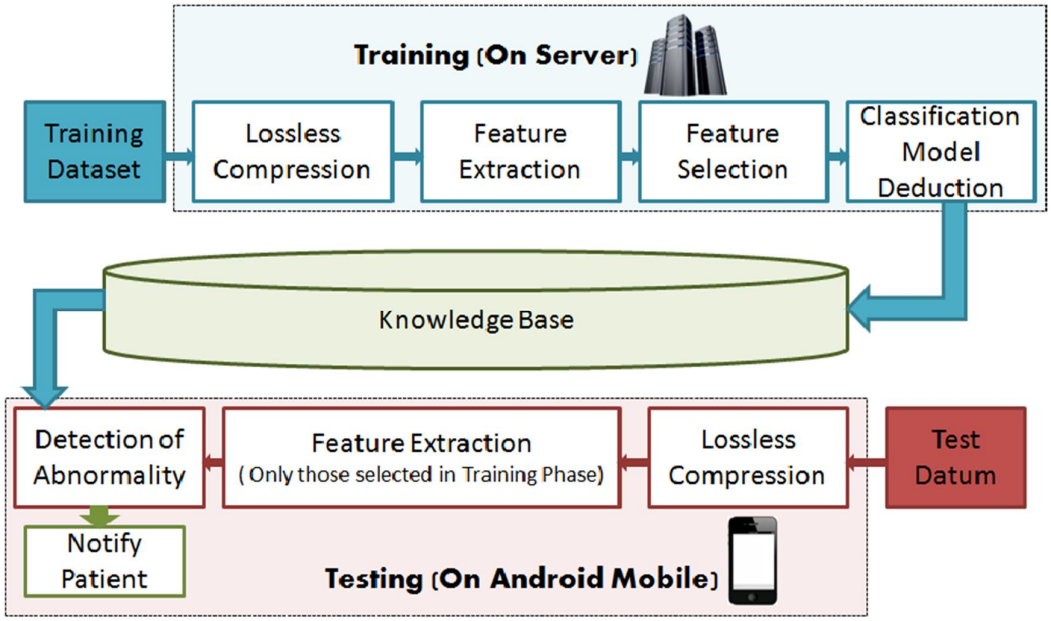

Figure 2. Process Flow of Proposed System

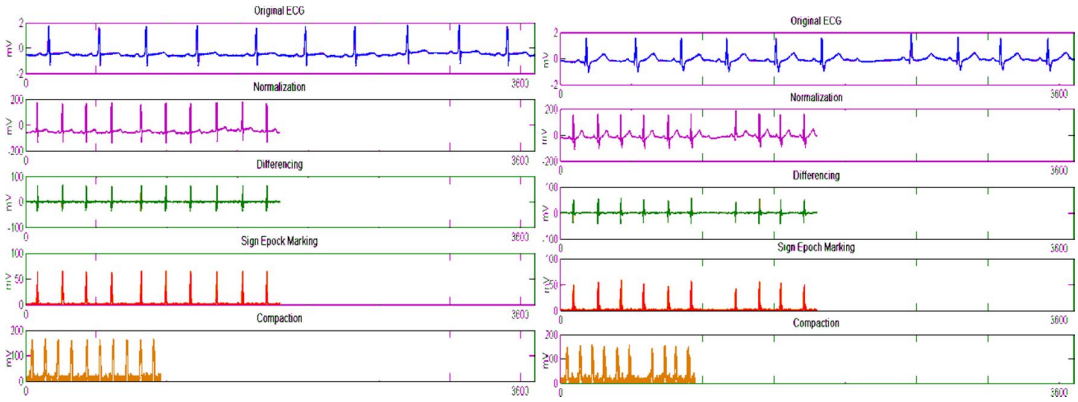

Figure 3. LECS Compression for (a) MIT ADB 115 (b) MIT ADB 231

B. Feature extraction from compressed ECG

Features were extracted in the time domain and frequency domain of the compressed ECG and statistics were computed for extracted features of both domains. The time domain features explore the morphology of the compressed ECG wave. The frequency distribution of the compressed ECG was analyzed using wavelet transformation methods. The Daubechies mother wavelet was chosen for fast numerical implementations. Most discriminative features were identified to reduce the dimensionality of the feature vector prior to classification. The statistics over the extracted features highlight the discrimination between ECG data belonging to different cardiovascular diseases during the classification.

C. Feature extraction in Time domain

The time domain analysis explores the structure of the ECG waveform and estimates the R Peaks, RR Interval, QRS Width and Heart Rate. Even though the exact values of the required features cannot be extracted from the compressed ECG, an illustrative representative of the feature can be extracted. For better comprehension, Figure 4 shows the original and compressed ECG of 4 samples.

The losslessly compressed ECG is first segmented into segments of 70 samples. The peak value in each segment is identified. The average of peaks of all segments is calculated. Those peaks with amplitude higher than the average of peaks are confirmed as R Peaks. The Q and S points are identified as the zero-crossings before and

after each Confirmed R Peak of the compressed ECG. Furthermore, for each P-QRS-T sequence RR intervals and QRS width are also calculated. The Heart rate corresponds to the number of R peaks identified in a 10 second window.

D. Feature extraction in Frequency domain

Frequency domain methods analyze the signal mathematically against the frequency of its components rather than time. Analysis in different domains provides multiple representations of the signal and contributes insight and points out properties that are hard to discern in other representations. Most commonly used tool for frequency domain analysis is the Wavelet transform, which is used in many signal processing methods including ECG analysis.

The Daubechies wavelet was used to decompose the compressed ECG signal. The scaling function and the mother wavelet of the Daubechies 6(Db6) wavelet are shown in Figure 3. The sampling frequency of the collected test data (1000Hz) was first resampled to 360 Hz to become compatible with the MIT ADB test data. Hence the classification models deduced can be used without any adjustment and the classification performance analysis adopted for MIT ADB can be used directly. These coefficients of 4 ECG samples are shown in Figure 3. It can be seen from Figure 3 that the cd4 coefficients coincide with the compressed ECG and reveal maximum information about the waveform.

TABLE II. LIST OF ALL EXTRACTED FEATURES

Domain	Feature Name	Count
Time Domain	Number of R Peaks (N)	1
	Average R Peak (Avg_R_P)	1
	Average QRS Width (Avg_QRS_W)	1
	Average RR interval (Avg_RR_I)	1
	Heart Rate(HR)	1
Frequency Domain	DB6 Coefficients	128
Statistical Domain	Statistics of R Peak in Time Domain: Mean of R Peak (Mean_RP), Maximum of R Peak (Max_RP), Minimum of R Peak (Min_RP), Variance in R Peak (Var_RP), Standard Deviation of R Peak (SD_RP), Maximum 7 Deviation from Mean R Peak (Max_Dev_RP), Minimum Deviation from Mean R Peak (Min_Dev_RP)	7
	Statistics of RR Interval in Time Domain: (same as calculated for R Peak) 7	7
	Statistics of QRS Width in Time Domain: (same as calculated for R Peak) 7	7
	Statistics of absolute value of Db6 coefficients in each subbands cd1,cd2,cd3,cd4,ca4 (same as calculated for R Peak, 7 values for each subband)	35
Total No. of Extracted Features		189

E. Feature extraction using statistical analysis

Statistical analysis of features extracted in the time and frequency domains reveal more descriptive information about the ECG signal. The statistical features evaluated over the time domain explores the variations between consecutive wave cycles. The statistical features evaluated over frequency domain extracts the essence of the information in each subband.

The time domain features were extracted for each wave cycle are R Peak, QRS Width and RR Interval. The statistics of each feature over multiple wave cycles derived for R Peak are: 1) Mean of R peak, 2) Maximum of R Peak, 3) Minimum of R Peak, 4) Variance in R Peak, 5) Standard Deviation of R Peak, 6) Maximum Deviation from Mean R Peak, 7) Minimum Deviation from Mean R Peak. These 7 statistical features were calculated for QRS Width and RR Interval over multiple wave cycles. The same statistical features were calculated for the absolute values of coefficients in each subband. The list of all the features collected from the time, frequency and statistical domains is given in Table 2.

F. Feature selection

Feature selection identifies a subset of the extracted features in the training feature set which when used alone in testing yield the same or higher performance. The main purposes of feature selection include: reduction in dimensionality, development of more robust classifier by eliminating over-fitting and improvement in classification performance due to elimination of noisy data. Reduction in dimensionality implies that the number of features extracted during the test phase is minimal. Consequently the testing system is computationally light

and deployable on mobile devices. Generally feature selection methods identify the correlation and redundancy among the extracted features and discard those that are highly correlated and assume that the interdependence between features is nil or negligible. However, in CVD diagnosis, the features are highly interdependent.
Traditional methods discard such feature reducing the discrimination in the resulting feature set. To overcome this issue, we have adopted the information theoretic, Dynamic Weighting based Feature Selection (DWFS) proposed by Sun et al [7]. The DWFS iteratively selects and dynamically updates the weight of each feature based on its correlation with the class feature and the interdependence between the selected features. This ensures that inherent feature groups with high discrimination power as a groups selects features by iteratively ranking each feature.

G. Classification

Classification is a data mining task that builds a classification model using a given training input to predict the outcome of a test data. The performance of classification quantified by Accuracy (Acc) is the number of test samples correctly classified. Towards improving the accuracy of classification, many approaches for the combination of classifiers have been proposed where multiple classifiers are trained and the results combined to provide a final classification output. Generally, a hybrid classifier performs better than individual classifiers when each classification model hits different errors. Specifically, classifiers that build model using different strategies hit different errors on test samples. Consequently, when results of individual classifiers are combined the model hits the correct classification.
In the proposed work, five different classifiers: J48, RandomTree, Random Forest, LAD Tree and REP. These are decision tree-based classifiers, which is why we have chosen them. The classification models built by these classifiers are converted into a set of diagnostic rules. These simple 'If-Then' diagnostic rules are incorporated in the Android Application Code in the testing phase. The Hybrid classifier derives a decision out of the 15 MIT ADB classes. The decision is based on the classification of each of the five individual classifiers combined using majority voting-based classifier fusion. The performance of the different classifiers and the integrated classifier for the selected feature set using the MIT ADB and NSRDB databases for training and testing is shown in Table 3. The integrated classifier performs better than individual classifiers (as shown in Table 3) and is optimized for the given set of features.

TABLE III. PERFORMANCE OF DIFFERENT CLASSIFIERS

Classifier	Train	Test	
		MIT ADB	Real-Time DB
REPTree	MIT ADB	97.5	93.3
	Real-Time DB	98.4	99.9
Random Forest	MIT ADB	94.3	89.4
	Real-Time DB	93.8	94.7
J48	MIT ADB	98.1	92.3
	Real-Time DB	99.2	98.6
LAD Tree	MIT ADB	94.3	92.8
	Real-Time DB	98.6	94.7
NB Tree	MIT ADB	96.2	87.9
	Real-Time DB	97.5	97.2
Integrated Classifier	MIT ADB	98.7	96.3
	Real-Time DB	100	99.8

IV. PROPOSED METHODS FOR GENERALIZATION OF CLASSIFICATION MODEL USING CROSS-DATABASE EVALUATION

Generalization is the process of deriving general classification models by abstracting common rules across multiple instances. We aim to find ECG classification model with reduced dimension, efficient and generalized model in multi-database scenario. As most of the systems in literature use overlapping training and testing data, the performance of the system is highly projected. Therefore, for a system to be usable practically, data used to train the classifier must not overlap with the test data.

More over when the number of training samples is far higher than the number of test data used, almost all methods yield very high accuracy in classifying the different classes. But these systems fail miserably when tested with real-time data due to the fact that data belonging to the same class have various morphologies that often are very similar to other classes as well. The model without generalization was presented in [17]. To ensure the credibility of using of our proposed system in real-time, the developed classification model should be generalized.

Generalization is achieved in three steps. Prior to generalization, MIT ADB is processed in the proposed framework described in Section 3 and classification model is optimized using the integrated classifier approach. The first step in generalization is the cross-database evaluation of the developed classification model. The second step is to identify those features that are discriminative across multiple databases. The final step is to evolve a generalized classification model using those features that are most discriminative across multiple databases. The selection of features that are discriminative across multiple databases ensures that the features that are robust to multiple types of noises, artifacts and errors are taken into account for development of the classification model. Thus, the developed classification model is robust across multiple acquisition scenarios and is suitable for use in real-time environment. The process for these steps is explained as follows.

Step 1: Evaluation of Classification model.

The ECG classification model was developed using the integrated classifier approach. The first step in generalization then tests the proposed classification model developed using MIT ADB and the framework using real-time data. The results of classification using MIT ADB for training and Real-time data for testing using different classifiers are presented in Table 2. It can be seen from table 2 that use of overlapping data for training and testing (i.e use of same dataset for training and testing) always projects the performance of the system. When using non-overlapping train-test data, the true performance of the system is revealed. It can also be seen that, when the classification model is trained using MIT ADB and tested using the real-time data the classification performance is reduced. This is due to the fact the classification model built using MIT ADB with limited training samples

Step 2: Selection of most discriminative features across multiple databases

The second step is the selection of best features across different databases. To accomplish this step, we have trained the system using the benchmarked MIT ADB database (taking 46 records as mentioned above) and tested the system using 324 samples collected from Madurai Rajaji Hospital (the details of which are presented in Table 1). This ensures that the performance of the proposed system is consistent and robust when applied for real time data besides those in the training data. The list of features selected in this scenario result in a more robust development of a classification model that is generalized across multiple databases. The Robust feature subset thus determined by this cross-database evaluation strategy is listed in the Table 4.

Step 3: Building a Classification Model with the Robust Feature Subset

The integrated classification scheme is used to develop the classification model using only the robust feature subset. The classification performance of the different classifiers and the integrated classifier is shown in Table 5.

V. Results and Discussions

In this work we have developed and evaluated a cardiovascular disease diagnosis system and deployed as an Android Application. The Massachusetts Institute of Technology-Beth Israel Hospital Arrhythmia Database (MIT- BIH ADB) [5] was used in the training and the collected data described in Section II was used for testing. During training, we have purposefully omitted records 102 and 104 as they were measured in Lead II and not in Modified Limb II (MLII) as the other records in the dataset.

We adopt two approaches to estimate the performance of ECG classification. In the first approach, we use the MITADB as the training dataset and the Real-time data for testing.

In the training phase, ECG was losslessly compressed using LECS. The LECS achieved a high Compression Ratio of 7.04 in spite of its lossless nature. The Percentage-Root-mean-squared-Distortion (PRD) was as low as 0.0221. The LECS compression scheme guarantees untrimmed transmission of data through SMS on mobile devices upon detection of abnormality. Features are extracted in three domains from the compressed ECG including the time domain, frequency domain and statistical features. The list of all features extracted from the compressed ECG is given in Table 2. The selection of features was successfully done using Dynamic Weighting based Feature Selection (DWFS). A hybrid classifier was engaged for CVD diagnosis. The use of hybrid classifier improved the accuracy of the CVD diagnosis abnormality detection by mitigating the misclassifications errors.

TABLE IV. LIST OF FEATURES SELECTED AS THE ROBUST FEATURE SUBSET

Domain	Feature	
	Name	**Count**
Time Domain	Number of R Peaks (N)	1
	Average R Peak (Avg_R_P)	1
	Average QRS Width (Avg_QRS_W)	1
	Average RR interval (Avg_RR_I)	1
	Heart Rate(HR)	1
Frequency Domain	DB6 Coefficients	9
Statistical Domain	Statistics of R Peak in Time Domain: Mean of R Peak (Mean_RP), Maximum of R Peak (Max_RP), Minimum of R Peak (Min_RP), Variance in R Peak (Var_RP), Standard Deviation of R Peak (SD_RP), Maximum 3 Deviation from Mean R Peak (Max_Dev_RP), Minimum Deviation from Mean R Peak (Min_Dev_RP)	3
	Statistics of RR Interval in Time Domain: (same as calculated for R Peak) 7	3
	Statistics of QRS Width in Time Domain: (same as calculated for R Peak) 7	3
	Statistics of absolute value of Db6 coefficients in each subbands cd1,cd2,cd3,cd4,ca4 (same as calculated for R Peak, 7 values for each subband)	8
Total No. of Selected Features		31

In the testing phase, the acquired ECG was transmitted to the Android device using Bluetooth communication. The ECG was losslessly compressed using LECS on the Android device. The features selected using DWFS during the training phase were extracted from the compressed ECG and used for classification. All these methods were developed using the Android Software Development Kit (version) and deployed and tested on three different mobile phones: Sony Ericsson ST25i (Android OS, v2.3 Gingerbread, Dual-core 1 GHz Cortex-A9, 512 MB RAM), Micromax Bolt A62(Android OS, v2.3.5 Gingerbread, 1GHZ Dual Core, Spreadtrum SC6820 Processor, 256 MB RAM), Samsung Galaxy Star 2 (Android OS, v4.4.2 KitKat, 1 GHz, SC6815A Processor, 512 MB RAM). The Android App is shown in figure 8.

TABLE V. PERFORMANCE OF DIFFERENT CLASSIFIERS USING ROBUST FEATURE SUBSET

Classifier	Train	Test	
		MIT ADB	**Real-Time DB**
REPTree	MIT ADB	98.5	96.7
	Real-Time DB	98.4	99.9
Random Forest	MIT ADB	93.2	93.9
	Real-Time DB	94.1	94.7
J48	MIT ADB	98.1	97.6
	Real-Time DB	99.3	98.7
LAD Tree	MIT ADB	94.3	94.8
	Real-Time DB	96.1	95.3
NB Tree	MIT ADB	97.2	97.6
	Real-Time DB	97.5	98.1
Integrated Classifier	MIT ADB Real-Time DB	98.8 100	99.4 99.8

The use of non-overlapping data samples in training and testing aids in validation of the developed classification model. Moreover, the use of real-time data aids in development of a robust classifier effective in real-time scenarios.

The comparison of the proposed method with some of the existing methods is presented in Table 6. We observed that our proposed approach achieved improvements in the classification accuracy. The improved performance indicates that the proposed feature extraction methods and the combination of morphological, wavelet and statistical features exhibits higher classification accuracy for discriminating different cardiovascular diseases. In addition, the proposed hybrid classifier-based CVD diagnosis strategy enhances the classification accuracy and

TABLE VI. COMPARISON OF PERFORMANCE OF PROPOSED GENERALIZED CLASSIFIER WITH OTHER TELECARDIOLOGY SYSTEMS

Literature	Data	Features	Classifier	Classes	Target Device/ Technologyy	Accuracyy (%)
Osowski & Linh 2001[1]	MIT ADB	Higher Order Spectra	Hybrid Fuzzy Classifier	7	Server/Workstation	96.06
Martis et al 2013[2]	MIT ADB and EuropeanST-T Ischemia	Morphology, Wavelettransform *Selected using PCA*	PNN	5	Server/Workstation	99.28
Pecchia et al 2011[8]	Real-time	Heart Rate VariabilityAnalysis, Power Spectral Density	CART	2	Server/Workstation	96.4
Park & Kang 2014[9]	MIT ADB	Pan-Tompkins[3]	J4.8	20	Server/Workstation	90
Oresko et al 2010[10]	MIT ADB, Real-time	Pan-Tompkins[3]	MLP	5	Mobile	99
Chen et al 2013[11]	MIT ADB	So & Chan[4]	Hybrid Classifier	6	Mobile-GSM/3G/LTE	79.4-100
Wen et al 2008[12]	MIT ADB, Real-time	Morphology analysis	Adaptive Resonance Theory NN	4	Mobile-GSM	98.98
Shih et al 20101[13]	MIT ADB, Real-time	Morphology analysis	Fuzzy Petri Nets	11	Mobile-GPRS	94.74
Rodriguez et al 2005[14]	MIT ADB with 4 other standard ECG Databases	ECGPUWAVE tool	Decision Treebased	15	Mobile-GSM/GPRS/UMTS	96.12
Dong et al 2012 [15]	MIT ADB	Morphology analysis	SVM	2	Mobile-GSM/GPRS/3G	98.74
Lee et al 2007[16]	MIT ADB	HRV analysis	Rule based Classifier	4	Mobile-GSM	--
Proposed Generalized ECG Classifier	MIT ADB, NSRDB, Real-time	Morphology, Wavelet,Statistical features from compressed ECG selected using DWFS	Hybrid Classifier	15	Mobile-GSM/GPRS/3G	100

thus the credibility of using this system. Based on the observed results, we can conclude that the proposed method offers improved performance over existing approaches.

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Trends and Paradigms in Machine Learning – A Review

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***Abstract*—This paper examines recent advances in the area of machine learning. Machine learning has emerged as a novel approach to producing fresh, precise decisions in the processing of massive amounts of data. In the next applications, where a huge amount of learning data must be analyzed in order to produce a judgement, the learning technique will become increasingly important. The field of automation was creating new interfaces and solutions for precise and effective mining in a variety of applications, including retrieval of information, medical applications, military surveillance, privacy and authentication concerns, astronomy data processing, etc. The development of machine learning techniques using different learning approaches, including the biological system, classification approach, and decision approach, are discussed in this study. In order to produce an approach that relies on training and validation, a machine learning strategy is employed, which involves learning specifics like descriptive characteristics and various predictive analytic algorithms in order to develop the best match option. While there have been many advances in the field of machine learning that have resulted in faster and more accurate learning systems, there is still room for development in the monitoring element. The limitations of machine learning are twofold: while intricacy and information extraction must be kept to a minimum, a higher level of accuracy is required. This study described the evolution and limitations of the current machine learning approaches.**

***Index Terms*— Dimensional Reduction Reinforcement Learning, Boosting, Predictive modeling Ensemble Learning, Instance learning, Regression Modeling.**

I. INTRODUCTION

A crucial challenge in many automation applications is the retrieval of data from a huge dataset. The need to automate the current approach drives up the effort put into machine learning for current and upcoming applications. The field of machine learning has recently seen advancements in deep learning [1], Bayesian modelling [2], non-parametric processing [3], etc. The demand for novel machine learning approaches, where a significant signaling request and data accessing, has increased due to the increase in the number of data in the registered data base. New methods to speed up and streamline the process have been prioritized as machine learning has advanced. The dissemination of data is no longer restricted to a single site thanks to the development of new architectures and network configurations, but rather to maintain a vast. Data delivery units are dispersed throughout a large network and communicate with one another. New topologies have emerged throughout the evolution, including heterogeneous networks [6, 4], distributed computing [5], and cloud

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computing [4]. Machine Learning (ML) techniques, which were created as a learning system in the data interface, have significantly improved the services provided and the performance of the data, but they are limited by high computing overhead, false decisions made under semantically uncertain circumstances, and higher latency issues in data exchange [7].

As a replacement for the human learning system, machine learning has been developed. The method anticipates the observation and bases decisions on prior knowledge. A machine learning system's main component is the collection and processing of data. Data updating, which can be done online or offline, is crucial to the development of machine learning systems. The approach of machine learning is created based on domain-specific learning models in numerous applications.

The creation of a learning system based on input observation is extremely hard because the observation is always changing throughout time. This method has trouble coming to a decision in a situation with a wide range of input. A big concern is the impact of security and the importance of data. The new learning methodologies that are being developed are centred on a dynamic environment. The current methods of machine learning [8] are divided into three categories:

1. supervised,
2. unsupervised, and
3. semi-supervised learning.

The categorization of the existing learning system is presented in figure 1 below.

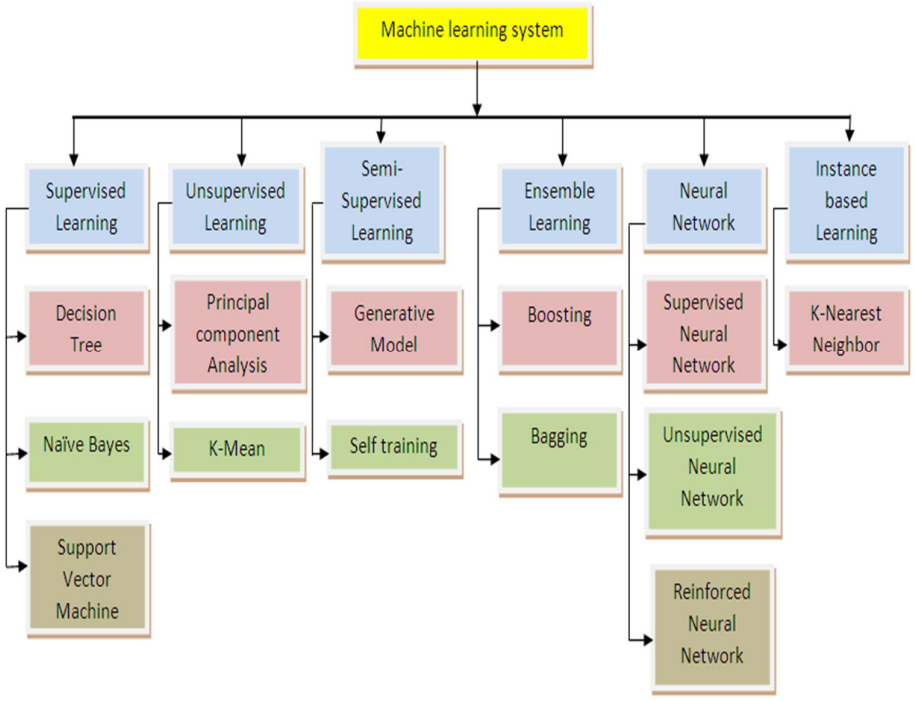

Figure 1- Machine learning hierarchy

Unsupervised learning does not adhere to any set patterns for data types, whereas supervised learning leverages a preexisting knowledge dataset to inform its choice. A combination of supervised and unsupervised methods is used in the semi-supervised [9] technique. The machine learning unit is created as a unit for training, testing, and categorization. Training is developed using either a supervised model or an unsupervised model. The clustering technique and decision logic are used to create the classification model. A supervised or unsupervised strategy is used to construct the training process in a machine learning approach.

Supervised technique: Based on the training data, this strategy employs a linear model of prediction for a given goal. Examples of supervised learning approaches include linear modelling [10], SVM, random forest [11], decision tree approach [12], etc. One way to learning that is frequently used in machine learning is supervised

learning. In this method, the input and output variables are mapped, with the result being a linear function of the input. The goal of the supervised learning strategy is to accurately map the input to the output for the optimal decision prediction.

b) *Unsupervised approach:* This strategy is based on prediction, the reduction of prediction error, and cluster formation for decision-making. For the purpose of predicting rules and obtaining the pertinent data needed to derive an output, an unsupervised technique has been created. This method was created using clustering and association rules [13,14], where the rules are derived to specify the association of training data to input data. The K-Mean approach [15], the Apriorie approach [16], and others are frequently used approaches for unsupervised learning.

The categorization of machine learning approaches and the methodology used in the classification process are shown in Figure 2.

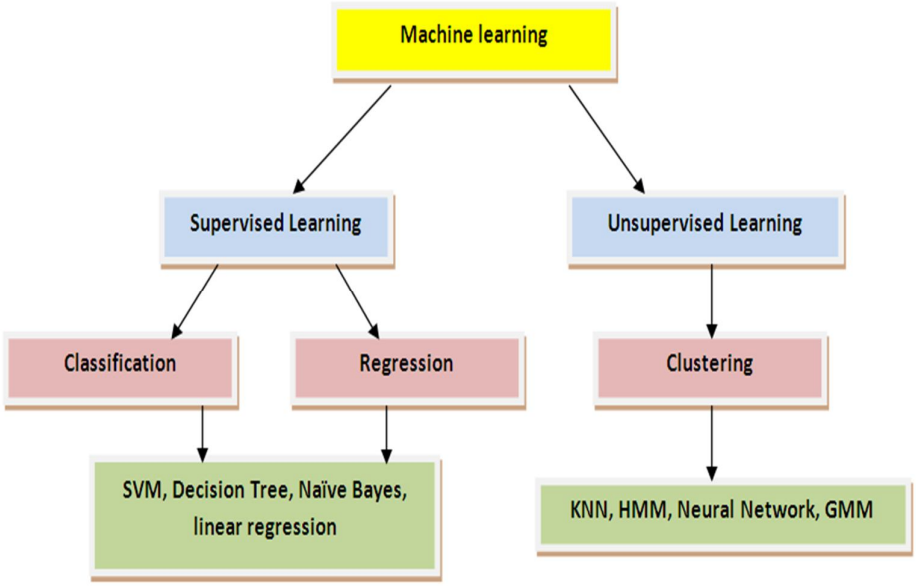

Figure 2 – Classification and methods in machine learning

The steps in supervised learning include selecting the training data set, assembling a training data set, selecting the learning function, and setting up the learning algorithm to verify the algorithm's accuracy using a variety of test cases. It is a challenging task for unsupervised learning to work with irregular data patterns. In this method, binary and multi-class classifications are used to develop the classifications [17]. It is a binary classification if the classification algorithm's prediction yields two target classes. A multiclass classification strategy is used if the predicate values produce more than two results.

II. Modeling of Learning System

Based on the decision criteria and previous learning knowledge, a learning system is created. Information that has been trained is the learning data that has been updated in the database. The learning data is processed during the testing phase and stored in a distant location, like a server. The machine learning system operates in two phases: the training phase and the testing phase [18]. In this method, the training phase establishes a connection with the testing input to provide a classification judgment. Below are the areas where supervised learning systems are frequently utilized.

***1)Decision tree modeling*:** This method is used to model various learned pieces of data in a database [19]. Decision trees are created during the categorization process, where the nodes and branches of the tree serve as representations.The categorization qualities are represented by the nodes in the tree, and the decision-making algorithm's transition to derive maximum correlation is represented by the tree's branches. Many machine learning applications use the decision-making process.

2) Reinforcement Learning*:* Reinforcement learning [20] is a type of learning that improves the decision-making process by building decisions based on occurrences. The action model serves as the foundation for the development of the reinforcement learning model. This strategy produced a judgement based on the testing system's action model. Through this method, a choice is produced based on the action to be taken, and the best-suited option is used to process the most exact retrieval. This method relies on an estimating procedure based on trial and error. The decision system receives a test input from the test system along with the processing status that is being shown. Here, the decision system creates the test model's operational behavior based on expected database information based on the query input. The choice for the given input is then processed using the best performing information. This method's learning mechanism allows for either solitary or collaborative processing of decisions.

3. Ensemble Learning: This method of learning is the result of the processing of several learning methodologies in an integrated manner. Making a decision involves the use of several different approaches, including the naive Bayes technique, tree-based modelling, neural network modelling, etc. The goal of the ensemble learning strategy is to improve decision-making accuracy by using numerous decisions to arrive at a conclusion. Although the strategy offers a high degree of decision-making precision, it also has a significant degree of complexity and time.

4. Boosting*:* This type of group learning uses information processing to reduce decision-making bias and variance. The method uses a strong versus weaker learning model to derive the data, then classifies and boosts the collective data that are less correlated in decision-making. The Ada Boost technique is a popular boosting method used in machine learning applications.

Figure 3 depicts the relationship between information flow and machine learning as it relates to decision-making.

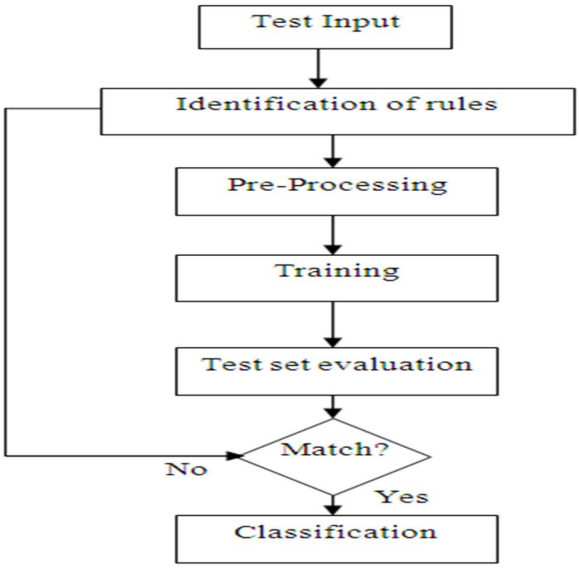

Figure 3- Flow diagram of machine learning approach

The majority of learning systems use inductive or deductive processing. In this case, a computer program using an inductive approach creates decisions based on the rules and patterns found in the database. This strategy creates a subclass of observations to enhance the decision-making process by using instances from previous processing and current knowledge. In order to generate updated information for decision-making, the deductive process creates a decision based on the learning algorithm that was successfully applied and the existing learning information

III. MACHINE LEARNING ALGORITHMS

The current machine learning algorithms are categorized as shown below depending on the methodology of learning methods used.

A. The regression method

This strategy was developed using the theory of the link between information and incorrect predictions. The regression approach forecasts the variation of temporal variant information used for decision-making. This method is used to anticipate price changes, temperature changes, changes in natural monitoring factors, etc. The regression model development methodology is as follows;

- Linear regression.
- Logistic method
- Stepwise method
- Multivariate approach
- Least square method

B. The instance learning strategy

This method was created as a learning strategy based on the present instance and decision-making strategy for training, and it derives the test model from the learning principles and input data. The principal strategies employed in this method include**;**

- Locally weighted approach
- Self organized mapping approach
- k-Nearest Neighbor (KNN) approach
- vector quantization approach

C. Decision tree based approach

This method was created based on the categorizing of data into smaller subsets and the formation of a tree-like relationship in the decision-making process. The attributes are arranged into sets and linked together as branches in this strategy, which is designed as a node and branch modeling. The most popular techniques are;

- Chi squared approach
- Decision stump approach
- Regression tree approach
- Conditional decision tree modeling

D. Bayesian Approach

In order to produce and quantify the information based on the Bayesian approach, this method is built as a probabilistic modeling. The Bayesian approach's most frequently applied strategy is;

- Bayesian belief network (BBN)modeling
- Naïve Bayes approach
- Gaussian naïve Bayesapproach
- Average one-dependent estimator (AODE)

E. Clustering Based approach

This method is created by breaking up the training data into numerous little sub clusters based on the information's correlative feature. A classified or hierarchical database is constructed using the clustering approach. Typical clustering-based approaches include;

- Hierarchical cluster modeling
- K-Mean approach
- Expectation maximization approach
- K-Median clustering

F. Association Rule Based learning approach

This method is based on a multidimensional database that is divided into numerous smaller clusters and linked to a learning algorithm. The link creates a relationship between a factor of variability and the database information. The often used association rule-based strategies are;

- Apriori Rule approach
- Eclat Approach

G. Neural Network Approach

Based on trained data, neural networks are created in relation to biological neural models. This network evolves into a multi-layer network with data input and output interfaces. With the help of hidden layers that were created based on kernel functions, the two layers are interconnected. Among the most popular neural network techniques were;

- Feed forward back propagated neural network (FF)
- Back propagation model (BP)
- Radial basis function network (RBF)

H. Deep Learning Approach

The neural networks are trained to a finer level using complicated neural networks trained with enormous amounts of data in this improved method to neural networks. The typically employed methods are;

- Convolution neural network (CNN)
- Deep Belief Network
- Deep Boltzmann Machine (DBM)

I. Dimensional Reduction Method

A dimensionality reduction strategy is created for the training process's minimising of the feature data set. The huge volume of feature representation generates a significant processing and storage cost. The feature vectors that are of high significance were reduced using a dimensional reduction method. The accuracy and complexity of the learning strategy were determined by the information vector's selectivity method. The methods for dimensional reduction that are most frequently used include;

- Sammon Mapping approach
- Quadratic Discriminant Analysis (QDA)
- Linear Discriminant Analysis (LDA)
- Principal Component Analysis (PCA)
- Partial Least Squares Regression
- Mixture Discriminant Analysis (MDA)
- Flexible Discriminant Analysis (FDA)

J. Ensemble based approach

This is a method of learning that is unsupervised. In order to make an accurate choice, this method combines various learning approaches to derive sub cluster representation from the training data. The ensemble strategy that is most widely used is;

- Bootstrapped Aggregation
- AdaBoost
- Random Forest
- Gradient Boosted Regression Trees
- Boosting

K. Machine Learning Tools

The tools were created using a learning algorithm to create a real-time learning interface for coding. The resources and applications for coding are compatible with the tools that were built. the following are frequently used tools for machine learning techniques:

- WEKA
- JSAT in Java.
- scikit-learn
- Panda

IV. Classification and Decision Rules in Machine Learning

The decision unit is one of the fundamental components of a machine learning system. This is a classification unit where the system uses training data to perform a prediction analysis and classifies data in order to decide. The choice is made based on an existing observation or a prediction of the future. This strategy is created as either a decision model, a descriptive model, or a predictive model.

a) ***Predictive Unit:*** This strategy establishes the relationship between the feature properties of training data. Based on the information's correlation property and the clustering criteria, the technique groups similar pieces of information into clusters.
b) ***Descriptive Unit:*** Based on the variance in the dataset's information, this unit determines and forecasts the relationship. According to the method, data are grouped based on the behavioral relationships between attributes in a training database.
c) ***Decision unit:*** This system makes decisions based on the relationships between attributes that have been detected, and it has also established a set of rules for classifying and categorising the data in the training dataset[15]. Based on the decision tree modelling and method for the identification and prediction of the outcome on several inputs or feature vectors of the dataset, the attributes were reclassified.

Machine learning systems are constructed using learning rules that are developed during decision-making. The rules of learning described the relationship of output to input in the classification process as well as the real-time of training information and trained information in the dataset while training. The rule specified the hypotheses that might be used to derive the learning system's decision model. Proportional and relational rules are the two methods of learning rules.

a) ***Proportional rules*:** Based on the data provided and examples of establishing relational values among various attributes during the classification process, proportional rules are built. The learning is developed as a hypothesis for conditional relation of input to output defining correctness of the rules, and the process is developed as an IF-THEN condition rules. A structured data collection was subjected to the proportional criteria for classification.
b) ***Relational rules*:**Using a relational database, this approach analyses a distributed dataset in which the data is stored in several places and a judgement is made. The relation coding is carried out using this method, which transforms learning strategy based on reference entry mapping with other training data. This strategy is sometimes referred to as the ILP (inductive logic programming) strategy.

Regression or predictive modelling is the foundation of the most popular machine learning models in the categorization process.

1. Regression Modeling This strategy was established using a mathematical definition of the output to input for decision-making. The regression modeling strategies employed include;

1. ***Linear model:***This method creates a linear relationship between the input value and the prediction value. The output of this method varies linearly with changes in the input data. The output (y) is produced by deriving the input (xrelative)'s linear function, where y=f (x).
2. ***Logistic model:***The decision has a chance of detecting success or failure in this two-level decision model. This system uses a binary variable for the value.
3. ***Stepwise model:***This methodology is applied when there are several variables. This strategy makes step-by-step predictions about the optimal fit value. With this strategy, a maximum prediction is made with the fewest possible indicators.
4. ***Ridge Model:*** When the information from the trained dataset is correlative in nature, this method is useful in decision-making. In order to derive the decision from the learning dataset, this model makes use of the multi correlation property.

2. Predictive modeling

In order to predict the class among different class values, this modelling is utilised. In this method, the prediction is tied to a particular class attribute. Typical prediction models include;

1. ***Support vector machine:*** This method is used to build relationships between complicated patterns in the dataset and to categorise them. Based on a learning strategy, often known as a learning machine, they carry out and identify the greatest match value.
2. ***Naïve Bayes approach:*** This strategy is employed in situations where the predictors are strong. With this method, the estimation is carried out using the Bayes conditional probability.
3. ***K-Nearest Neighbor Approach*:** Based on both positive and negative values in the dataset, the technique creates a mechanism for statistically predicting pattern identification.
4. ***Random forest Approach:*** This is an ensemble-style approach where a tree-based modeling-based decision is made. A prediction judgement is made using this method based on the out-of-the-bag mistake. This method carries out categorization based on a subset of dataset's variables.

V. Recent Developments and Future Perspective in Machine Learning

Numerous advancements have been made recently in the process of refining the unsupervised learning technique. The presentation of a self-organizing neural architecture for active perception. The multimodal fusion approach serves as the foundation for the unsupervised learning approach. The method is a tree-based methodology that maps various modalities among the dataset's properties. The suggested architecture separates the data collection into manageable tiny groups of information and carries out sub learning using various learning models. Here, each cluster is processed independently, and a multimodality approach to redundancy reduction is suggested. This strategy minimises repeated entries during the learning phase, boosting the effectiveness of the learning process.However, because the system is designed on a linear scale, past observation is not taken into account when mapping data. This restricts the grouping decision to the most recent observation, decreasing efficiency. A characteristic-based method is described in order to develop unsupervised learning and increase its learning effectiveness in the context of online learning. Based on the user characteristic of updating and the mining process mode, this technique established an adaptive learning approach. This method reads user access log files and creates a characteristic value for user updating. An efficient learning representation that represents the user characteristic is created using an adaptive e-learning classification, which is described.The adaptive E-learning framework is created by observing the learning methodology to enhance the learning process by giving updated data. It is described how to identify the best learning approach based on the characteristics of the current learners and how to use online custom mining and machine learning techniques. In order to determine the learning circumstances and identify the learners' patterns, the log file was pre-processed using the web custom mining method.

The user-developed attribute, however, is mapped as a solitary observation in the learning process. This caused observational learning to be isolated and misclassified as a result. To achieve the highest level of classification accuracy, a vital system operation in the classification process is to accurately cluster the information. In quantum information-based coding, the clustering method is proposed. The quantum machine learning methodology serves as the foundation for the clustering process. In order to achieve faster convergence in decision-making, a q-mean approach developed by a k-mean approachis provided.Although the data clustering does not validate the information gain in cluster formation, this clustering approach created a higher precession in the clustering process. Table 1 provides a review of prior advancements in machine learning techniques along with applications, benefits, and system limitations.

A new processing interface for data retrieval in widely distributed domains that offers high security, reliability, throughput, low resource consumption, accuracy, and integrity of data using an advanced machine learning approach that is to be quicker and more accurate in processing is being developed in light of previous developments and the limitations described. Utilizing the input characteristics and learning system feedback could reduce the learning and updating overhead. This approach would speed up learning. reduce overhead, and shorten the time between data transfers. Each observational piece of data that is used for learning during the machine learning updating process is randomly stored. This update causes a significant increase in search overhead during decision-making, which delays allocation. For dynamic input updation throughout the learning process[19], a new data semantic strategy based on input updating rate, characteristic of input fluctuation, and maximization of expectation parameter may be produced. Better decision performance may result from improving the clustering strategy. For the best clustering in machine learning, a brand-new method based on information gain can be suggested.

VI. Conclusion

The development of novel machine learning approaches has become necessary as a result of machine learning's progress and use in practical applications. This study provides an overview of various historical modeling and operational approaches for machine learning. An overview of the evolution of the machine learning operation units is provided by the machine learning system's process and functioning model. The limits of the current approach and its applications lead to the conclusion that new machine learning methodologies are required. The technique of working methods for classification, clustering, and decision-making in a machine learning system was provided in this research. In relation to ML algorithms, an effort is made to describe the operational framework and methodologies of Classification, Regression, and Clustering. The most recent advancements and the outlook for machine learning system development are described.

TABLE I: APPROACHES OF MACHINE LEARNING ADVANTAGES AND LIMITATION

Method	Application	Advantages	Limitations
Neural Network (NN) Method	Operational testing for commercial use Large-system functional analysis apps for risk management and data security projections for the market and sales, etc.	Being adaptive, the network adjusts to the decision-making process according to the input and trained data provided to the network. Self-organizing: During the learning phase, the method builds and modifies the representation of the data based on the input received. Usage in practise: This method was created and is put to use in numerous real-world applications that demonstrate the value of adapting to change throughout the course of time.	Overfitting is a problem that requires a lot of computational work. The established rules are used to determine the relationship between input and output, which could result in a misleading mapping in a dynamic environment. The magnitude of the data provided for learning, which must be substantial in order to make appropriate decisions, determines the accuracy of this network.
Case Based Reasoning (CBR) Approach	An automated support desk interface. software application effort estimation. Making decisions with knowledge-based applications	No specialised learning system is needed for this system. It employs a prediction model and handling procedure for case failures. The system requires very little maintenance.	The learning and decision-making interface is challenging. Because the case facts are specific to the application, they have a low prediction restriction.
Classification and Regression Trees (CART) Approach	Utilised in the financial sector for client relationship management. effort accuracy with the COCOMO model	This non-parametric technique clusters the data based on a thorough search of all conceivable operations. This method has the potential to handle the learning process' missing variables. It is an automatic learning system that has the ability to forecast several metrics.	This is an innovative strategy, and the degree of coding complexity varies depending on the application. Less expert analysis for evaluation is used in this strategy. With this method, enormous, unstable decision trees would result, and the clusters would be created using just one variation.
Rule based coding	Utilized in the lending and accounting systems. Transformer protection is used in electrical applications. used for categorising mechanical devices	The rules are well specified and the input interface is straightforward.	For categorization performance to be improved, the rules must be precise. It is challenging to estimate rules in dynamic conditions, and the system must deal with complex rules.
Adaptive Coding	Used to scientific studies of biological evolution, for example. used for processing genetic data. used in different economic process tools.	This strategy requires less processing and yields accurate answers based on convergence. The strategy is predicated on the principles of fittest survival.	The amount of computing resources needed is substantial. In order to arrive at a decision, the process requires extensive processing time. For many different genetic processing combinations, the choice is comparatively similar.

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An Intelligent Way to Recognize Digits using Convolutional Neural Networks (CNN) Algorithm

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***Abstract*—The Handwritten digit recognition issue in pattern recognition systems is one of the more significant technical issues. Applications for digit recognition include data entry forms, bank check processing, postal mail sorting, and more. The capacity to create a practical algorithm that can recognize handwritten digits given by users via a scanner,tablet and other digital devices is at the core of the issue. The study's main goals were to create a machine learning algorithm and an optimization technique to improve the precision of handwritten digits recognition, as well as to analyze the performance of the proposed algorithm with test data set. This model offers a method for recognizing handwritten digits offline that is based on various machine learning techniques. There are several machine learning algorithms such as Support Vector Machine, Random Forest, Multilayer Perceptron, Convolutional Neural Network etc. In this project is aimed to use Convolutional Neural Network to complete the task. The MNIST dataset also used in this project. The main objective of this model is to ensure effective and reliable approaches for recognition of handwritten digits.**

***Index Terms*— CNN, Neural Network.**

I. INTRODUCTION

The sudden growth of new documents and multimedia news has created new challenges in pattern recognition and machine learning (Cecotti, 2016). Handwriting character recognition has become a common research area due to technological advances such as handwriting capture devices and powerful mobile computers. However, since handwriting focuses on the writer, building a highly reliable recognition system that recognizes any handwritten character input to an application can be challenging.

In this work, we deal with the recognition problem of handwritten numbers, i.e. the numbers 0-9. Handwritten number recognition is usually crucial in various practical applications such as management and economics (Niu & Suen, 2012). These industries require excellent recognition and the highest credibility. For example, unconstrained handwritten digit recognition has been applied to checks and hand-filled forms such as tax forms or postal codes on postcards with excellent results (Lauer, Suen, & Bloch, 2007). Constraint perception refers to the extent to which people believe that factors beyond their control limit their behaviour. In contrast, an unconstrained detection system can be divided into several parts: preprocessing, feature extraction, classification, evaluation, and verification.

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However, the detection accuracy of the tests is mostly around 95%. Since many classifiers cannot adequately process the original images or data, feature extraction is one of the preprocessing steps that seeks to abstract the relevant information and decrease the complexity of the data (Lauer, Suen, & Bloch, 2007).

A. Objective

The project's main objective on handwritten recognition is to calculate the accuracy of the digits written by the user and display the correct digits on the screen. The project aims to build an application program to recognize the digits written by the user and display them accurately.

II. Literature Survey

Numerous academics made their imprint on the digit recognition subject. Hanmandlu and Murthy built a character recognition system with varied priorities for particular aspects based on the accuracy of various features. In order to determine the character order in a handwritten script, a hidden Markov model utilising a recurrent neural network (RNN) has been utilised. This model was applied by Graves and Schmidhuber with 91 percent accuracy for the classification of handwritten Arabic words. Multilayer perceptron (MLP) was used by Pal and Singh to recognise handwritten English letters, and they were able to increase computation efficiency while achieving accuracy of up to 94 percent.

III. System Study

A. Input What is Convolution?

Convolution is an operation that transforms a function into another. For example, doing a convolution to transform the original function into a shape to get more information. Convolutions have long been used in image processing to blur, sharpen, and perform other operations on images, such as Image enhancement and embossing.

B. Convolution Process

Convolution is not a new concept. They are long being used in image and signal processing. However, convolution in machine learning is different from image processing.

Convolutional layers are the primary building blocks used in convolutional neural networks.

Convolution is a simple filter applied to an input that results in activation. Repeatedly applying the same filter to input will result in an activation map called an object map, which shows the position and strength of the detected input object, such as an image.

The innovation of the agglomeration neural network is the ability to automatically learn in parallel many specific filters for a training dataset under the constraints of a particular predictive model problem, such as classification. As a result, specific features are detected anywhere on the input image.

A Convolutional Neural Network, abbreviated as CNN, is a specialized neural network model designed to work with two-dimensional image data. However, it can be used with one- and three-dimensional data.

A convolutional layer is a layer that gives the network its name is the heart of the convolutional neural network. This class performs an operation called "convolution".

In the context of convolutional neural networks, convolution is a linear operation that involves multiplying a set of weights with the input, just like a traditional neural network. However, since this technique is designed for two-dimensional input, the multiplication is performed between an input data array and a two-dimensional array of weights, known as a filter or multiplication.

The dot product is an element-by-element multiplication between the input and the filter's filter size patch, which is then added together, always resulting in a single value. Here it results in a single value, and the operation is often referred to as the "dot product".

Using a filter less than input is intentional, as it allows the same filter (weight set) to be multiplied multiple times by the input array at different points in the input. Specifically, the filter is applied consistently to each filter-sized overlap or patch of the input data, left to right, top to bottom.

The systematic application of the same filter on an image is a powerful idea. For example, suppose a filter is designed to detect a particular type of feature in the input. In that case, applying that filter consistently across the entire input image will allow the filter to detect that feature at any time, anywhere in the image. This capability is often referred to as translation invariance, e.g. a general concern about whether the item is present rather than its location.

Convolution is an ordered procedure in which two sources of information are interleaved, and it is an operation that converts a function into something else. Convolutions are used for a long time in image processing to blur, sharpen images, and perform other operations. (e.g. edge enhancement and embossing) CNN's apply a model of local connectivity between neurons in adjacent layers

C. Convolution Layers

Convolutional neural networks use filters to detect features such as edges throughout the image.
There are four primary operations in CNN:
1)Convolution
2) Non-Linearity (ReLU)
3) Pooling
4) Classification
In Convolutional Neural Network, the first layer is the Convolutional Layer. These layers apply a convolutional operation to input, passing its result to the next layer. A convolution converts entire pixels in its receptive image field into a single value. For example, suppose you would apply convolution to an image. In this case, you would reduce the size of the image and pack all the field information into a single pixel. The final output of the convolution layer is a vector. We can use different complexes depending on the problem we need to solve and the type of feature we are looking at.

The 2D Convolution Layer

The most commonly used convolution type is the 2D convolutional layer, often abbreviated as 2D convolution. The filter or kernel in the collation layer "slides" on the 2D input data, performing element-by-element multiplication. As a result, it will aggregate the result into a single output pixel. The core will perform the same operation for each position it slides over, turning the 2D matrix into a different 2D matrix of entities.

The Dilated or Atrous Convolution

It will enlarge the window size without increasing the number of weights by adding null values into the convolution kernels. As a result, scaling or flickering combinations can be used in real-time applications and applications with lower processing power because less intensive RAM is required.

Separable Convolutions

There are two main types of separable convolution: spatial separable convolution and depth separable convolution. Spatial separable convolution mainly deals with the image's and kernel's structural dimensions: width and height. Compared to spatially separable convolutions, dimensional separable convolutions work with kernels that cannot be "computed" into two smaller kernels.

Transposed Convolutions

These types of convolutions are also known as deconvolutions or fractionally stridden convolutions. A transposed convolutional layer carries a regular convolution but reverts its spatial transformation. browser.

IV. SCREEN SHOTS

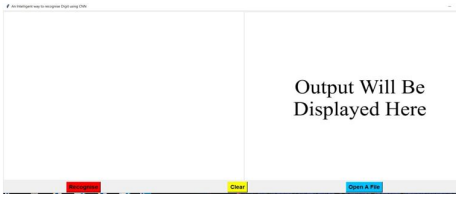

Figure 1. Main Menu

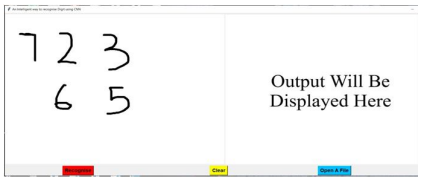

Figure 2. Handwritten digits on the screen using mouse

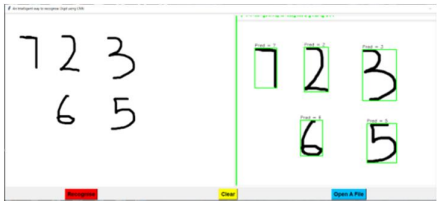

Figure 3. Output of the written digits

Figure 4. Output of the uploaded image

V. Conclusion

We have developed a handwritten digit recognition Python deep learning project with success. We created and trained a convolutional neural network that is exceptionally good at classifying images. Later, we create the GUI, which recognises numbers on images and allows us to draw a digit on the canvas, classify it, and display the findings.

Future Scope

This model has a scope of improving it's areas on recognizing texts, objects and even human faces with that we can information across the world.

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A Novel Web Application of Product Recommender System based on Sentiment Analysis

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***Abstract*—In present scenario the data overload is a serious problem. for mere humans, its impossible to analyse data manually without error or bias. One prime example of this regarding the review of products on e-commerce websites is that when a customer buys a certain product, he first looks for its ratings and then decides whether to buy that item or not. But only ratings are insufficient to determine the quality of the product. Reviews give us a much clearer and more in-depth understanding of the product. There is a need to summarize the feedback in a meaningful manner. Here's where sentimental analysis comes into play. Sentiment analysis can be automated, decisions can be made based on a significant amount of data rather than plain intuition that isn't always right. This proposed model combines sentiment analysis and a recommendation system to provide users with a comprehensive recommendation of e-commerce products. The aim of this analysis is to determine the orientation of a review then the recommender module provides users with product recommendations by analyzing large amounts of user-supplied data that is ratings and the sentiments of users and other factors like price and the number of sales to provide the user with the best recommendation. This is developed in the Python language.**

***Index Terms*— Sentiment Analysis, Product Reviews, Vader Sentiment.**

I. INTRODUCTION

In a world driven by data, the limitations, and possibilities of what we can carry out with the data are unfathomable. Whether it is data from a football game or a student's database, there are times when we can give meaningful execution to the data at hand and use it to solve a variety of issues and make our lives easier.

Companies may have bought mountains of client feedback in today's data-overloaded atmosphere. However, it is still hard for normal people to manually analyse it without inaccuracy or bias. A perfect illustration of this relating to product reviews on e-commerce websites is the fact that when a buyer buys a product, he first checks its ratings before deciding whether to buy it. However, merely ratings are insufficient to adequate for deciding the product's quality. Reviews supply a far more precise and comprehensive picture of the product. Additionally, we may have our own prejudiced, predetermined notions on the issue at hand, which may affect how we understand the material we must analyse. We will also need to synthesise the input into a handful of actionable insights so that it is useful to the user. Users want insights to make an educated decision before buying a product. And they are inadequate. We must devise a more efficient strategy for gaining the most valuable ideas. Here, emotive analysis comes into play and aids the user in condensing evaluations and providing a concise insight. Sentiment analysis may be automated, and choices can be made based on a substantial quantity of data as

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opposed to simple intuition, which is not always accurate. In addition to using emotion scores, a recommender system also evaluates parameters such as pricing, reviews, and purchase. It finds the best product for the consumer and provides a mathematical reason for its selection.
They may be used to measure and record a vast array of internal and external company activity. While the data itself may not be particularly useful, it serves as the foundation for all reports and is therefore vital to company. Consumer data are measurements about customer engagement. It might be the number of jobs, the number of inquiries, the revenue earned, the costs incurred, and so forth. We need statistics to understand our interactions with the consumer.

II. Literature Survey

Sentiment analysis is a popular topic. It is a new technique to making effective use of linguistic knowledge because everyone has a unique perspective on things. The analysis of these opinions can provide useful information. The combination of web scraping, sentiment analysis, and the Recommender system model provides better recommendation outcomes. The sentiment analysis output helps in the generation of more intricate recommendation outcomes.
Alka Singhal et. al [5] have researched on how recommendation systems Work in an IT environment and in the real world. The two areas of text mining and sentiment analysis, which are often studied separately, are combined in this study. The textual tweet data we got from Twitter constitutes the sole subject matter of this article. Future additions to this data set could include photographs, audio, internet articles, multimedia, etc. Geospatial data is completely disregarded. All of these qualities may be taken into account in the future.
Satuluri Vanaja et. al. [6] Their work uses Amazon customer review data and focuses on finding aspect terms

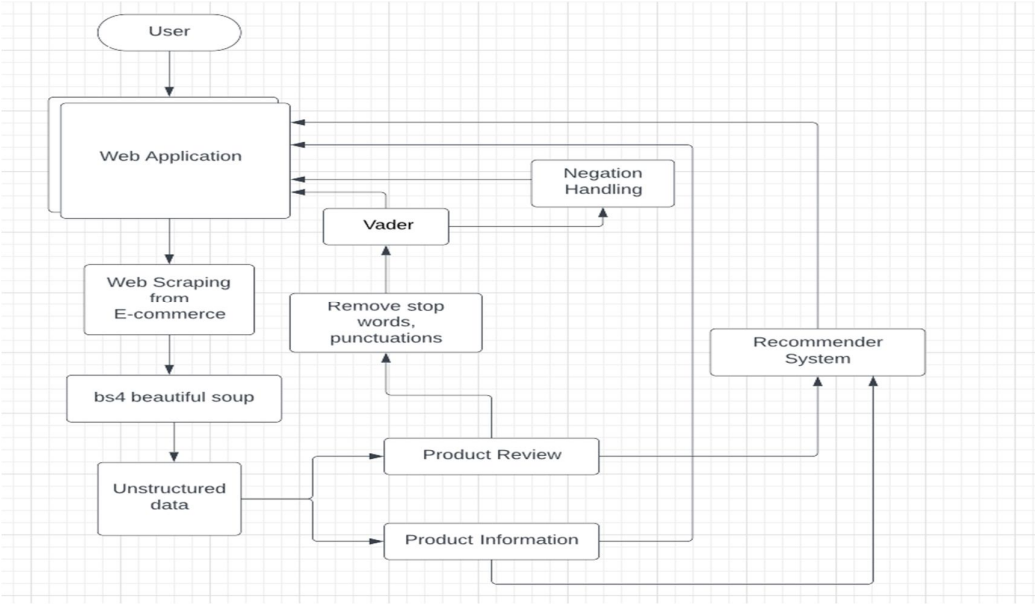

Figure-1: Proposed Model of Web App For Sentiment Analysis

from each review, identifying the Parts-of-Speech, applying classification algorithms to find the score of positivity, negativity, and neutrality of each review. In future the focus is on implementing advanced algorithm and compare with Naïve Bayes.
Shivaprasad T K et. al. [7] more research work is needed to improve the performance measures further. Sentiment analysis or opinion mining can be applied for any new applications which follow data mining rules.
The study of Prashast Kumar Singh et al. [8] entails the measurement of the sentiments of thousands of (good) reviews as well as the filtering of irrelevant and unhelpful remarks. Last but not least, giving the final user (business/manufacturer) a summary of the information regarding the expressed sentiments in the form of clear and understandable graphs, charts, and other visualisations. In the future, it will be possible to mine reviews from Twitter, which is rich in such slangs due to the 140-character limit on tweets, which forces users to use shortened forms, by accounting for Internet slang language and expressions like "LOL (laughing out loud)"[8].

Kim Schouten et. al. [9] research aims at finding the right implicit feature without this pre-knowledge. The proposed algorithm better in distinguishing between sentences that have an implicit feature and the ones that do not. In future work a shift to word-based methods like this one to concept-based methods will be intriguing.

III. Proposed System

The proposed system is intended to provide a user-friendly interface to the web application. Our project addresses the limitations encountered by data overload. The data cannot be analysed manually without error or personal prejudice. The sentiment analysis tool, in addition to saving time required for filtering through thousands of reviews, also overcomes the shortcomings of user biases and preconceived opinions about the product at hand, which can influence how users interpret the reviews they must analyse. Large amounts of relevant data will be scraped in real time from Flipkart. The data will be cleaned and pre-processed, the data is then analysed using VADER. The VADER sentiment score result is then processed and displayed to the user. The recommendation module reduces the user's time required to analyse product information and compare it with competitors by incorporating the relevant factors that is user sentiment, price, quantity sales, and ratings for a more enhanced recommendation. A comprehensive formula has been developed to include all relevant factors and recommend the best product.
Figure-1: Proposed Model of Web App For Sentiment Analysis
In the above Figure 1 explains the overview of the web app and how its modules work out. Firstly, the user engages the web application through his browser and sends a POST request to an e-commerce website, here in our case, Flipkart. To achieve this web scraping is done using the beautiful soap bs4 library to extract unstructured data from which product reviews and product info are retrieved.
Further division of this data is done, product info is used by the recommender system as well as is sent to the front-end. On the other hand, reviews are analyzed, and sentiment score is calculated

IV. Implementation

A. Web scraping

We used a Self-built Web Scraper that extracts underlying HTML code, and, with it, data stored in a database the scraper then copies the entire website's content, which is then processed.
Although many huge websites, like as Google, Twitter, Facebook, Stack Overflow, etc., supply APIs that
allow you to access their data in a structured fashion which is the ideal choice, Flipkart does not allow customers to obtain big volumes of data in an organized format, or they are not technologically advanced enough, therefore we scraped their website for data using web scraping.
The Web scraper was built in Python using the Beautiful Soup package, which is ideally suited for Web Scraping. It generates a parse tree that may be used to extract HTML data from a website. Additionally, Beautiful Soup includes many navigations, search, and modification tools for these parse trees. In the web app, web scraping is used to scrape the following data
Product title
Product image
Product price
Product stars
No of people who bought the product
No of reviews on the products
Link of the page having the reviews

B. Data processing

In the proposed research we have used Natural Language Toolkit, or more commonly called NLTK, is a Python-based toolkit and set of programs for symbolic and statistical natural language processing of the English language. It includes libraries for tokenization, parsing, classification, stemming, tagging, and semantic reasoning

C. Negation handling for word jargons

The part of the sentence that negation effects are called the vicinity or scope of negation. We performed explicit Negation handling. It is proposed for negation and inverting the polarities of words, These words are opinionated.

Figure 4.1: A Negative review with positive words

```
[[], [('Not great', 1), ('Not fit.', 1), ('Not best', 1)], [], []]
```

Figure 4.2: Concatenating" Not" to positive adjectives

D. Sentiment Analysis

Sentiment Analysis, as its name implies, is the process of extracting sentiment and opinions from a collection of reviews or the emotions behind a situation. It further condenses the data into the behaviour that the data senses. The purpose of this study is to automatically determine the direction of a review. We have employed VADER to perform sentimental analysis.

E. Vader Sentiment

VADER makes use of a variety of a list of lexical properties that have been classified as having a positive or negative semantic orientation. It displays the strength of the emotion, or how positive or negative a sentiment is, in addition to the positivity and negativity scores. The NLTK package contains VADER, which can be used to instantly process unlabeled text data.

F. Recommendation System

A recommender system is a way to tell the user based on certain calculations and algorithms the product which the system recommends. Here we recommend the user a product based on the following formula.

$$\alpha + \left[\frac{\text{No. of orders} \times 2}{\text{Average of all orders}}\right] + \left[\text{Ratings} \times \beta\right] + \left[\text{Sentiment Score} \times \Omega\right]$$

Figure 4.3 : Recommender System Formula

α = price coefficient
β = ratings constant (8.4)
Ω = sentiment constant (0.4)
The formula in Fugure 4.3 is applied to all the products and a score is calculated; the highest score is the recommended product.

Price Coefficient

Price	Ratings	Sentiment Score	Price Coefficient
↓	↑	↑	8
↓	↑	↓	7
↓	↓	↑	6
↓	↓	↓	5
↑	↑	↑	4
↑	↑	↓	3
↑	↓	↑	2
↑	↓	↓	1

Figure 4.4 : Price Co-efficient table

Each price, rating and sentiment score is compared against their averages and the price coefficient is calculate. For ex, if the price is higher, ratings are higher and the sentiment score is lower, then the price coefficient is 3.

V. EXPERIMENTATION

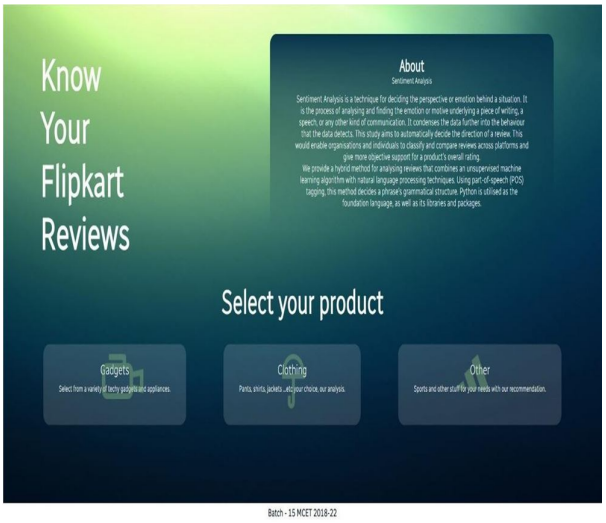

Figure 5.1 : Landing page

Figure 5.2: Search of a bottle

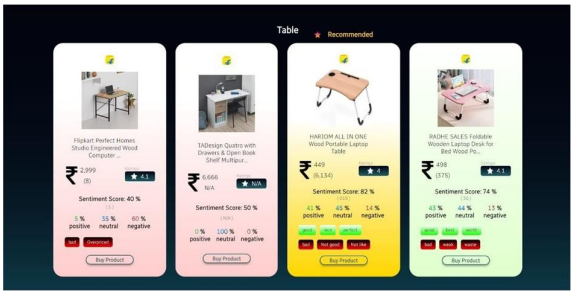

Figure 5.3: Search of a table

Figure 5.4 : A positive product

VI. CONCLUSION AND FUTURE SCOPE

A recommender system that considers not just the product ratings and price but also the overall sentiment score of the reviews. An intricate formula with just calculations that puts proper weightage on its parameters to get a perfect recommender score. The product with the largest recommender score is the recommended product. The whole idea behind this computation is to save the users time which he/she takes to analyse the reviews and find the right product.

Content-based filtering can be integrated into this model which works with the data that we take from the user, either explicitly or implicitly. With the data, we create a user profile, which is then used to suggest actions to the user. As the user provides more input or takes more action on the recommendation, the engine becomes more accurate. Furthermore, a more comprehensive formula can be formulated to enhance the accuracy.

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Tachyon: Bike Rentals Made Easy

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***Abstract*—The bike rental application is an online-based web application which is created to enhance the bike booking facility with ease. This application focuses on the portability of the bike booking feature. This application helps the users to interact with various bike rental companies. With this application, the customer can rent a bike at the best value. One can easily browse through various bikes available by different companies using different interfaces.**
This application provides three types of users, customer, admin, and super admin who work on the same portal. In this application customer is the one who uses the portal to book the bike, the admin is the one who uses the portal to provide different bike details of his own company and the super admin is the one who uses the portal to manage every other user and company. Every user has their type of authentication to work with so that it provides enhanced security.

***Index Terms*— Bootstrap, Springboot, bike, rental services, booking.**

I. INTRODUCTION

Bike Renting is a quite common service that is being utilized in current times. People who want to ride a bike but do not want to buy the bike or cannot bike can utilize this bike renting and can his work completed We can observe that for the past few years the number of people that are using the bike rental application is increasing rapidly. Even though there are multiple providers for this bike renting, they have their drawbacks.

A. Motivation

Bike rental application is a feature which is having increased in demand in the past years. In the bike rental field, there is no web application designed which makes it mandatory for a user to download the application which every user may not prefer. In general, users prefer to use the application and experience the app, only then do they try to install it, which can be possible only through a web app. As the existing applications and models do not satisfy the ease of bike rental system. We decided to implement our system which is faster and more convenient with more features.

B. Problem Statement

The existing bike rental services are having only android and iOS applications but nothing as a web application or an application that can be run on a Windows system. The system that will be built will be a web application that can be used on any type of Operating System and any type of browser. This can be used to smoothly run the application anywhere which increases the portability.

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C. Project Objectives

The application's main goal is to create a website where users can reserve bikes and administrators may rent out bikes. We need to create a special type of user who can monitor and control all users and admins so that the application can run without any issues. Another important task is to make this platform useful by making any admin rent their bikes such that the users can book them based on their interests.

II. EXISTING WORK AND IT'S LIMITATIONS

Some applications provide bike rental services like VOGO, BOUNCE, and GoBumpr which are currently famous in this domain. These applications are present on both iOS and Android but not for Windows. These applications provide mostly gearless bikes like Activa, Zest and eTrance. These existing works are two user applications in which user one is the company and user two is the customer who is renting the bikes.
Limitations:

- The existing models are only app-based either Android or iOS-based but not any web application that can be run on any type of operating system.
- In the existing applications, if a person has any bike that he wants to rent out for others, there is no feature provided to him for that.
- In existing applications, there is no way for a user to choose the same bike that he previously rented and liked.
- In the existing application, there is no flexibility in choosing a particular type of bike after selecting a model, he will be randomly assigned a bike.
- The existing applications, as are written specifically for android and iOS, so if they want to change the code or update a feature, they need to write a feature separately for both android and iOS.
- Every time an update to a feature or security is available for an existing programme, it must be downloaded from the Play Store or App Store.

A Web-based application for a bike renting system is proposed. To create this application, we need to build a portal for users to book bikes and for the admins to rent out bikes. A backend server must be created with the help of spring tools like spring boot, spring web, spring JPA, and spring hibernate. This backend server will be connected to a MySQL database that can be run on either a local machine or server. This spring back end will have various functions that will manage the business logic inside the controllers. Various endpoints need to be created using the spring rest controller and with required HTTP methods so that they can be accessed only using the corresponding methods. The front-end will be created using Angular 11 to create various components and reuse components that can be used in various scenarios like navbar. The front-end that is created will use data from spring boot by using different API calls to perform required operations like login, logout, dashboard etc.

III. IMPLEMENTATION TECHNOLOGIES

A. Angular

With the utilization of HTML and TypeScript, singlepage client applications might be made using the Precise stage and structure. TypeScript is utilized to make Precise. As an assortment of TypeScript libraries that you load into your applications, it carries out both center and discretionary usefulness.
An Angular application's architecture is based on a few key ideas.The fundamental building elements of the Angular framework are NgModuleorganized Angular components. An Angular application is defined by a series of NgModules, which group similar code into functional groups.
A root module, which facilitates bootstrapping, is always present in an application, and there are often many more feature modules as well.
Views are collections of screen elements that Angular may select from and alter in accordance with your programme logic and data, and they are defined by components. Services, which offer specialised functionality unrelated to views, are used by components. Service providers may be added as dependencies to components, which will make your code efficient, reusable, and modular. Classes that make use of decorators include modules, components, and services. As well as indicating their type and providing metadata, these decorators instruct Angular how to utilise them.
A component class is linked to a template that describes a view by the metadata for that class. Ordinary HTML is combined with Angular directives and binding syntax in a template, which enables Angular to alter the HTML before rendering it for display.

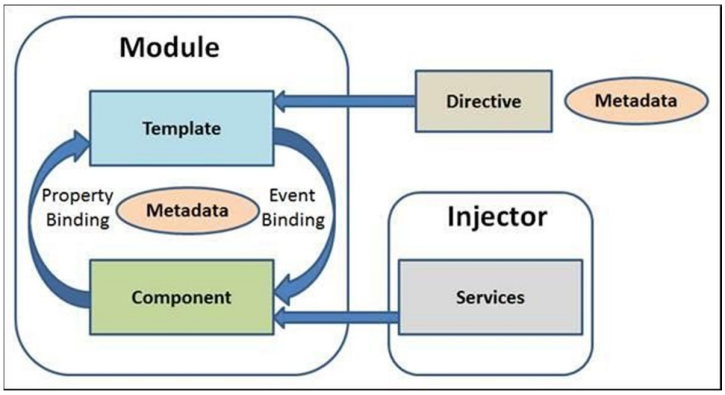

Figure 1: Angular Architecture

A service class's metadata contains the details Angular requires to make it available to components through dependency injection (DI). The parts of an application often define a large number of hierarchically organised views. In order to assist you in creating navigational paths between views, Angular offers the Router service. The router has highly developed browser navigational features.For a group of components that are dedicated to a workflow, an application domain, or a collection of closely linked capabilities, a NgModule declares a compilation context. A NgModule can link its elements to relevant code, such services, to create functional units. At least one component, known as the root component, connects a component hierarchy to the page document object model in every Angular application (DOM).Each component establishes a class that houses the application's data and functionality, and it is connected to an HTML template that establishes the view that will be seen in the target environment.

B. System Architecture

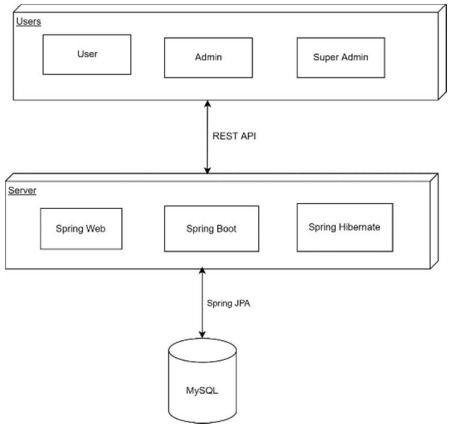

Figure 2: System Architecture

C. Bootstrap

A free and opensource web development framework is Bootstrap.By offering a collection of
vocabulary for template designs, it is intended to make the web development process for responsive, mobilefirst websites easier. In other words, Bootstrap enables web designers to create websites more quickly by relieving them of the burden of learning fundamental commands and functions. It is made up of scripts that are based on HTML, CSS, and JS for various web design-related functions and elements.
The main goal of Bootstrap is to build responsive, mobilefirst websites. It guarantees that a website's UI elements function properly across all screen sizes. Precompiled and based on source code versions of Bootstrap are both options.
The latter is preferred by seasoned developers since it enables them to tailor the styles to their projects.

The advantages of bootstrap are Ease of Use, Browser Compatibility, Bootstrap Image System, and Bootstrap Documentation. There are three distinct types of files in bootstrap, they are Bootstrap.css - Which is a CSS Framework that designs a website by giving class names or by other attributes, and Bootstrap.js – This file is the core part of Bootstrap which consists of JS files that are responsible for website interactivity, Glyphicons – These are the design icons included free with bootstrap.

D. Spring Boot

Spring Boot is an open-source Java-based framework used to create a micro-service. Pivotal Team developed Spring boot and it is used to build stand-alone and production- ready spring applications. Micro Service is an architecture that allows developers to develop and deploy services independently. The lightweight paradigm for supporting business applications is made possible by the fact that each service running has its own process. Easy deployment, straightforward scaling, little configuration, shorter production times, etc., are some of Spring boot's benefits. Java programmers can use Spring Boot to create standalone, production ready spring applications that you can easily execute. Without the requirement for a full setup of Spring configuration, you can get started with the bare minimal configurations.

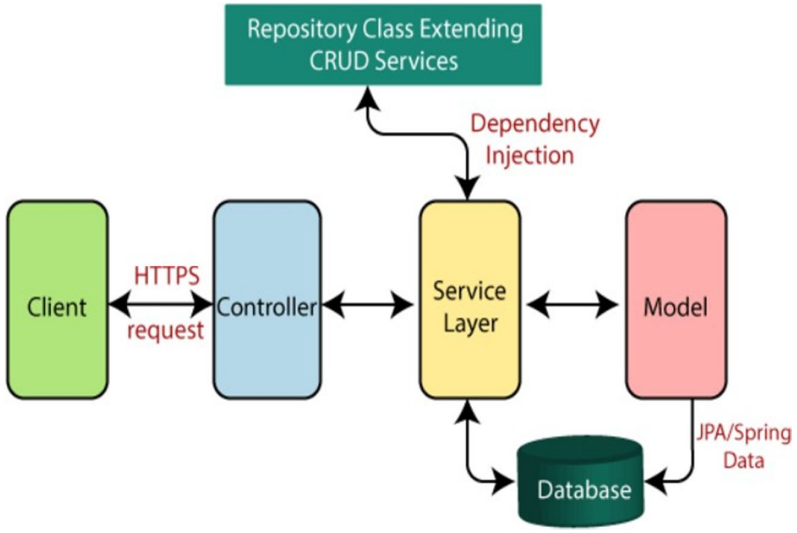

Figure 3: Spring Workflow

By avoiding complicated XML, spring boot makes it easier to create applications that are ready for production. It offers a versatile approach to set up database transactions, XML customizations, and Java Beans. It handles endpoints and offers strong batch processing.

E. MySQL

Usually used in conjunction with PHP and Spring Boot, MySQL is an open-source, quick, reliable, and versatile relational database management system. The only distinction between it and Oracle Database is that MySQL is open-source software.
A database system called MySQL is employed in the creation of web-based applications.
It can be applied to both modest and substantial enterprises. Because it is constantly supported by a team of experts and was designed in C++, which runs more quickly than many other languages, it is incredibly quick and reliable to use.

F. OpenJDK

A free and open-source version of the Java SE Platform Edition is known as OpenJDK.
As a result of the work that Sun Microsystems began in 2006, it was first made available in 2007. Since version SE 7, it has been an official reference implementation of a Java Standard Edition.
It is used since OpenJDK is open-source software, and it releases updates every 6 months, unlike oracle which releases every three years. So, we can get the latest features for free. It performs similar to Oracle JDK as the build process is the same for the JDK.

IV. SCREEN SHOTS

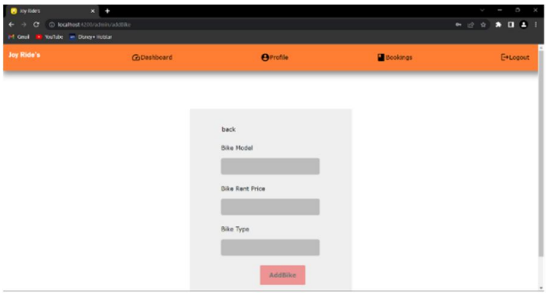

Figure 4. Admin add bike page

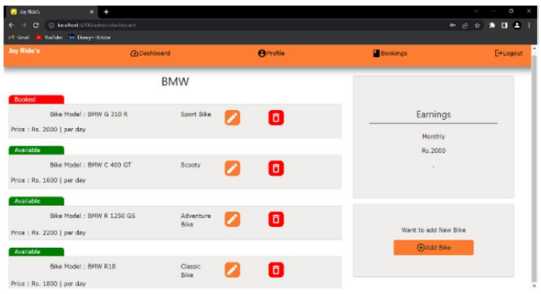

Figure 5. Admin Dashboard page

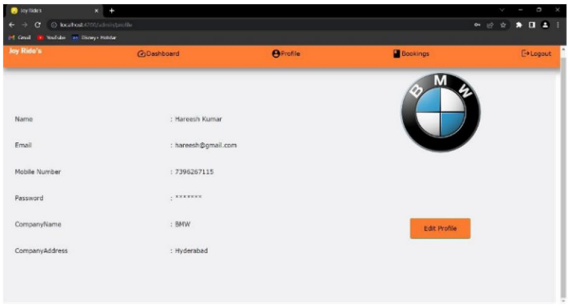

Figure 6. Admin profile page

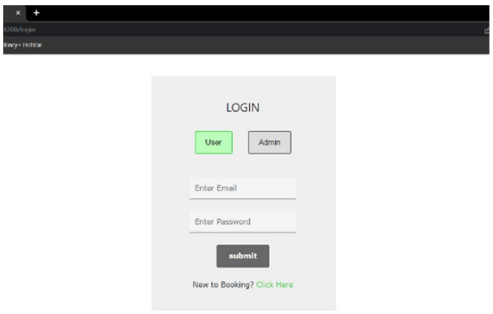

Figure 7. Login Page

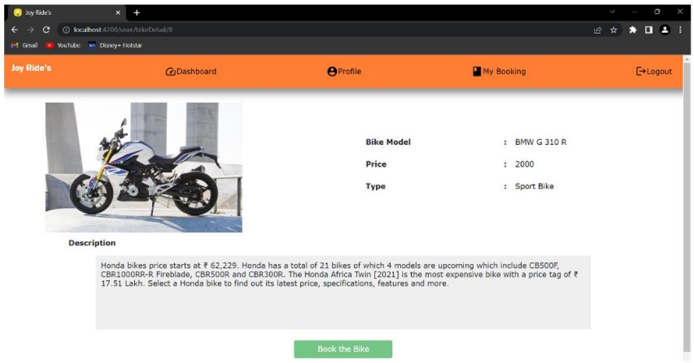

Figure 8: Bike details page

V. CONCLUSION

This project facilitates smoother and faster bike renting services for the customers. This application is built using API which uses very less payload, so it consumes less amount of network, which in turn becomes fast as it needs to transport a small amount of data. This application is built on Single Page Architecture (SPA) which makes sure that the components that are re-used will be rendered only once and used repeatedly. This makes sure that the time to load decreases as well as it uses less CPU than normal.

FUTURE SCOPE

A location feature that allows for bike tracking can be added to this application. This can be used to prevent bike theft, and to do this, we can easily install a GPS sensor on each bike. A rating feature is a plan of adding after every bike is returned to the admin, the user will be given a choice to rate the company and the bike based on his experience and similarly, the admin/ company will be given a choice to rate the customer based on the condition how the customer returns it.

A feature can be added such that before accepting any person as an admin or as a company, he will be verified with the admin's data like his bikes and their authenticity and only then the admin can access the portal. A feature can be added such that image upload can be done directly. To achieve this a base64 format can be used to store the images as a string, or it can be stored as a blob.
When a user clicks the "book the bike" button, a payment gateway must be implemented so that the user is immediately taken to the payment gateway of his choice where he may make the payment to reserve the bike.

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Sentimental Analysis of Online Products using Ratings and Reviews

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***Abstract*—Every second, we can observe a massive surge of data being generated. Data present abundantly needs to be processed to become meaningful information. One way of processing data and knowing the current trend is through product analysis. This concept can be used by organizations to identify their flaws and enhance their productivity. It is often performed on textual data to help businesses monitor brand and product sentiment in customer feedback, and understand customer needs. In this project, we throw light on the aspect that data generated by textual comments along with the rating contribute the efficient classification of data rather than only the rating and obtain various insights as a part of the analysis. In general, when a person wants to buy a product, he checks for the review of the product and then makes a decision whether to buy or not. In more specific terms, the user checks only the rating and makes a decision. We have understood that sometimes rating is misleading the customers and it alone cannot be the sole parameter to take a decision hence we are comparing ratings and comments for better efficiency and authenticity of product reviews.**

***Index Terms*— NLP, SVM, KNN, and Logistic Regression.**

I. INTRODUCTION

Researchers already use social data to analyze the sentiment of users' opinions on a product, event, or setting. Moreover, People utilize online comments to convey their interests or attitude in social networks, thanks to the rapid development of Internet technology. We can utilize these comments to extract vital information, such as consumer sentiment for a particular product. One of the most important research tasks in text mining is sentiment categorization. Researchers are already analyzing the sentiment of consumers' opinions on a product, event, or location using social data. In addition, sentiment analysis is frequently referred to as opinion mining, which is an important NLP task. The direction of the sentiments is determined by this sentiment analysis. In respect to text, as neutral, positive, or negative in addition, text analytics, computational linguistics, and natural language processing (NLP) are all used in sentiment analysis to recognize and understand the text. Organizing the user's points of view. The primary purpose of sentiment analysis is to determine the author's perspective on a similar event or the overall polarity of the material. Views of emotional communication might include a user's judgment or appraisal, emotional state, or deliberative state. It's typically used to identify sentiment information disclosed by people in comments, such as movie reviews. Sentiment analysis, also known as option mining, is the process of extracting a reviewer's attitude from a movie, usually in the form of a sentence or a review. Sentiment analysis

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can be thought of as a binary classification of positive and negative sentiment in its most basic form. We know that sentiment analysis analyses people's sentiments or opinions based on their written texts, and that it's important in data mining and natural language processing.

II. Literature Survey

Kushal Dave et. al. [1] They start by defining the special characteristics of the product review issue and create a technique for automatically differentiating between favorable and unfavorable reviews. For feature extraction and scoring, the classifier uses information retrieval techniques, and depending on the testing scenario, different metrics and heuristics produce different results. Performance is constrained when working with individual sentences gathered from web searches because of noise and ambiguity. However, the results are qualitatively highly valuable when used in conjunction with a comprehensive web-based application and helped by a straightforward mechanism for categorising texts into qualities. The results are qualitatively very helpful in terms of qualities. Finn et. al [2] Separating reviews from other sorts of content is a difficult undertaking. Having trouble categorising a genre or style. It entails determining subjectivity.
XING FANG et. al. [3] with thorough process descriptions, a general procedure for sentiment polarity categorization was suggested. Online product reviews gathered from Amazon.com [4] were the source of the data for this study. Both sentence-level categorization experiments and review-level classification experiments were conducted with encouraging results. Finally, provided a preview of our upcoming sentiment analysis work.
NAJMA SULTANA et. al**.** [5] Sentiment analysis's primary goal is to classify online data by determining its polarity. Although sentiment analysis is a text-based process, it might be difficult to determine a sentence's precise polarity. This asserts that a superior solution must be found in order to outperform any prior method or strategy utilised to determine sentence polarity. Therefore, there was a need for automated data analysis approaches to determine the polarity or emotion of a user or client. In addition to a novel strategy that was proposed in this research, a thorough survey of several sentiment analysis methods was included.
JAYAKUMAR SADASIVAM et. a,l [9] improved the accuracy of the provided reviews, an ensemble technique has been used. SVM and the Ensemble algorithm are merged in this study. They put forth the Ensemble technique, which improves upon the current algorithm's accuracy. The user is advised to buy the specific product once the accuracy calculation is done based on the reviews.
YANG et. al. [11] Analyzed that the opinions of the reviews of customers which are useful for consumers as well as the also the shop owners. They improve the service and consumer satisfaction. Zendesk et. al. [10] also agree upon the same concept that the online shopping is greatly effected with the reviews.

III. Proposed System

In the proposed system, we are comparing the rating and review to give a brief overview. Then the prediction of the user rating from the reviews and comparing these predicted review with the user reviews are performed. The results in the next section speak that if the user review and prediction are the same there will be no conflicts and if not, then the user reviews and predicted review conflicts are also determined. In order to perform all the said tasks the architecture is proposed as below

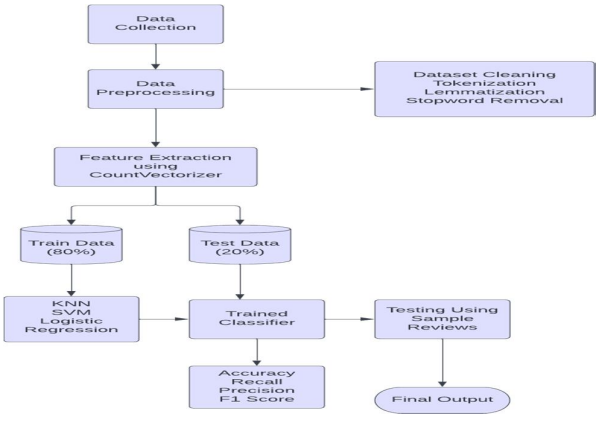

Figure 3.1 Overview of the proposed system architecture

The overall structure is described in the architecture.In the first step obtain the data set. The data set includes several kinds of reviews. The data should go through pre-processing after collection to get rid of unnecessary words, phrases, and symbols. Before performing an analysis, it is crucial to consider the representation and quality of the data. Before spell checking, symbols land Stop Words will be eliminated. A fantastic utility offered by the Python sci-kit-learn module is Count Vectorizer

Usually, training data is larger than testing data. 80% of the data are often used for training and 20% are typically used for testing in machine learning. Here, Logistic Regression, SVM, and KNN classifiers will be applied to collect and analyses training data. Unsupervised and supervised classification are the two main categories in general. Labels will be provided as part of the supervised classification. The unsupervised classification will not be given any set of labels, whereas the training data will consist of a collection of training examples. The usage of supervised classifiers like Logistic Regression, KNN, and SVM is suggested in this work. Finally, by merging all of the proposed techniques, an Ensemble strategy is used. After classification, the group votes for the majority (Accuracy). As illustrated below, the confusion matrix is computed for multiclass classification.

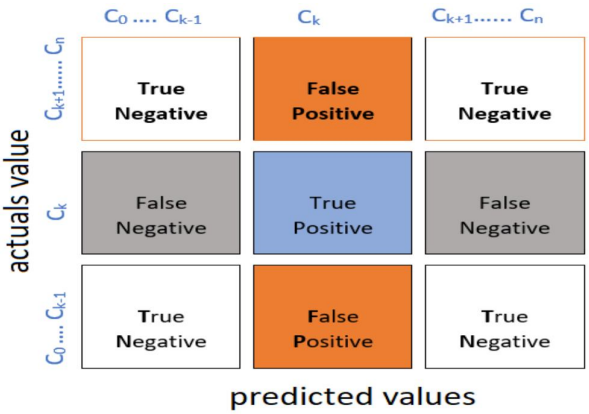

Figure 3.2 : Confusion Matrix for multiclass classification

The performance measure is calculated by precision, recall and F1-Scores. The calculation is described in the equations as follows

$$Precision(Class_i) = \frac{TP_{a_i}}{TP_{a_i} + FP_{a_i}}$$

$$Recall(Class_i) = \frac{TP_{a_i}}{TP_{a_i} + FN_{a_i}}$$

$$F1 - Score(Class_i) = 2 * \frac{Precision(Aspect_i) * Recall(Aspect_i)}{Precision(Aspect_i) + Recall(Aspect_i)}$$

$$Accuracy(Class_i) = \frac{FP_{a_i} + FN_{a_i}}{TP_{a_i} + TN_{a_i} + FP_{a_i} + FN_{a_i}}$$

$$Over\ All\ Accuracy = 1 - \frac{\sum_{i=0}^{a_n} (FP_{a_i} + FN_{a_i})}{\sum_{i=0}^{a_n} (TP_{a_i} + TN_{a_i} + FP_{a_i} + FN_{a_i})}$$

Then providing the sample reviews with rating and checking with the predicted rating. If the sample review and predicted rating doesn't match, we are giving the conflicts otherwise we are providing no conflicts. Lastly, we are testing the algorithms with the X_test reviews and Y_test rating. We are predicting the rating of X_test reviews and comparing it with Y_test rating.

IV. EXPERIMENTATION

The experimental results presented in this section show the performance of the proposed work which involves data preparation, data pre-processing, data labelling, preparation of emoji lexicon, data labelling, feature extraction and classification using machine learning approaches. The experimentation was conducted using a python programming language.

A. Dataset Characteristics

In the case of the suggested technique, the Amazon product reviews dataset is used as the input. And there are approximately 6,000 records in this collection that are freely available online.They have features like Product Name, Brand Name, Price, Ratings, Reviews, and Review Votes in their dataset. The data (i.e., 20%) is used for testing while the remaining data (i.e. 80%) is used for training. Finally, the sentimental analysis based on language includes both ratings and user written evaluations are used. The dataset consists of six columns and 5183 rows. The columns consist of Product Name, Product Brand, Price, Rating, Review, Review Votes.

B. Dataset Cleaning

Data cleansing is performed on data for analysis by Fixing spelling and syntax errors, Standardized records,Fixing errors such as blank fields and identifying duplicate data points.The extraction of reviews and ratings from the dataset is performed. Then the numbers are removed and website URL from the reviews also to look cleaner. The new reviews are stored in a separate column.

C. Tokenization

Tokenization is performed to separate reviews sentenceds, words, letters, or subwords. Text is divided into sentences, called as tokenization of the sentence. Words into word tokenization. After tokenization the words are converted into lower case.

D. Lemmatization

Lemmatization is performed for translating words in the reviews into its basic form. lemmatizinging takes context of reviews into account and transforms a word into a basic meaningful form.

E. Stop words Removal

A stopword is a language word in the review that doesn't make much sense in a sentence. After removing stop words, the result in result in stopWordRemoval column. Then we are adding all words in the stopWordRemoval column into a sentence and storing them in the Final_Review column.

F. Feature Vectorization

Count Vectorizer is a great tool provided by Python's Scikit-learn library. This approach in Machine Learning counts how many times a particular word is found in the reviews. The end result is an encoded in a matrix in which each unique word is represented in a matrix column and each product review in the document represents a row in the matrix.

G. Classification

In the proposed study, the count vectorizer-acquired training data set of product review words is used to train the classifiers. It is used to turn a text into a vector depending on how frequently (count) each word appears across the entire text. A new column named "sentiment" was added once the reviews had been cleaned up. The ratings (1–5) are converted into Positive, Negative, and Neutral to create this column. Negative ratings fall between 1 and 2 stars, neutral ratings fall between 3 and 5, while positive ratings fall between 4 and 5 stars. Review-level classification is the term for this. The training set of classifiers is applied to the test set of data, and the array is measured for the classifiers that consider Logistic Regression and Support Vector Machine. As a result, the methodology combined some machine learning techniques with one feature extraction method.

V. RESULTS

In this study, sentimental analysis was conducted for product reviews that include it’s both ratings and comments. In the end, the machine learning algorithms were used to assess the data. It was observed that there are 5333 non-recurring words in the dataset which are columns. The 5182 text samples in the dataset each represented as rows of the table. Each cell has a number in it that represents the amount of words in that specific

text. Lowercase letters have been used for all words. The words have been sorted in columns using the alphabet. The ratings are given on a scale of 1 to 5. The diagrammatic representation of the dataset is given below

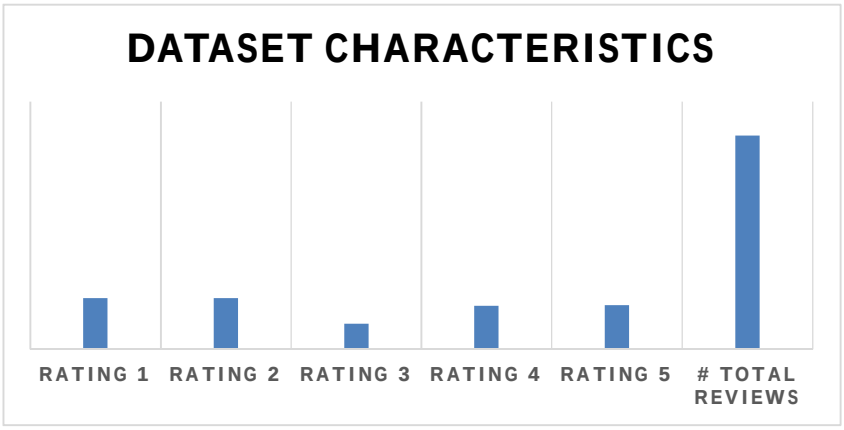

Figure 5.1 Data Set Characteristic

The Data Cleaning, Tokenization and Lemmatization is performed and the output is passed to the machine learning classifiers. Initially, Logistic Regression machine learning algorithm is used for classification. It provides probabilities as it can classify product reviews datasets. After training and testing the dataset with logistic regression algorithm with 80, 20 ratios. The confusion matrix of the proposed modal is as follows

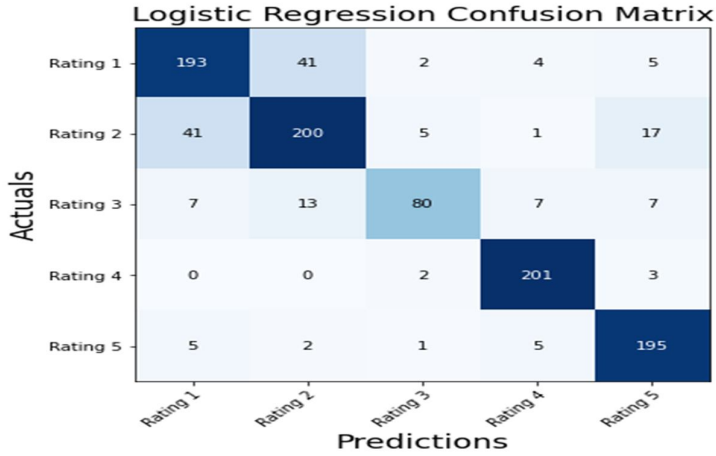

Figure 5.2 : Confusion matrix for Logistic Regression

A abbreviated version of the Logistic Regression model Classification Report achieved during the modelling stage is shown in Table 5.1.

TABLE 5.1 : EVALUATION METRICS FOR LOGISTIC REGRESSION CLASSIFIER

class	TP	FN	FP	TN	Accuracies	Precesion	Recall	F1 score
Rating 1	193	52	53	739	0.79	0.78	0.78	0.79
Rating 2	200	64	56	717	0.77	0.78	0.75	0.77
Rating 3	80	34	10	913	0.88	0.88	0.70	0.78
Rating 4	201	5	17	814	0.95	0.92	0.97	0.95
Rating 5	195	13	32	810	0.90	0.85	0.93	0.87

From the Table 5.1 it is observed that the F1 Score for the rating 4 is high of 95% compared with the others. Next another classification algorithm was used and results are described below

SVM is also a supervised machine learning that is used in classification. The SVM will separate with the boundaries which are linearly seperable. So this expression defines the decision boundaries returned by the

SVM. Despite its simplicity, the closest neighbour has been successful in numerous classifications and regression problems, including handwritten numbers and satellite imagery scenes. As a nonparametric technique, it often succeeds in classification situations where the decision boundaries are very irregular. Confusion matrix follows as

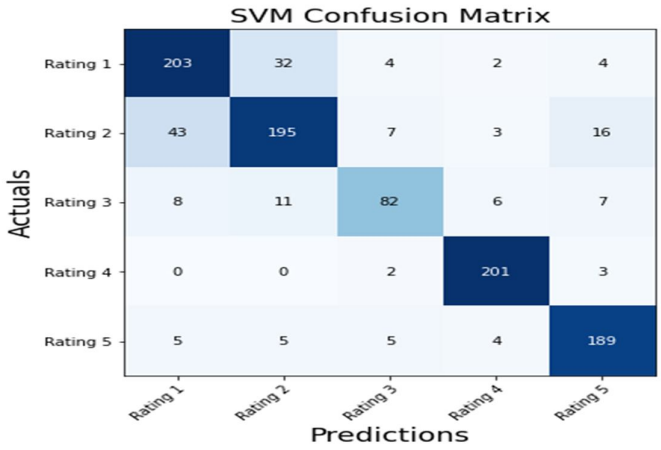

Figure 5.3 : Confusion matrix for SVM

A abbreviated version of the SVM model Classification Report achieved during the modelling stage is shown in Table 5.2.

TABLE 5.2 : EVALUATION METRICS FOR SVM CLASSIFIER

class	TP	FN	FP	TN	Accuracies	Precision	Recall	F1 score
Rating 1	203	42	56	736	0.81	0.78	0.83	0.80
Rating 2	195	69	48	725	0.78	0.80	0.74	0.77
Rating 3	82	32	18	905	0.86	0.82	0.72	0.77
Rating 4	201	5	15	816	0.96	0.93	0.97	0.95
Rating 5	189	19	30	818	0.90	0.86	0.91	0.88

It is observed that the ratings 4 and 5 are having high accuracy above 90% compared with the other ratings. As the accuracies are very similar to each other so the other modalities like Precision, Recall and F1 Score are also analysed for clarity. All the three parameters are high for the rating 4. Then the KNN classification is also performed as explained below

The KNN classifier with the training and testing model is performed. The Confusion Matrix of the KNN model, the predicted sentiments for all 5 labels for ratings 1 to 5.

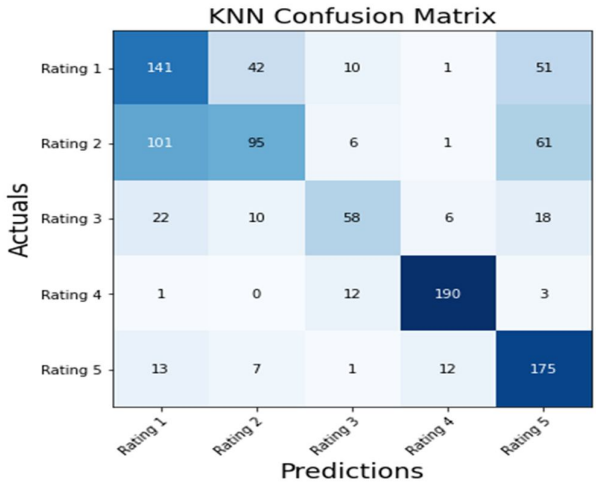

Figure 5.4 : Confusion matrix for KNN

A abbreviated version of the KNN model Classification Report achieved during the modelling stage is shown in Table 5.3.

TABLE 5.3 : EVALUATION METRICS FOR KNN CLASSIFIER

class	TP	FN	FP	TN	Accuracies	precision	Recall	F1 score
Rating 1	141	104	137	655	0.56	0.51	0.58	0.54
Rating 2	95	169	59	714	0.57	0.62	0.36	0.45
Rating 3	58	56	29	894	0.77	0.67	0.51	0.58
Rating 4	190	16	20	811	0.92	0.90	0.92	0.91
Rating 5	175	33	133	729	0.69	0.59	0.84	0.68

It is observed that the ratings 4 are having high accuracy above 90% compared with the other ratings. As the accuracies are very less except Rating 4 so the other modalities like Precision, Recall and F1 Score are also analyzed. The ratings of 4 have all three parameters high. The classification algorithms performance is evaluated for thorough revision.

In this step, we are comparing the accuracy of Logistic Regression,SVM and KNN algorithms using matplotlib. pyplot. The X-axis consists of scores and Y-axis consists of algorithms. The model accuracies of all the classifiers have been calculated. The score ranges from 0.0 to 1.0, this represents the percentage of accuracy of algorithms.

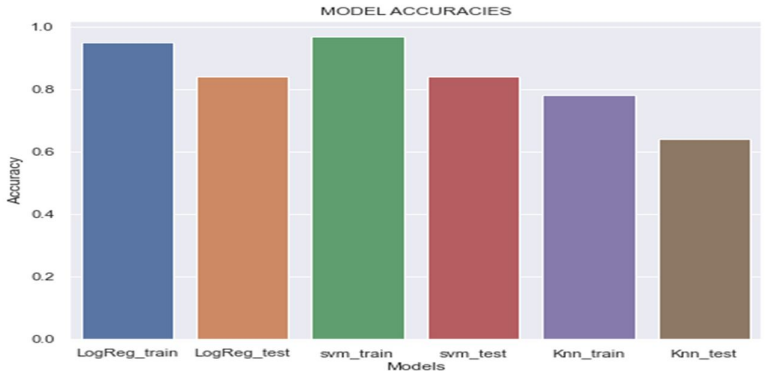

Figure 5.5 : Classification Model Performance accuracies

The accuracy of the SVM classifier is 96.6% accuracy. The Logistic regression is also nearly 95.6%.

In this next step, the checking of the test data with predicted data is performed. Here the storing of the predicted ratings of X_test data in the array predicted_values. The original ratings of the Y_test data are stored in the array original_values. The comparison is performed on the predicted ratings of the X_test data with the original ratings of the Y_test data to check the conflicts. The comparison of predicted ratings of the X_test data with the original ratings of the Y_test data with all three algorithms and counting the non-conflicts and conflicts values. Lastly, we are printing the conflicts and non-conflicts values at the end. As the dataset increase the values of conflicts and non-conflicts will increases. The graph depicting conflicted and non-conflicted reviews is presented below.

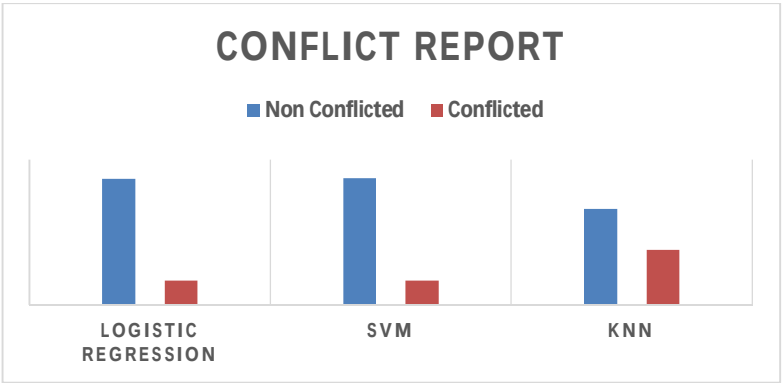

Figure 5.6 : Conflict Report

The number of total reviews on testing SVM data is 1037. In this the Non-Conflicted between rating and review is 870 and Conflicted is 167. In similar manner the other two classifier algorithms are also performed. This study is giving us the inference that the ratings and reviews always need not be on the same lines as either positive, negative or neutral. So, during sentiment analysis the conflicted reviews have to be further analysed for the accurate results.

VI. Future Scope and Conclusion

This is a comparative study uses a combination of reviews and ratings as input and provide the polarity of the data by analyzing and interpreting the data. The system does pre-processing operations like tokenization and removing stop-words from the dataset to extract the important features as a part of feature extraction using vectorization. Each product review and Amazon customer review has been assessed. In this dataset, we used 5182 user reviews. Each product has a distinct rating and review. For measuring the Amazon product review analysis, we developed a system that would compare the user rating with the rating from the trained model and we represent the number of conflicting and non-conflicting reviews from a trained dataset as an efficient measure for the user to take a better decision.TAs far as future scope is concerned, we can upscale the model using Deep Learning Algorithms like LSTM, RNN and also work on data that contains a combination of textual data and emoji data.

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Hrypton: Password Manager App Built using SHA-256 Cryptographic Hash Function

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***Abstract*—Explosive growth in the number of passwords for web-based Applications and encryption keys far surpass the management's allotted number of users for outsourced data storage. the outsourcing of keys (including passwords and data encryption keys) to the professional password managers (honest-but-curious service providers) which attracts the attention of many users. However, current approaches to conventional data outsourcing scenarios cannot meet the security requirements for crucial outsourcing simultaneously. So, the proposed Hrypton is a modified cryptographic hash function that addresses all three goals above. Under the framework, the key owner can perform privacy, and controllable authorization-enforced encryption with minimum information leakage. To implement Hrypton efficiently, a new cryptographic primitive named Searchable Conditional Proxy Re-Encryption (SC-PRE) combines the techniques of Hidden Vector Encryption (HVE) and Proxy Re-Encryption (PRE) seamlessly and proposes a concrete SCPRE scheme based on existing HVE and PRE schemes.**

***Index Terms*— Hash Function, SHA-256, Encryption, Security, Cryptographic.**

I. INTRODUCTION

An individual's passwords for multiple online accounts and security features are stored and managed by a password manager, which is a piece of software. With a master password, password managers offer secure access to all password information and store passwords in an encrypted format password.

If your current passwords are weak, the best password managers will alert you. brittle, frequently used, or have been implicated in a data leak. These tools assist you in maintaining good password hygiene by providing fresh, robust, and outstanding login credentials for each session. We advise configuring your password manager to create passwords of at least 20 characters and a variety of character kinds, including uppercase, lowercase, numbers, and symbols.

Password management tools also provide several other standard features. It's common for them to have password generators that can create strong passwords. Many also can automatically fill out Web forms, such as online job applications, order forms on retail sites, and contest forms. By entering your contact information into the tool, it can then pass your name, address, and other contact information into fields on whatever Web form is loaded in your browser. Then, by pressing a button, you can fill out most or all of a

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state.
When using password management software, there are serious considerations you need to make. If the tool saves passwords on the local computer, then all of these may be lost to you if the computer itself is stolen. As such, many provide the ability to print a list of your passwords, which you can then keep in a safe place. This isn't a concern if it's stored on the cloud unless you've used a weak password to access your other passwords. If you have, someone could enter the easy-to-guess password or easily crack the password to gain access to all of your account credentials.

A. Objective

The project's main objective is to minimise information leaks during the privacy procedure andto minimise information leaks during the privacy procedure and owner-controllable authorization enforcement. The project aims to build an application password program to modify the cryptographic Hash Function SHA-256.

II. Literature Survey

Numerous academics imprinted the Searchable Conditional Proxy Re-Encryption (SC-PRE). The investigation by Fagan et al. shows that while users of password managers noted their usefulness and convenience, others cited security issues as the main factor for not using password managers.
Furthermore, the Users using password managers are more likely to report feeling comfortable, admiring, and energised, and less likely to think suspicious while using their password manager to access a website, according to the examination of emotional differences between "users" and "non-users

III. System Study

The information system and the user are connected through the input design. It includes creating specifications and practises for data preparation, as well as those steps are By looking at the computer to read data from a written or printed document or by having users essential the data directly into the system, it is possible to put transaction data into a useful form for processing. The input process is designed with an eye toward minimizing the quantity of input needed, minimizing errors, preventing delays, eliminating superfluous processes, and maintaining a straightforward workflow. The input is made in such a way that it offers security, usability, and privacy preservation.
A quality output is one that shows the information clearly and complies with the end user's needs. Any system's outputs are how processing results are transmitted to users and other systems. It is decided during output design how information will be displaced for immediate demand as well as the hard copy output. It is the user's most crucial and direct source of information. The interaction between the system and aiding user decision-making is improved by efficient and intelligent output design. The process of creating computer output should be planned and well-thought out; the proper output must be created while ensuring that each output component is constructed in a way that will make the system usable by people quickly and efficiently. When analyzing design output from a computer.

IV. Screen Shots

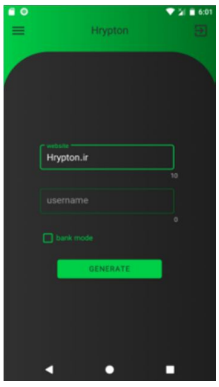

Figure 1: Home Screen

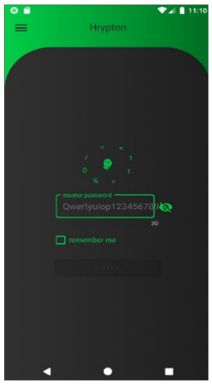

Figure 2: Master Password

Figure 3: Password Generation

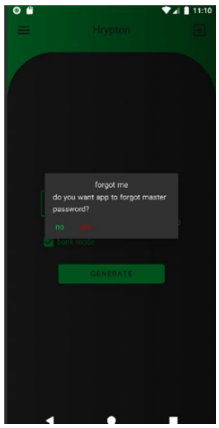

Figure 4: Forgot password Section

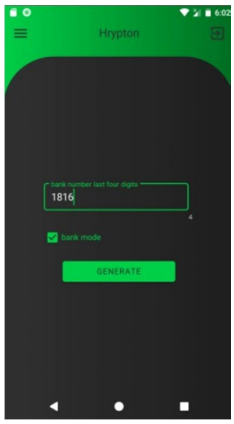

Figure 5: Bank Mode

V. Conclusion

We have developed a password manager application project with success .We have achieved the minimum information leakage in the process of privacy and owner controllable authorization enforcement, with dual authorization. It efficiently solves the challenge of performing a key tuple encryption so that the different privacy requirements of attributes are achieved in one encryption scheme.

Future Scope

This model has a scope of improving its areas such as where we will introduce searchable symmetric encryption.

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A Deep Exposition of Data Science: Related Issues and its Applications

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***Abstract*—Data science is the study of extracting, collecting, gathering, representing, and safeguarding data for use in technical problems or for business goals. Although the term "Data Science" may seem to refer to databases and software engineering, numerous other quantitative and qualitative skills, including non-mathematical skills, are also necessary. Information dissection is the main goal of data science. This essay provides an explanation of what data science is, how it works, and some possible applications. This essay's second section contains several reviews of data science. The full data science method is illustrated in Section III of this essay. The data science-related research topics are all described in Section IV. The report concludes with several recommendations for data science-related future research. The writers of the current study will make an effort to look at the various problems, execution, and challenges in the field of data science.**

***Index Terms*— Information, Data Science, investigation, management, cloud computing.**

I. INTRODUCTION

Data science is the aggregation from a sizable amount of data that is combined or free, or, to put it another way, it is the field of data mining and data disclosure, which are generally terms for data scooping and perception research. The statement made by John Tukey on this subject and his conclusion are as follows: "The combination of a few data and a desperate need for an answer does not ensure that a sane answer can be derived from a given set of data".

According to Hal Varian, Google's economist, "the ability to absorb information—to have the capacity to interpret it, to analyze it, to remove an incentive from it, to visualize it, to present it—that will be an enormously vital competence in the next decades. Since information is essentially free and readily available right now. The ability to interpret that knowledge and draw a benefit from it is therefore a complementary rare factor. This science's field covers data sequencing, collection, and presentation, bits of information, and machines that make assumptions about how to handle various problems in various fields.

II. LITERARY REVIEW

According to Dr. S. Justus (2013), the entrance layers, processes, and capacity frameworks for big data are all improving gradually. In this significant circumstance, test architects and testing groups are not prohibited. They focus on some of the problems that test groups would shortly look into. For adaptive performance benchmarking and quality affirmation in the current machine-learning and examination outstanding tasks at hand, J. Nowling

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(2014) outlined the importance of producing a large amount of semantically-rich data for testing big data processes. According to Volker Markl Brucke (2013), the academic community and business are now researching and developing cutting-edge data administration frameworks. These frameworks are designed to analyze large data sets with fast data input rates. According to C. L. Philip Chen (2014), another cohesive viewpoint is known as data serious intelligent revelation (DISD), or big data concerns. Big Data concerns are present throughout a wide range of industries and sectors, including national security, open association, financial and business activities, and regular research in numerous subjects.

III. Data Science Process

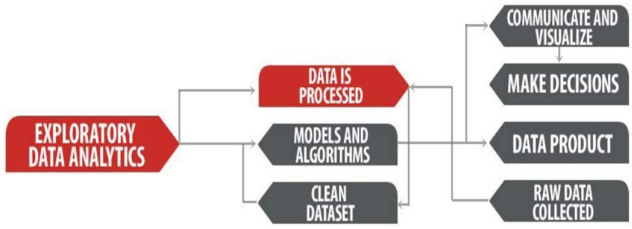

Fig. 1. A Data Science Process Stages or Steps

The three components of data science are data organization, data assembly, and data dissemination (the ABC of data). At any rate, data wrangling, which combines data assembling and orchestrating, includes assembling as a crucial component. In other words, knowledge of the what, why, and how is what distinguishes data science from other disciplines. A data expert must fundamentally acknowledge the identity of the overall populace involved in the profit-making venture. The channels connected to a data science process are listed below.

A. Data wrangling and transforming

Data wrangling is the process of transforming data into a different format. Data wrangling, also known as data transformation, is the process of physically converting data from one "rough" shape into another association that takes into account more advantageous use. The essence of change is imposing boundaries and advances. The stage that comes after orchestrating data is called "shoving data." Data is merged into another portrayal and bundle by reliably managing and merging the necessary disagreeable data. Data shoving is particularly counterproductive to managing data and fuses moving together.

B. Data Investigation

An approach to evaluating, manipulating, and presenting data with the aim of examining pleasing data and accompanying fundamental authority is called data examination. The data is prepared using a variety of counts of knowledge-based information and a machine learning algorithm that understands how to extract significant and profitable outcomes from the large amounts of data.

C. Transfer Data

Data transfer systems combine the numerical or measurable results extracted from the facts into an edge that can be properly understood and decoded by the analyst needing it. Data exchange enables change, first from one perspective and then from the opposite.

IV. Open Research Issues for Data Science

Data science is evolving into an inspection tool for use in endeavors and the perceptive world. Data science involves analyzing vast amounts of data and includes data extraction. The internet of things (IoT), cloud computing, and quantum computing are three broad categories into which the research difficulties pertaining to enormous data examination are grouped. In any event, it isn't required to deal with these issues.

A. IoT for Data Science

Machines are eventually joining the show to operate countless autonomous devices using web-based techniques and create the Internet of Things (IoT). In this way, mechanical assemblies are evolving into online users, much like how people interact with web applications. Researchers are considering the Internet of Things for its most exciting opportunities and challenges.

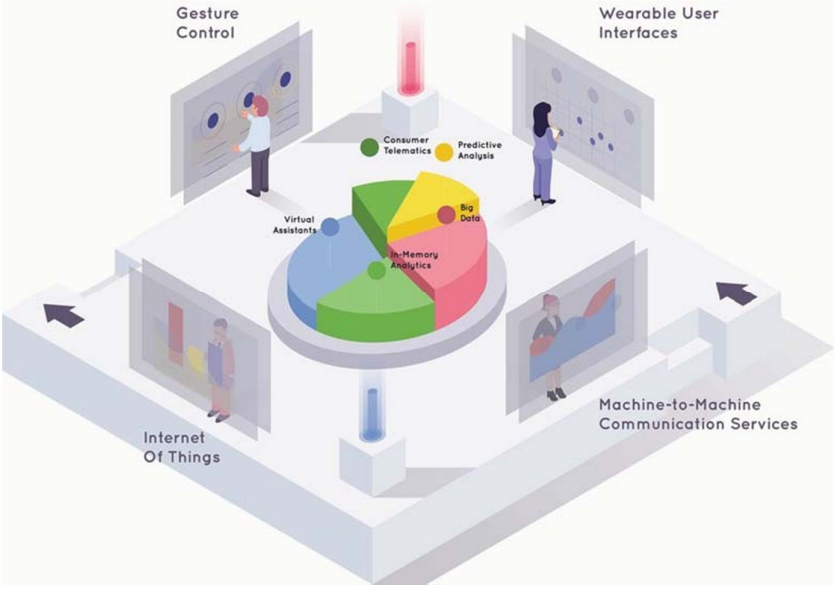

Fig. 2. Pie Chart of Emerging Technologies in Data Science

For the creation of data, frameworks, and correspondence in the future, it has a critical financial and societal influence. Long-term, everything will be connected and carefully managed under the new future outlook. Due to the advancement of smartphones, anchored and comprehensive communication developments, delivered figuring, and data analysis, the possibilities of IoT is becoming more significant to the practical world. IoT is currently a hot topic for research among analysts.

B. Cloud Computing for Data Science

Computing platforms wrapped in virtualization software enable platforms to behave like a real PC while having the adaptability of specific features like processors, plate space, memory, and working framework. Massive Data and cloud computing improvements are made with the goal of establishing flexible and on-demand access to resources and information. Cloud computing organizes massive amounts of data by allowing on-demand access to manageable intellectual resources via computerized processes. Utilizing the cloud has many benefits, including the ability to recommend assets when there is interest and only pay for the assets needed to develop an item.

C. Quantum Computing for Data Science

A genuine quantum computer would have been able to tackle the current enormous data problems, which are especially difficult for conventional computers, if one existed today. It may soon be able to develop quantum computers without the usual specialized difficulties. A method for dealing with the quantum mechanics to process the data is provided by quantum figuring. Additionally, it frequently gets caught up and captured by the wonders of other areas. It is because qubits behave in a quantum manner.

V. Applications of Data Science

Data science is a field that primarily developed out of necessity, as opposed to being an area that was being explored. It has evolved over time from being used in the relatively narrow realm of measurements and research to being a ubiquitous presence in every sphere of science and business. In this section, we examine some of the key research and application areas where data science is now in use and on the cutting edge of development.

Business analytics - Gathering data on how a business has operated at different points in time can assist explain how it functions, drive fundamental leadership practices, and create predictive models to predict how it will operate in the future. Some researchers have argued that information science is simply another name for business analytics, a profession that was briefly on the rise a few years ago before being replaced by the new, hip phrase information science. Whether or not the two domains may be considered to be equally free, information science is probably certainly used extensively in the subject of business analysis.

1. Expectation – Significant amounts of collected and separated data can be utilized to spot patterns in the data, which can then be used to compile perceptual models. This is the premise of the field of machine learning, which is based on numerous estimations that are claimed to "learn" and data acknowledgment figuring. All things considered, machine learning techniques are employed to create perceptual models across several disciplines.
2. Security – Information science is used to identify fraud using data gathered from analyst logs. Examples from client actions can be used to cut off cases of extortion and malicious insiders. Information mining and machine learning algorithms are heavily used by banks and other financial institutions to detect fraud.
3. Computer Vision – Information from image and video analysis is used to carry out PC vision, which is the study of making PCs "see," using image data and learning algorithms to acquire and deconstruct images and make decisions in a similar way. Applications for autonomous driving, self-sufficient transportation, and human-PC collaboration use this.
4. Natural Language Processing – Modern NLP techniques make extensive use of literary data from record corpora to factually demonstrate etymological knowledge. They then apply these models to tasks like machine translation, parsing, features dialect age, and notion analysis.

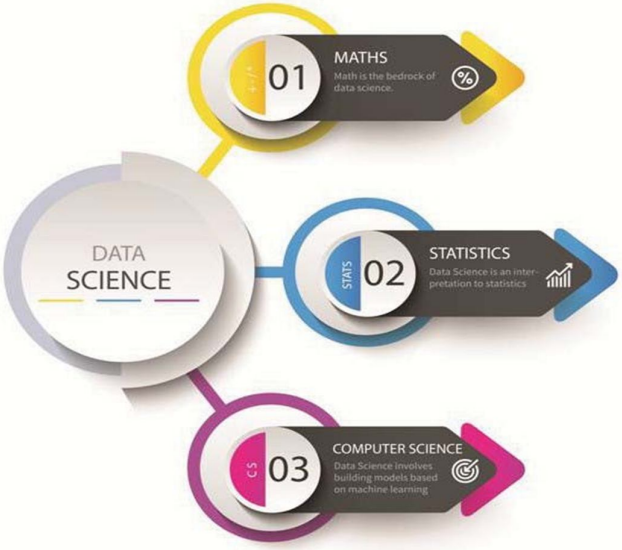

Fig 3: Data Science Model

VI. Suggestions for Future Work

It is expected that the amount of data collected from various applications across the globe in a wide range of disciplines will double on a regular basis. It is useless unless these are looked into to gather useful information. This necessitates the development of techniques that can be applied to support big data analysis. The development of powerful PCs makes it easier to carry out these procedures in response to mechanical systems. For elite extensive size information handling, including the misuse of parallelism of current and future PC models for data mining, turning information into learning is in no way, shape, or form an easy task.
The information gathered frequently lacks important details. More importantly, these new challenges may affect, occasionally even degrade, how well the frameworks for information-concentrated processing are executed, effective, and adaptable. Another difficulty is how to prepare food quickly while yet achieving outstanding throughput and storing it in an effective manner for later. The efficient tools that are being developed must be equipped to handle information that is raucous and uneven, vulnerable and irregular, and lacking in certain traits.

VII. Conclusion

Late in the year, data are generated incredibly quickly. In order to do this, we review the various research problems, difficulties, and data science applications in this study. This analysis makes it clear that each massive

informational stage has a unique main interest. Some of them are made for group preparation, while others excel at ongoing research. Every large information stage also has a certain utility. Factual analysis, machine learning, information mining, perceptive analysis, distributed computing, quantum registering, and information stream handling are some of the distinctive techniques used for the research. We believe that in the future, analysts will carefully explore these approaches in order to properly and effectively handle difficulties involving vast amounts of information.

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Short Term Memory Recurrent Neural Network-based Machine Learning Model for Predicting Bit-coin Market Prices

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***Abstract*—Machine learning based on Deep neural Network have integrated usages in a variety of domains such as translation, finance, distribution, and medical world as well as cognition. This study illustrates Recurrent Neural Network Learning Model on the basis of LSTM, which analyses the previous values of a crypto currency, Bit coin and predicts the future one. This application estimates the actual and anticipated price of Bit coin, starting with 30 days of the previous price and then extrapolating to forecast the next day's price. At a ratio of 1:9, a regularized data set for modeling is separated into test data and training data. The previous set is divided again, this time between training and validation data. The machine learning from this research should use the usage of the Neural Network library and the Keras framework. You optimize the process by searching for the model's weight using the training data while trying to fit the model. In this article, the batch size and epochs for the fit function are 11 and 30, respectively. The loss is reduced more slowly, then levels off to a more steady amount as learning is processed repeatedly. In other words, over fitting is impossible. As the outcome of the experiment, the machine learning states that the neural network becomes better at processing after studying the graphs of error rates and weight change rates.**

***Index Terms*— Bitcoin, Block Chain, price, LSTM, Recurrent Neural Network, prediction.**

I. INTRODUCTION

Artificial intelligence is described as a program that simulates human thought processes and behavior, including natural language processing, automatic inference, computer vision, voice recognition, and knowledge representation. The two categories of learning in Artificial Intelligence are supervised and unsupervised learning, depending on whether a label is in the learning data. To solve an issue, the brain uses strategies including grouping, categorization, and forecasting. A learning model should be established in advance, according to research from [1,2]. Machine learning, with its predictive analysis, provides knowledge and advice suited to the task at hand, calculating patterns and possible outcomes before projecting the most likely results. RNN, when applied to estimation problems dealing with time series data like monthly sales, price index, unemployment rate, exchange rate, and stock price, generates the following data prediction via learning context -> RNN, when

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applied to estimation problems dealing with time series data like monthly sales, price index, unemployment rate, exchange rate, and stock price, generates the following data prediction via learning context The time series data has a succession of observed values. You may do a number of analyses on time series data, such as currency and stock prices, using various methods, including moving averages, ARIMA, regression analysis, and more. Along with AI, cryptocurrencies have been a focus of IT convergence, with both large-scale technology and public interest devoting growing attention to the topic. Busan was established as a Blockchain free zone by the government of Korea to encourage the development of the Blockchain and make the local economy more robust. Blockchain District, a new model in the field of financial services, leads the way in both new technology and industry dominance, with permission-free freedom from laws and an advantageous demonstration to application industries.

Cryptocurrency is traded via the internet, and is transacted without the need of commodity money, since it uses encryption technology. The information may be safely stored on a computer with no worries about theft or loss, and it doesn't cost anything to create or store. It is not simply a means of payment and a kind of currency; it is of the same worth as real estate or a stock. However, they may be used for tax evasion or drug trafficking because of the secrecy of transactions. Cryptocurrency is developed to let people to conduct financial transactions privately through P2P(peer-to-peer) systems. The block is the storage device for online transactional information in a blockchain, and it can only be linked to a chain that has already established. It refers to the exchange of value between the parties to a transaction. Bitcoin, which is built on the Blockchain skill developed by Nakamoto Satoshi in 2009, has increased in value by tenfold in the last 12 months. It recognized the concept of Bit Gold and B-money and rectified their flaws, such as the potential for duplicate spending. Transactions in Bitcoin are conducted using the address of a kind of wallet file, which is known as Bitcoin. The block is a collection of every 10-minute Bitcoin transaction information. That is, Blockchain is a kind of trading book which covers trading record. Figure 1, the graph shows market price of Bitcoin from 2009 to 2019[4].

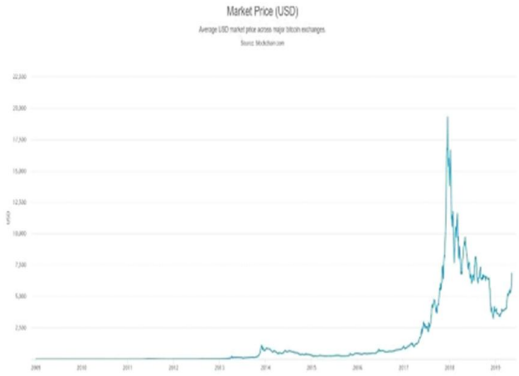

Figure 1: Cryptocurrency (Bitcoin) Market Price

The following chapters are included in this paper: Chapter 2 discusses research on cryptocurrency, blockchain, recurrent neural networks, and long short-term memory (Long Short Term Memory). Machine learning is modeled in Chapter 3 by examining bitcoin prices and commercial agreements gained between January 2017 and April 2019. Its model is also analyzed, and tests are performed. This chapter lays out the roadmap required to enhance the efficiency of bitcoin prediction algorithms.

II. Related Work

A. Blockchain and Cryptocurrency

Cryptography innovator David Chaum introduced Blind Signature technology, which allows for telecommunication of encrypted messages that are signed with digital signatures, and invented Ecash in the process. That is the leading cryptocurrency for business applications. Bitcoin was the first new cryptocurrency that uses Block Chain technology to be introduced in 2009. Most digital currencies have been enhanced with the use of blockchain technology. The advanced cryptocurrency Ethereum made its debut in 2015, offering more than just a Block Chain. World Economic Forum's Global Risks Report concluded that blockchain will be ranked fourth among the twelve top technologies to watch in the future. In addition, ten years from now, Blockchain technology is projected to account for 10 percent of the global GDP[6]. Some 40 of the world's

biggest banks stated in April 2019 that they will experiment with CBDCs, or central bank digital currencies, using Blockchain technology[7]. A blockchain is a distributed ledger that shares data with network members via an encrypted private or public network. Traditional ledger systems keep data on a single node. The diversified ledger's data is held on many nodes. All nodes in the network synchronize the same ledger when trade information is entered on a ledger. The block is made up of the header and body (Transactions). There are six distinct pieces of information included in the header: version, former block header hash, Merkel root hash, time, nBits, and nonce. As shown in Figure 2, Block Chain is a linked list of blocks that is connected to each block's header using an inclusion technique.

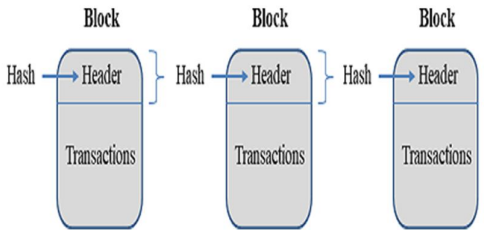

Figure 2: Blockchain Architcture

Since altering any one data entry will result in an alteration of the whole Blockchain's hash value, the idea of constructing a specific node is invalid. Besides, peer-to-peer network has the advantage of being able to share everything, preventing a stranger from gaining access to a single node. There are many versions of the Blockchain, including a public one that everyone can use, a private one that's exclusive to certain nodes, and a consortium one made up of a limited number of organizations who were given special access in advance. It is Bitcoin, the most famous of all cryptocurrencies, which is the focus of this paper's analysis. Bitcoin's worth of well over $6,000 per on May 9, 2019, has brought back its exhaust market price[9]. In December 2017, Bitcoin reached its greatest value ever of $19,000, following which it fell to $3,237 in December 2018.

CCN.com says Bitcoin prices are expected to increase for the following three reasons: Bull Parabola Meets Golden Cross2) Cross in Sepia -> Cross in Sepia3) Dirty Donkey -> Dirty Donkey4) Mrs. B -> Mrs. B5) Portly -> portly6) Closing -> Closing7) Top -> Top8) Sticky -> Sticky9) Tussle -> Tussle10) Cruise -> Cruise11) Perspiration -> Perspiration12) Bovine -> Bovine13) Wrest -> Wrest14) Dip -> Dip15) Bull -> Bull16) Dander -> Dander17) Procrastinate -> Procrastinate18) Vertical -> Vertical19 -> Spilt -> Split20) Relinquish -> Relinquish21) Despair -> Despair22) Sissy -> Sissy23) Concentrate -> Concentrate24) Reap -> Reap25) Judo -> Judo26) Overwhelm -> Overwhelm27) Pilfer -> Pilfer28) Eyeball -> Eyeball29) Father -> Father30) Tumor -> Tumor31) Shrink -> Shrink32) Bring -> Bring33) Stray -> Stray34) Fat -> Fat35) Pop -> Pop36) Insult -> Insult37) Heavy -> Heavy38) Locate -> Locate39) Break -> Break40) Emission -> Emission41 -> Grope -> Grope42) Saucy -> Saucy43) Sympathy -> Sympathy44) Pro Our next stop is the hot, Bitcoin bar. The High Fidelity Factor[9] -> the last component of Phelan's component system -> ABFE EAIOEE EIMAJEE -> The last component of Phelan's component system Despite this, there is little doubt that a contentious debate over whether Bitcoin has value or not has begun since it is impossible to know the future exactly. China may restrict bitcoin mining, its major cryptocurrency trading market could go bankrupt, and so on. Fidelity Investments, a property management firm in the United States, will likely create its own Bitcoin trading service, or Facebook will build a bitcoin payment network. AI technology may transcend the limits of blockchain with its technological capabilities, such as helping to improve the speed of block creation, tailoring the adoption of blockchain to meet the needs of certain sectors, and increasing the security of blockchain. Cryptocurrency platform and investors attempt to maximize their interests and to make sound decisions by using a range of AI technologies[13].

B. Recurrent Neural Network and LSTM

Artificial Neural Networks were used to process the high information level and thus started in the 1980s. While the training was successful at the single layer network, the deep network had no further benefit. Geoffrey Hinton proposed the pre-training method in 2006[15], as a model that has a multi-layer structure. In order to obtain a strong starting point, pre-training teaches you each layer unit before you start studying the Neural Network. Machine learning benchmarking may be used to verify its effectiveness in recognizing vocalizations or images, and then triggering deep learning. Furthermore, to identify pictures, the Convolutional Neural Network (CCN) is often used, while the Recurrent Neural Network (RNN) is necessary to process spoken languages or to

differentiate voices. Processing time series data, such as price indices, stock indices, or the market value of cryptocurrencies, may be done by using RNN. RNNs utilize input information as well as their node's status data to calculate their output, as shown in Figure 3[16].

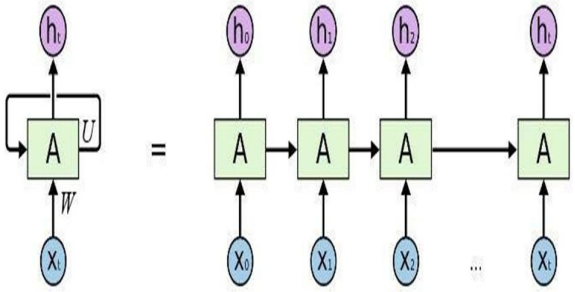

Figure 3: Structure and Operation of RNN

$h_t = \varnothing(W\vec{x}_t + Uh_{t-1})$ weight matrix *W*, hidden state to hidden state matrix *U*[17].

RNN must take into account the extent to which background information is removed from the current input when it predicts future pricing. RNN outputs, although theoretically reflecting the input history, are difficult to quantify in practice. RNN training often uses stochastic gradient descent. With multi-layer neural networks, the grade value may either be the maximum or disappear to zero when the gradient is computed with back propagation, as checking the layer after the calculation is done. LSTM (Long Short Term Memory) is a particular recurrent neural network that is able to handle the gradient vanishing issue.

In addition to the LSTM's memory cell and its input, output, and forget gates, the unit also includes separate cell and input-output gates. A memory cell sits in the heart of the system, and it is surrounded by three units that determine the input, output, and forget gate costs. Additionally, two other units are configured to accept external inputs. Memories are recalled by re-entering their past condition, which happens after a certain amount of time from the present. Gateg receives input from the outside world and outputs it to the memory cell. the gateh output of memory heads out of the external world. RNN memory and processing limitations may be addressed by this structure, allowing for more accurate predictions when opening and shutting the gates can be managed effectively, and allowing for the extraction of information from lengthier contexts. Many recent research assert that RNNs have good predictive capabilities when it comes to time series financial data. They forecast stock markets by integrating RNN with a dynamic system application, which utilizes embedded memory[19,20]. Therefore, visibility is increasing on the predictions for Bitcoin prices.

III. Implementation Methodology

Step 1: In the study presented here, models are built by first normalising learning data, then isolating it from the verification data, and then generating an RNN model before it is tested, learned from, and forecasted.

Step 2: Figure 4 displays the data from https://coinmarketcap.com[22] for Bit Coin prices for the 838 days between January 1st, 2017, and April 30th, 2019. Bitcoin has a high value of $19,531.55 and a low value of $791 as of December 17, 2017. (Jan. 12, 2017). The average of the day's lowest and maximum prices is used to determine the duration of the Window and to learn how to estimate the next day's price after verifying the previous 30 days' prices.

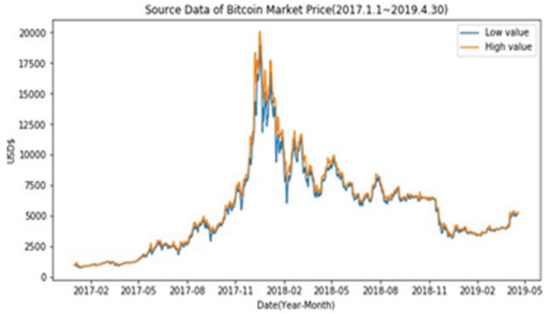

Figure 4: The Distribution Map of Data (Bitcoin Price)

Step 3: The activation function in neural networks is used to print the nods of hidden layers and output layers, but not those of input layers. Time series data, such as stock prices and bitcoin prices, must be normalised into a range in order to improve forecast accuracy (0, 1). This study takes the initial value of the window and divides it by that number, then subtracts one from the result. After normalisation, 807 of the 838 data points are usable.
Step 4: Eight hundred and seventy-seven normalised data sets for modelling are randomly split into training and testing data sets in a 9:1 ratio. Again, there are 726 training data sets that are partitioned into the training and validation data. Learning should not be based on test data sets. Because of this, x training set is located at (726, 30, 1), whereas x test set may be found at (81, 30, 1). It indicates that 726 days of data are used to anticipate the price of 81 days.
Step 5: It is important to build and train an LSTM learning model with better Back-Proposal Through Time(BPTT) in order to predict the value of Bitcoin over time. Keras, a neural network library, may be used to provide learning. LSTM layers with 50 units are piled on top of each other and the input layer is tightly linked to a neuron.
The LSTM parameter adds a model-like layer to the system by learning everything that has been done in the last 30 days.
Add (LSTM(30, return sequences=True, input shape =(30, 1))) to the list of options. Model-like models are used to predict what would happen the following day by adding a specified neuron to each layer. Incorporate (Dense(1, activation='linear'), mse(mean squared error) is used as the loss function and rmsprop, which produced the best results in the optimization experiment, is utilised as the optimizer instead of tanh as the activation function. Additionally, Keras offers a number of optimizers apart than rmsprop (Adadelta optimizer, Adagrad optimizer, Adamax optimizer, Adam optimizer, Nesterov Adam optimizer, Stochastic gradient descent).
Step 6: Neural network models may be learned using the Fit function on Kerasis. In order to fit the model, it is necessary to seek for the model's weight while optimising the process using the training data set. A single epoch is intended to accomplish a comprehensive analysis of all data. If the epoch is set to 30, for instance, this implies that the complete dataset has been utilised and learnt 30 times. Underfitting occurs when the epoch is too short. Overfitting, on the other hand, occurs when the epoch is too big.
As one epoch cannot hold all of the data, there must be many epochs and a large enough batch size for each epoch in order to undertake iteration. In this investigation, the model learnt 1,980 times: if the data 726 were split into 11 arrangement sizes, 66 iterations would occur. A total of 1980 times may be learned if 66 iterations are performed 30 times. A history object may be obtained from the Fit function's return value, which contains the following data:
|| Training Loss Value(loss), || Training Accuracy(acc), || Validation Loss Value(val_loss), || Validation Accuracy(val_acc). A summary of the neural network model of the study is shown in Table 1.

TABLE I: SUMMARY OF LSTM MODEL

Layer(type)	Output Shape	Param #
lstm_1(LSTM)	(None, 30, 30)	3840
lstm_2(LSTM)	(None, 50)	16200
dense_1(Dense)	(None, 1)	51

IV. PERFORMANCE ANALYSIS ON

This study, using batch sizes of 11 and epochs of 30, models like the batch and epoch values. (train x, train y, test x, test y) = (batch size=11, epochs=30) fit(x train, y train, validation data=(x test, y test), batch size=11, epochs=30). The val-loss in the output is extremely low, which implies that the machine will learn better as the val-loss decreases. Figure 5 shows that the learning loss value drops more steadily when learning is processed more often, and it approaches a more consistent value. No overfitting occurred.
The graph in Figure 6 displays the Bitcoin price weight (as a percentage of the total price) against the actual and predicted price for 81 days. For better results, the starting weight value should be randomly initialized rather than setting it to a fixed number. The model is set to a random weight initialization with a standard deviation of 0.01. The weight first starts at zero and then alternates between high and low values. It ultimately settles at a specific point. It seems intuitive that, as the model learns more, it would get more efficient.

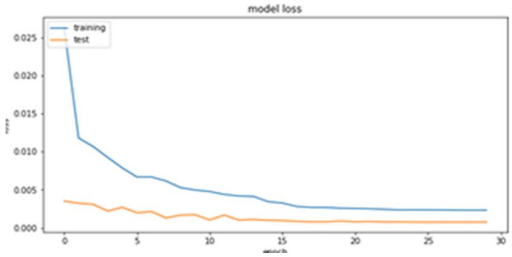

Figure 5: Change Rate of loss According to Epochs

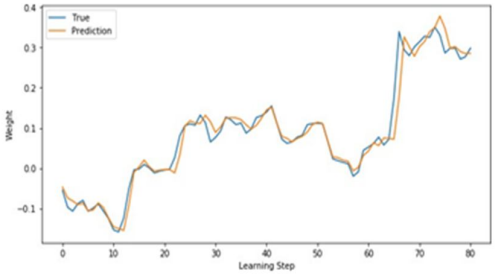

Figure 6: The True & Prediction Graph of 81 Days

V. Conclusion

Artificial intelligence (AI) has become a common part of modern life, being utilized in many practical areas and progressing to become more sophisticated. Google's AlphaGo (now known as Alpha Zero) increased the world's interest in artificial intelligence when it was developed in 2016. Three years after that (in 2019), Alpha Zero, an AI system known for its skills in the game of Go, has developed into a general-purpose learning system, increasing its winning rate without having to go through further training.

This study suggests that Artificial Neural Networks be used to predict the price of Bitcoin, which is now valued at around $20,000 per piece, and it's believed that it will be about $25,000 in December 2017. The error rate and price volatility are examined by showing real and predicted Bitcoin prices for 81 days using the prior 30-day values and forecasting the following day's price. Experiment findings demonstrate that an initial weight of zero causes the value to converge to a certain number after varying up and down repeatedly, and that its performance improves as the training process continues. Our project seeks to create the best cryptocurrency trading software by doing different experiments using Artificial Neural Network learning models, combining the results with new and more comprehensive data from a variety of cryptocurrency exchanges.

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A Cyber Physical System Enabled Intelligent Farming System with Artificial Intelligence, Machine Learning and Cloud Computing

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***Abstract*—In this proposal, we study the advances of major core technologies and their applicability in creating an Intelligent farming System (IFS). As the world is trending into new technologies and implementations it is a necessary goal to trend up with agriculture also. Cyber Physical System (CPS) plays a very important role in Smart Farming. IOT sensors are capable of providing information about agriculture or Farming fields.**
We have proposed a Cyber Physical System (CPS) enabled smart agriculture system using different technologies like AI&ML, Data Science and Cloud Computing. This CPS based Intelligent Farming system makes use of sensor networks that collects data from different sensors which as a result develop an Intelligent Village Farming. Several Utilities such as Pest management, Crop Stress management, Nutrient management, Water management and Deep Analysis can be done to suggest the farmer regarding the crop and climatic conditions. This smart agriculture or Smart Farming using Cyber Physical System (CPS) is powered by advances in sensor technology, wireless communication technologies and their applicability to farming Chatbot, Computer vision, technology enabling farming, it consists of sensor followed by technological techniques.

***Index Terms*— Intelligent Farming System, Crop disease detection, Automated irrigation, Yield prediction, Soil nutrition management.**

I. INTRODUCTION

Irrigation was defined as “the application of water supplementary to that supplied directly by precipitation for the production of crops”. Although clearly defined, irrigation has not been clearly identified and separated from the wide-ranging area of water development activities, such as major and minor constructions for water harvesting, storing, conveyance and allocation; the drilling of tube-wells; and pumping. Most of the efforts and investments made in many countries for irrigation development result in water resources development and very few in on-farm water use improvement. The application of improved irrigation methods and techniques on small to large farms is expanding rapidly as a result of the increasing demand for higher irrigation efficiency, improved utilization of water and intensification, diversification & optimization. An irrigation system consists of canals and structures to convey regulate and deliver the water to the farmers. Two basic types of irrigation systems exist: open canal systems and pressurized piped systems.

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Cyber Physical System plays a very important role in Intelligent Farming. The cyber physical system is built using various sensors and actuators that are capable of providing real-time physical parameter measures about soil, atmosphere and climatic conditions. Here, a CPS based intelligent agriculture system equipped with AI&ML are proposed which use different technologies to monitor, mitigate pest, weed, diagnose diseases and suggest medication.

The green house technology in the forefront of farm modernization conventionally, crops are cultivated in open fields where the sudden and drastic changes in climatic conditions like temperature, humidity and light intensity adversely impact the crops.

The first phase of the work involves a novel framework for IoT enabled cyber physical system and monitoring of different agricultural lands in various regions of north India and collection of this data on the cloud. The second phase involves cross database evaluation and analysis using machine learning and artificial intelligence algorithms to control the cyber physical system and to draw inferences requirements, usage of seeds, fertilizers, pesticide and the yield of the crop thus produced. Section 2 presents an exhaustive survey of methods currently available; Section 3 elaborates the proposed framework and the methods proposed for data collection, system management and prescriptive data analysis methods. Section 4 presents the inferences out of the literature survey and lists the challenges in the realization of these systems, Section 5 discusses the directions for future work in this domain.

II. LITERATURE SURVEY

Irrigation was defined as “the application of water supplementary to that supplied directly by precipitation for the production of crops”. Although clearly defined, irrigation has not been clearly identified and separated from the wide-ranging area of water development activities, such as major and minor constructions for water harvesting, storing, conveyance and allocation; the drilling of tube-wells; and pumping. Most of the efforts and investments made in many countries for irrigation development result in water resources development and very few in on-farm water use improvement. The application of improved irrigation methods and techniques on small to large farms is expanding rapidly as a result of the increasing demand for higher irrigation efficiency, improved utilization of water and intensification, diversification & optimization. An irrigation system consists of canals and structures to convey regulate and deliver the water to the farmers. Two basic types of irrigation systems exist: open canal systems and pressurized piped systems.

IoT-based brilliant cultivating has effectively been being developed throughout the previous twenty years, since the blast in remote sensor innovation. An extensive review on the job of IoT in SAS has been given by Farooq et al. [2] and Ayaz et al. [3]. Li et al. [4] introduced a genuine working savvy nursery (SGH) with remote observing choice utilizing the WSN innovation. With the appearance of savvy lower-fueled remote sensor innovation empowering arrangement in high densities, micromanagement thoughts for SAS have begun to develop rapidly. As soil boundaries could be checked intently, water protection methodologies like brilliant water system innovations were created. Aqua-farming [5] and Aeroponics [6] are two such forefront, soil-less medium based water the executives advances. Nalwade and Bit [5] portrayed an aqua-farming based shrewd water system framework in which plants are suspended into a supplement arrangement rather than soil for direct use of water to edit roots according to necessities. Idris et al. [6] executed an aeroponics-based water system framework for crops in which water is straightforwardly showered at crop roots according to require. Extraordinary equipment plan for sensor hubs was effectively grown particularly for use in savvy agribusiness applications [7].

IoT-based SAS studies have likewise been a famous subject among analysts [8]. These have been essentially carried out for efficient checking and controlling of the agribusiness frameworks from a distance, in some cases with the choice of saving information to the cloud for the benefit of different ranchers working in comparable areas, e.g., crops and climatic circumstances.

Web of Underground Things (IoUT) is a new arising idea [9]. Observing soil factors and climatic circumstances are two significant supporters of the prosperity of the yields. Like IoT, it addresses a web of remote sensors and actuators which are situated subterranean to screen and control soil conditions, for example, dampness, supplements, corrosiveness, pH levels, and soil electrical conductivity. Remote sign engendering misfortune furthermore, insurance of delicate hardware inside remote sensor hubs is a difficult issue for the IoUT innovation. Singlehop, remote, underground sensor networks have been examined exhaustively by Tiusanen et al. [10].

UAVs for savvy urban communities observation continuously have been proposed already [11], [12]. The utilization of UAVs in brilliant cultivating is additionally being investigated by analysts [13]. UAVs outfitted with specific savvy camera applications catch ethereal pictures of the field, which, joined with cutting edge DL-

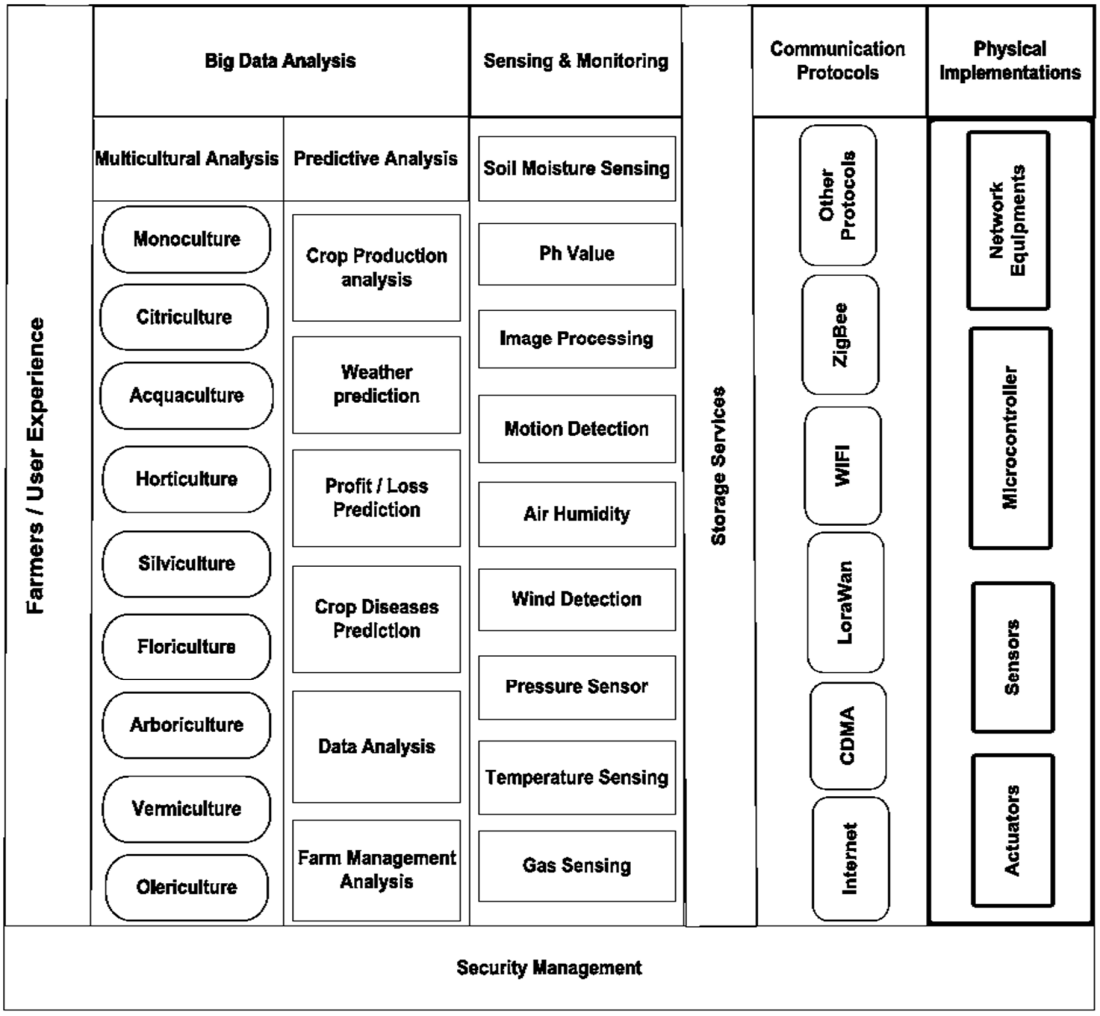

Figure I. Review of status of Research and Development in the Domain

based man-made intelligence apparatuses, can foresee crop sicknesses, phenotyping, plant development observing, weed identification, and utilized for water system pesticide splashing.

In ebb and flow conditions of intense water deficiencies for rural purposes, it is significant to devise brilliant methodologies for water preservation. High level water system ideas focused around IoT-based accuracy farming incorporate the procedures of tank-farming [19] and aeroponics [20]. Zahid et al. [46] present an original TeraHertz (THz) waves based technique to gauge water content in living plant leaves to expand water protection by means of brilliant water system techniques.

The idea of nurseries [17], [18] isn't new and has been near and used for farming for years and years presently. Nonetheless, with the progression in IoT and remote sensor hubs innovation, the SGH idea is quickly arising [47], [48]. SGHs empower ranchers to keep up with microclimate conditions, upgrade water system and compost use. Comparative to SGHs is the idea of Passage Cultivating [19]. Plastic burrow cultivating is effective in non-industrial nations due to its minimal expense, having slow time of year yields, and improved efficiency [49]. Conventional passage ranches use trickle water system, above water system, or sprinkler water system techniques for improved results. This kind of water system is superior to typical flooding strategies. Different water system techniques give different degrees of water also, energy efficiency. Semi-Roundabout cross-area burrows are utilized, which are normally 14 to 28 feet wide and 7 to 12 feet tall at the middle (contingent upon width), and 48 to 96 feet in length. It is generally suggested that passages ought to be no more extensive than 30 feet for cross ventilation and to keep away from snow gathering on the rooftop. Like SGHs, it is additionally

fixed with IoT sensor innovation to screen soil dampness, temperature continually, stickiness, and light force and take restorative activities likewise through fitting actuators.
The utilization of AI (ML) and DL has additionally been effectively explored for further developed crop yields [50], horticulture warning frameworks [51], [52], recognition of harvest illnesses, weed recognition [53], and bothers [38]. Zeynep et al. [21] have completed a thorough writing study on the utilization of DL strategies in brilliant horticulture. The utilization instances of DL in shrewd agribusiness incorporate location of plant sicknesses, bug acknowledgment, plant classification, savvy water system, and weed discovery. Table 1 sums up the points connected with SAS shrouded in different exploration papers and contrasts them and the commitments we introduced in this review article.

TABLE 1. REVIEW OF STATUS OF RESEARCH AND DEVELOPMENT IN THE DOMAIN

Reference (Chronologically arranged)	**IoT for Smart Agriculture**	**Irrigation control mechanism**	**Application of Machine Learning for analysis**	**Security and Privacy methods**	**Edge and AI for agriculture**
[14]	Yes				
[38]					Yes
[35]		Yes			
[16]		Yes			
[30]			Yes		
[33]			Yes		
[32]			Yes		
[18]				Yes	
[21]			Yes		
[39]	Yes				
[17]		Yes			
[42]		Yes			
[43]			Yes		
[44]			Yes		
[45]			Yes		
Proposed Framework	Yes	Yes			

These four significant parts are actual design, information obtaining, information handling, and information investigation. The physical structure is the main variable for accuracy agribusiness to stay away from any undesirable occurring. Entire framework is planned in such a manner which controls the sensors, actuators, and gadgets.
A sensor plays out different errands like soil detecting, temperature detecting, weather conditions detecting, light detecting, and dampness detecting. Also gadgets perform many control capabilities like, hub revelation, gadget recognizable proof and naming administrations and so on. This large number of capabilities are performed by any gadget or on the other hand sensor which is controlled through a microcontroller. This controlling activity is performed by any distant gadget or PC which is associated through the Web.
Information Securing is additionally partitioned into two sub parts specifically: IoT information obtaining and standard information procurement. By which, the IoT information obtaining part comprises of seven conventions that are Message Lining Telemetry Transport (MQTT),Websocket, High level Message Linin Convention (AMQP), Hub, Compelled Application Convention (CoAP), Information Circulation Administration (DDS), and Hyper Text Move Convention (HTTP). Contingent upon the prerequisites furthermore, condition more conventions can be utilized for the execution of shrewd cultivating. While, in the standard information obtaining ZigBee, WIFI, Long Reach Wide Region Organization (LoraWan), SigFox and ISOBUS conventions have been utilized.
Information handling comprises of different elements that are picture or then again video handling, information stacking, choice emotionally supportive network, furthermore, information mining as displayed in Figure 2. As indicated by the framework prerequisites any element might be added that might work in lined up with offer different types of assistance. Information examination comprises of two primary highlights that are checking

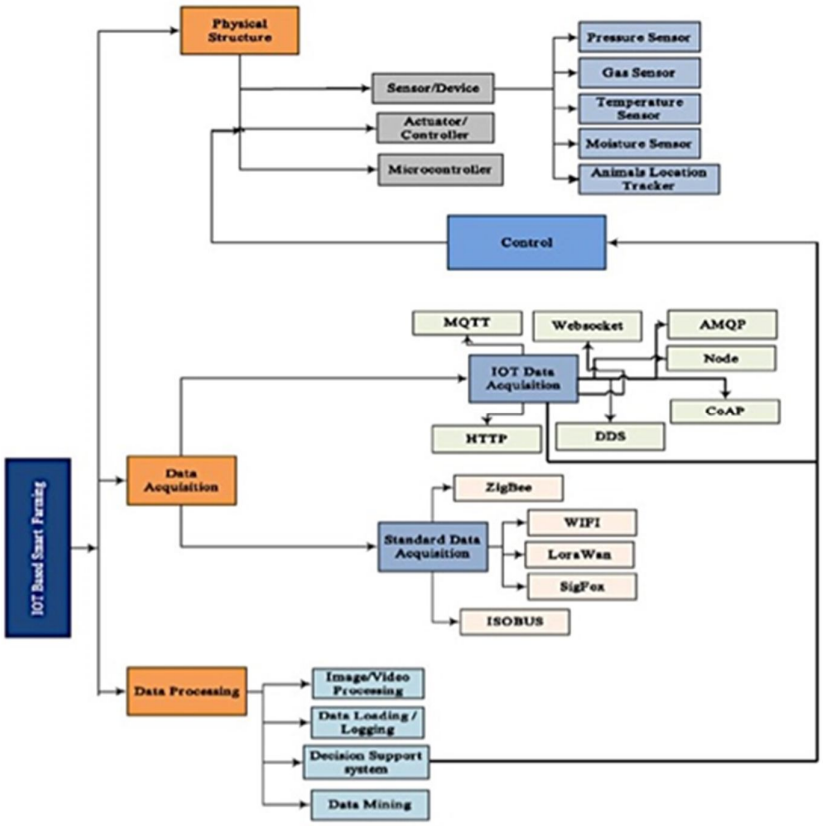

Figure 2. Major components of IoT based smart farming

what's more, controlling. Checking includes three fundamental application in shrewd horticulture that are Live Stock Checking, ranchers to screen domesticated animals through numerous sensors which are used to screen different creature's illnesses like temperature, pulse, and absorption and so on. Though field checking applications plan to report various states of field like soil wealth, temperature, stickiness, gas, pressure (pneumatic stress and water tension), and harvest illness observing. A smart nursery configuration takes out the manual mediation and measures different environment boundaries by clever IoT gadgets and sensors as indicated by plants prerequisites.

III. Proposed Framework of Intelligent Farming System

Intelligent Farming System (IFS) includes the fusion of information and communication technologies into machinery, equipment, and sensors for use in agricultural production systems. Latest technologies such as the Cyber Physical System (CPS) with Artificial Intelligence, Machine Learning (AI&ML) and cloud computing are expected to enhance the advanced technical developments in farming.

The advances in major core technologies and their applicability in creating an Intelligent Farming System is proposed. Agriculture is the backbone of Indian economic growth and is done from ages. Intelligent Farming System is the key to development in the rise of sedentary human civilization which has been done heavily with human labor from ages. As the world is trending into new technologies and implementations, it is a necessary goal to implement latest techniques and trend for enhancing the farming system.

Cyber Physical System plays a very important role in Intelligent Farming. The cyber physical system is built using various sensors and actuators that are capable of providing real-time physical parameter measures about soil, atmosphere and climatic conditions. Here, a CPS based intelligent agriculture system equipped with AI&ML are proposed which use different technologies to monitor, mitigate pest, weed, diagnose diseases and suggest medication.

The green house technology in the forefront of farm modernization conventionally, crops are cultivated in open fields where the sudden and drastic changes in climatic conditions like temperature, humidity and light intensity adversely impact the crops.

Further, in this proposal, we will explore how technology can help increase the efficiency of some of the major farm activities in the growth stage of crop management like: Water management, Pest management, Crop monitoring and management, Soil Nutrient management, Climatic Analysis and Farmer Alert System

Artificial Intelligence / Machine Learning services running in cloud servers are cost effective solutions for crop health management, especially in the areas of detecting and classifying unhealthy plants.

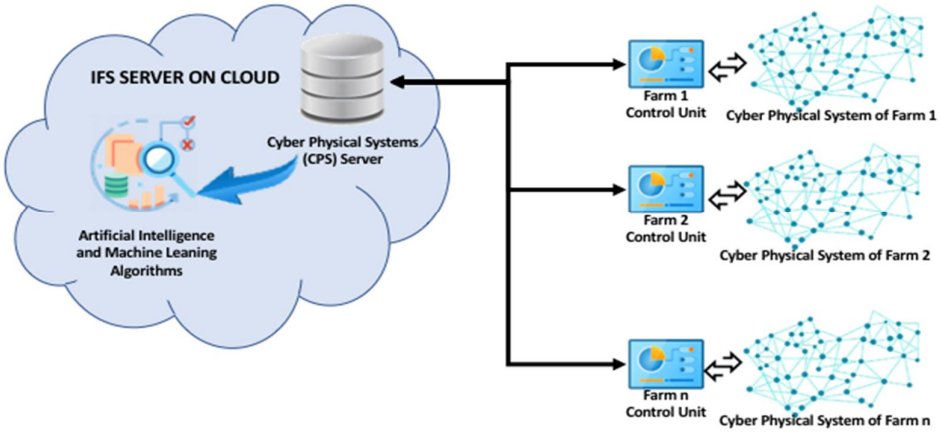

Figure 2. Cyber Physical System Connected to the CPS Server on Cloud

In this proposal, we study the advances of major core technologies and their applicability in creating an Intelligent farming System (IFS). As the world is trending into new technologies and implementations it is a necessary goal to trend up with agriculture also. Cyber Physical System (CPS) plays a very important role in Smart Farming. IOT sensors are capable of providing information about agriculture or Farming fields.

We have proposed a Cyber Physical System (CPS) enabled smart agriculture system using different technologies like AI&ML, Data Science and Cloud Computing. This CPS based Intelligent Farming system makes use of sensor networks that collects data from different sensors which as a result develop an Intelligent Village Farming. Several Utilities such as Pest management, Crop Stress management, Nutrient management, Water management and Deep Analysis can be done to suggest the farmer regarding the crop and climatic conditions.

This smart agriculture or Smart Farming using Cyber Physical System (CPS) is powered by advances in sensor technology, wireless communication technologies and their applicability to farming Chatbot, Computer vision, technology enabling farming, it consists of sensor followed by technological techniques.

The basic differences between traditional surface irrigation and piped irrigation techniques are:

The water flow regime: With traditional surface methods the size of the stream should be large, while in pressure piped irrigation systems very small flows, even 1 m3 /h, can be utilized.

The route direction of the flow: With traditional surface methods the irrigation water is conveyed from the source and distributed to the field through open canals and ditches by gravity following the field contours. The piped system conveys and distributes the irrigation water in closed pipes by pressure following the most convenient (shortest) route, regardless of the slope and topography of the area.

The area irrigated simultaneously: With traditional surface methods the water is applied in large volumes per unit of area, while piped irrigation systems distribute the water at as needed rates over a very large area.

The external energy (pressure) required: Traditional surface gravity methods to a large extent do not need external energy for operation, while piped irrigation systems require a certain pressure, 2–3 bars, which is provided by means of pumping overhead supply tank or distribution chamber situated at a high mean sea level.

The proposed IFS aims to help the farmers to adopt the advanced technologies in improving the quality of the crops and its yield. Climatic Analysis is done by the sensors that collect data which is in turn transmitted to the server to generate useful alert system to the farmer. The IFS manages irrigation system using soil moisture sensors, artificial intelligence-based rain prediction. Machine learning based crop dependent water volume allocation methods are used.

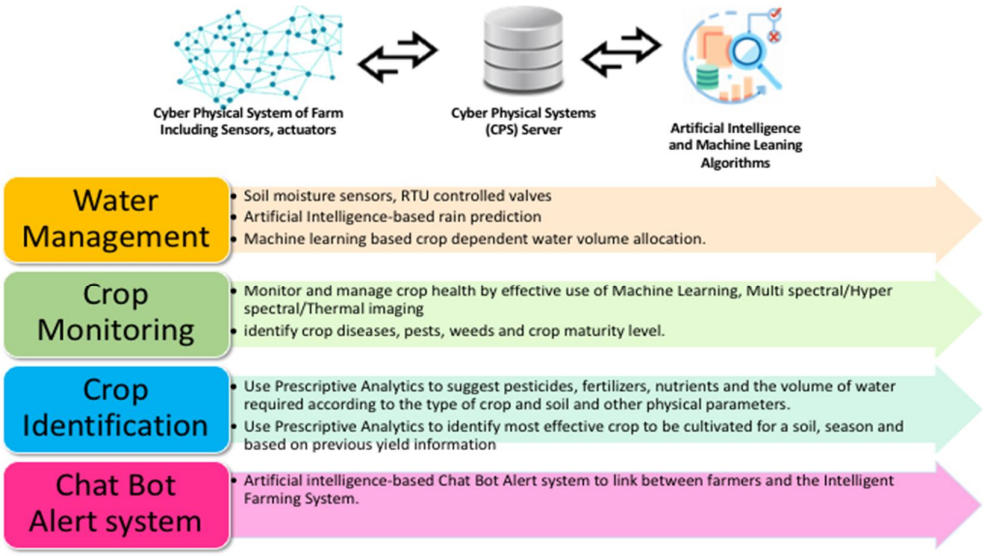

Figure 2. Research Components of the Proposed Intelligent Farming System

The IFS monitors and manages crop health by effective use of Computer Vision, Multi spectral/Hyper spectral/Thermal imaging to identify crop diseases, pests, weeds and crop maturity level. The IFS also includes use Prescriptive Analytics to suggest pesticides, fertilizers, nutrients and the volume of water required according to the type of crop and soil and other physical parameters. It is also proposed to design an artificial intelligence-based Chat Bot Alert system to link between farmers and the Intelligent Farming System.

Cloud/Fog/Edge Computing server is used to collect and store all data including crop cultivated, soil and its nutrient analysis, ph Levels, moisture content, volume of water delivered, diseases identified (If any), pesticide and weedicide used, yield harvested. Machine learning models use this data collected over a period of time to provide insight on the crops to be cultivated and water release, fertilizer and other items along with the yield information. Machine Learning is applied on this data for prediction of best optimal crops that can be cultivated in a given soil and climate in a given region.

IV. Discussions

In farming checking weather is the most significant conditions ceaselessly with the goal that future exercises can be planed likewise. Weather conditions stations are the most well-known contraptions in the field of farming which are utilized to screen unique climate conditions. Climate boundaries which are being observed incorporate temperature, mugginess, wind heading, furthermore, pneumatic stress and so forth. Situated across the field, weather conditions stations gather the ecological information and send it to the cloud server. Gathered information is utilized for climate investigation to plan environment conditions, and give new experiences to take required activities to work on horticultural efficiency. US Food and Farming Association (FAO) has been characterized a climate related approach called Environment Savvy Horticulture (CSA) which assists the client with changing farming framework by recognizing environment conditions [61].A wireless sensor network has been sent by utilizing IoT innovation to screen climate changes by incorporating the sensors and gadgets [62]. Soil checking has become one of the most requesting rehearses in horticulture field for the two businesses and ranchers.

In soil checking there are numerous natural issues which influences on crop creation. If these sorts of issues are distinguished information precisely then the cultivating designs and cycles can be see without any problem. Soil designs which are being checked comprises of Soil Stickiness, dampness, preparation furthermore, temperature. Soil dampness and dampness sensors are conveyed to screen the dampness content in soil [63]. A sufficient measure of preparation in the field likewise increment crop yield [64]. Soil observing test report increment crop efficiency also, suggests a fitting treatment arrangement to rancher [65]. Additionally, recognizable proof of sullied soil by utilizing IoT innovations safeguard the field from over treatment and harvest misfortune. Main drivers of income and creation misfortunes are crop infections.

Because of the blast of IoT rural framework has been changed into computerized framework which helps the rancher to settle on informed choices. Expectation of harvest sicknesses at beginning phases assists the ranchers with creating more income by saving yield from bother assaults. IoT safeguard crop in various ways by distinguishing various infections and keep crop from creature assaults. An IoT based observing framework has been introduced in [66] to screen the wheat illnesses, bug and weeds. Crop assaulting is the greatest issue because of withdrawal of developed land into various untamed life torment. In [67] a observing and repulsing framework for the insurance of yield against wild creatures assault has been introduced. Discovery of yield illness at beginning phases is exceptionally difficult in the field of agribusiness. Since to distinguish harvest or leaf illness group of specialists is called, which is costly and time taking process. While, programmed identification of illnesses is very helpful, precise and less expensive for rancher when contrasted with manual perception by specialists. Picture handling procedure likewise assumes a fundamental part for the prior recognition of plant sickness [68].

IoT gives instructive information to horticultural organizations for better choices making like preparation, overseeing and interface with colleagues brilliantly by setting aside cash and time. In developing climate soil, air, water, manures, what's more, pesticides conditions are observed by RFID and Worldwide Situating Framework (GPS). GPS framework is utilized to find the specific area of farming field and screen different horticultural boundaries by utilizing remote correspondence networks. In [77] a design has been foster which remotely screen the dirt condition and soil structure according to necessity of harvests culture. In this design ZigBee is associated with different gadgets like substance the executives framework (CMS), Worldwide Framework for Portable (GSM) and General Parcel Radio Help (GPRS) by utilizing Remote sensor organizations to screen and acknowledge continuous information checking. GPS gives connection point to cooperate with ARM (a keen observing framework to accomplish capabilities like SMS/MMS) and gives an caution to cultivate administrator when an undesirable changes happen furthermore, assists the ranchers with making a remedial move. Despite the fact that it's functional and support cost is high however it is broadly utilized in horticulture because of its definite area checking and following property.

The reception of savvy cultivating is correspondingly expanding how much efficiency by diminishing the ecological influence yet this savvy cultivating method can be conceivable by means of *Intelligent Farming. System. I*FS is a critical component for handling, arranging, and decision making with the end goal of savvy cultivating [78]. A coordinated *IFS* permits the ranchers to screen the whole where entire information is gathered by means of WSN, GSM modules and microcontroller. An identifier is utilized on the sensors and gadgets in all around the ranch which gives th*e* appropriate information on treatment, climate information, programmed cradle zone width observing, and programmed detail record is produced by each day exercises of homestead. This entirety data is put away in the PC in standard organization and can be available through phone or web for additional handling.

To streamline the utilization of water assets a mechanized water system and observing framework is utilized [73]. Aside from water system framework ranch is likewise safeguarded from bug and animal interruption [66], [67]. To gauge the specific measure of required water in nurseries is a key issue. Savvy sensors are executed which are constrained by applying different IoT procedures to keep away from unreasonable utilization of water. In nurseries water the board is completed by utilizing programmed trickle water system which works by following soil *moisture threshold* that is set as needs be [81].

IoT sensors and cameras establishes ideal climate for plants by observing the condition of plants consistently and creates a caution assuming any issue is unmistakable. On the opposite side, cloud based IoT arrangements store the detected information and view it intermittently which is useful for producers to guarantee that all plants gets ideal consideration in the nursery [82]. There are numerous boundaries which are consolidated to keep up with furthermore, establish an optimal climate for plants inside severe cutoff points, for example, the support of ventilation, temperature, carbon dioxide, and oxygen level. This can be made conceivable by sending IoT empowered nursery where brilliant gadgets also, sensors share their data for solid independent direction [81].

From the most recent couple of years it has been seen that combination of electronic gadgets with cell phones advance the innovation world and cell phones are taken as a driver of IoT. To make advanced mobile phones adaptable in horticulture field different equipment and programming have been planned. A decent (however not complete) study of PDA applications giving horticultural arrangements has been introduced [98]. Figure 15 appearance a characterization outline of PDA applications for savvy cultivating. Moreover, there is various ongoing applications which are serving comparative functionalities. These PDA applications are not restricted; designers from everywhere the world have created numerous e-Cultivating applications thusly, this paper featured some chosen applications which have been examined by their ubiquity.

V. Future Direction

Numerous scientists have dealt with IoT horticulture framework what's more, tackle different innovative issues and structural issues by carrying out and planning different IoT horticultural arrangements. Also, as indicated by the exploration point of view in the writing, there are likewise a few open issues what's more, challenges which are expected to address effectively [57]. There are many difficulties which are linkage with IoT shrewd cultivating organization and applications. This examination has recognized some investigated and neglected IoT horticultural issues furthermore, challenges.

A few difficulties emerge in IoT horticultural arrangement. First of every one of the supplies which exists at the insight layer are straightforwardly open to cruel ecological experience, for example, downpour, significant level temperature, outrageous dampness, hard breezes, also, numerous other potential risks which obliterate electronic circuits. End gadgets turns out reliably for an extensive stretch by relying upon insufficient batteries power assets. Along these lines, a reasonable programming instruments and less power potential is important in light of the fact that in the event of any program disappointment quickly battery substitution is muddled particularly in a huge scope open field. These difficulties are not just for the equipment executions, yet additionally exist at the organization layer. Because of significant expense of wiring, remote correspondence is generally significant for the arrangement of IoT based horticulture. Actual arrangement shows that acknowledged handsets execution is misrepresented by human presence, temperature, stickiness and numerous other obstructions inside the space where remote gadget or hub needs to convey. Because of which there ought to utilize generally dependable also, powerful advances to move information as indicated by the natural difficulties and provincial circumstances [8].

A nitty gritty examination on IoT horticulture organizing difficulties and issues is given. IoT farming design is more confounded as think about to other IoT end gadgets and calls for ongoing checking framework with extra severe prerequisites. For this a custom-made registering stage is required with run time libraries. A help situated approach (SOA) can likewise take to fabricate a reasonable stage; such administrations can be taken advantage of by utilizing various Programming interface's. Furthermore, suitable systems what's more, libraries ought to be grown with the goal that rural designers can utilize accessible archive, classes, codes and other helpful information.

In the field of farming net revenue is vital, there is a need of soundness the compromise between the organizations of IoT empowering advances. At the point when an IoT framework is conveyed the expense of executions are exceptionally high like IoT gadgets/Sensors, doors, and base station framework. After that support cost additionally significant for the utilization of focal administrations which are essential for IoT gadgets the board, information assortment, and data dividing between all different administrations. In addition, the main consideration of easing back IoT in rustic regions is essentially the need information on IoT and its applications. This is the primary issue since larger part of farmers is uninformed and lives in country regions. Therefore, it is generally vital to defeat these impediments by teaching farmers to create more revenue [7].

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A Framework for E-Auction Scheme using Hyperledger Fabric

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***Abstract*—In these days most of the people has started using e-commercebased applications they become very much handy. E-Auction are among the most inuential e-business application. There are so many dierent se- curity problems in implementing the e-auction such as, the privacy of sellers and bidders, fairness in the transactions, transaction data secu- rity, and veriability. The Hyperledger fabric blockchain architecture is one of the most widely used permissioned blockchain designs, and it has made a substantial contribution to the development of a framework for the safe conduct of online auctions; it ensures data integrity, reliability, and transparency while reducing the corruption, data manipulation, and uncertainty that are commonly encountered in online systems.**

***Index Terms*— E-Auction, Hyperledger Fabric, Blockchain, Security, Auc- tion, Information Security, Smart Contract.**

I. INTRODUCTION

Blockchain is a revolutionary technology that alters how data and transactions are stored and recorded. A blockchain is comparable to a standard database, but the concept behind it is to eliminate the intermediary [1]. In 2008, Nakamoto proposed Bitcoin, a digital money; this was the first time blockchain was used. The bulk of cryptocurrencies are based on this method, and it's widely ac- cepted as such. There is no one owner of ledger, and every network node hasan identical copy of ledger. This is the key attribute of this system. For ex-ample, blockchain might be used for public services [1], reputation systems [3], security, and the Internet of Things (IoT) in addition to financial applications. As with any new technology, scaling, privacy, and performance [6] are all issues that need to be addressed with the blockchain. One of the biggest challenges to using blockchain implementations as a replacement for traditional databases is the performance of the technology. Swan [7] outlined seven possible techni-cal roadblocks to blockchain adoption, including throughput, latency, size and bandwidth, security, wasted resources, usability, and versioning and hard forks. Unresolved limits and concerns stemming from these roadblocks were identified in a comprehensive evaluation of blockchain research in [8].

Latency and throughput have been exhaustively examined. Also necessary is a scalability assessment, since it is anticipated that developed blockchain frame- works would include a high number of nodes [8]. In the paper, a research gap in the blockchain area is that most current research focuses on the Bit-coin platform rather than other blockchain platforms. An open source, permissioned blockchain known as

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Hyperledger Fabric v0.6 introduced by IBM [10] and sub- sequently as Hyperledger Fabric v1.0 [11] in 2017, is one of the newly formed blockchain systems.
Blockchain is a cryptographic technology used to share users' information into a secure, decentralised database. Each block contains both transaction records and information about the block itself. Each node uses a secure hash function asa reference for validating the data in previous blocks; if the hash is compatible with the contents, the block is allowed for addition to the chain. All processing on a blockchain is recorded as transactions between users that are traceable and serve as evidence of ownership. Once a transaction is deemed complete, it is kept on the blockchain as a permanent record [12] [13].

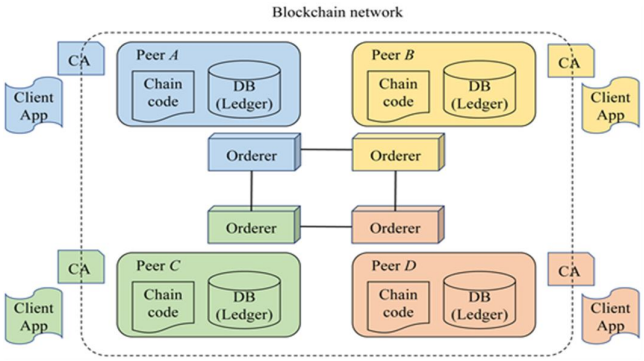

Fig. 1. Process of Block Chain

In a blockchain network, all nodes have access to the complete history ofthe whole blockchain, and newly connected nodes must synchronise the entire blockchain to ensure the integrity and authenticity of the data. Because eachnode has a copy of the data and agrees on the order in which transactions should be executed, attacking or hacking a blockchain network is almost im- possible. The major use of blockchain technology has expanded beyond digital currencies to include Internet of Things (IoT), supply chain management, net- working, healthcare and medical research, cloud computing, etc. [14]. Emerg- ing blockchain technology paired with smart contracts might decentralised and autonomously revolutionise established E-bidding platforms. While maintaining high levels of accuracy and completeness, it paves the way for a safe, unchanging,and auditable E-bidding process. Currently, there are additionally
Some E-bidding systems that use Blockchain technologies to preserve all details of the bidding process are available, however they are limited in their use of the blockchain's unique characteristics. The blockchain may be required to obtain sensitive data in order to perform a smart contract. In order to ensure that no sensitive information is divulged, it is critical that the data stored on blockchain be kept private and accurate.
The following is the paper's structure: There was a lot of discussion in Section 2 on the evolution of electronic auction systems. In Section 3, we explored the suggested system's approach and architecture. In Section 4, we discussed about how the Hyperledger fabric used in implantation of the E-Auction system. Fi- nally, in Section 5, we given our conclusions and future scope.

II. Related Works

A. E-Bidding

A bidding system based on Ethereum smart contract methods[12] was proposedby Tang Jun in 2020, and he defined the final goal of unmanned intelligent reviewby adding deep learning techniques. E-bidding applications, according to V.A.Trinh et al. [7], need just one person who can authenticate the signer's signatureto avoid information leaks and other undesired events. An innovative tenderingand bidding system based on the cloud was first proposed in 2013 by Xu Jing et al. [6]. This system created a new cloud layer by creating a reliable database.According to C. Fan and colleagues in 2008, each bidder may participate in many bidding projects only after completing one round of registration, which reduces costs and enhances the level of bidder anonymity in traditional biddingactivities.

B. Blockchain-Based E-Bidding

E-bidding systems based on blockchain technology is developed in recent years. When A.Sarfaraz et al. [14] announced a blockchain-based auction system in 2021, they employed multiple cryptographic primitives to accommodate for lim- its on privacy and security. Rather of using the original chain structure, a tree structure is used instead to incorporate the blockchain. Forbidden bidders are protected using elliptic curve encryption (ECC) and dynamic cryptographic ac- cumulator encryption (DAC). Using Ethereum smart contracts, decentralised storage systems, and a trusted Oracle, I. Omar et al. presented in 2021 a solu- tion based on the Ethereum blockchain that ensures data integrity and trans- parency while eliminating middlemen. Bidding data files should be distributed, checked for accuracy, and tracked via a blockchain-based credible e-bidding sys- tem (BCES) [24] by 2020. This system would address operational compliance challenges, multiparty coordination, and cybersecurity concerns. 2020 saw intro- duction of a system proposed by E.O. Blass and colleagues that would allow

Use building blocks [12] to securely establish a variety of sealed-bid auc- tions that may boost e□ciency by guaranteeing little contact between players to support blockchains or other circumstances requiring time-consuming several rounds.

A blockchain-based electronic bidding system was introduced in 2019 by P. Manimaran et al. [11]. A third party isn't required in this model. Using smart contracts, all bidding transactions will be managed, and the system will guar- antee the integrity of the auction. Using the concept of smart contracts for gov- ernment bidding was proposed by F.S. Hardwick et al. in 2018 [9]. This would allow for a strategy that is fair, transparent, and auditable. Blockchain-based sealed-bid auctions were proposed in 2018 by H.S. Galal and colleagues [10]. Zk-SNARK may also be used on the Ethereum network to implement the Vickrey auction method.

Problems with the E-bidding system include information opacity, resource sharing challenges and a high credit cost, as well as data privacy vulnerabilities. With the openness, transparency, tamper resistance, high trust and traceability provided by blockchain technology, this essay sets out to create a new E-bidding system that addresses the problems with the current platforms already discussed. Reduced expenses and improved data verifiability are achieved via the use of Hyperledger Fabric and chaincode in place of a third-party trusted party.

Encrypting and storing bidding information in a secure manner on the Blockchain with the use of smart contracts ensures the fairness of bidding in this arti-

cle. Users' identities are authenticated using the zero-knowledge proof protocol, which also protects their anonymity and confidentiality [16].

As a whole, their contributions may be summed up as follows: Smart con- tracts and blockchain technology have been proposed as a foundation for an E- bidding system that can handle large-scale bidding. It is suggested that electronic bidding systems may benefit from a strategy for protecting their users' privacy. Because it doesn't connect to the sender, the non-linkable zero-knowledge proof protocol keeps the recipient's identity private.

III. METHODOLOGY

There were six stages to the decentralised sealed-bid electronic auction: regis- tration, publication, bidding, opening, verification, and conclusion. Owners of goods, bidders, smart contracts, and the blockchain all participated in the auc- tion. Buyers entered their bids before the deadline, after the seller had posted product information to the blockchain. The services o□ered by the smart contract supported the activities in the preceding stages. The architecture and auction process flowcharts for this system are shown in Figure 1 and Figure 2, respec- tively.

A. Register Phase

The sealed auction mechanism requires all users, including the seller and all bids, to register. Registered users received their user IDs and private and public keys through the contract's register function. Using the smart contract's public key, the IDs were encrypted and placed on the blockchain by the people who got the registration data.

B. Publish Phase

The smart contract's publish() method was used by the commodity's owner after registration to make its details publicly available on the internet. The following steps were conducted in the publish() method:

- As soon as the user ID was verified, the smart contract sent back a publish authorisation to the goods' owner.

- An auction began at t1 and ended at t2, with bid security requirements m, and the fewest number of bidders being required to participate. The reserve price was encrypted using the smart contract's public key and kept in a blockchain record. hence, all details other than the reserve price were agreed upon in advance.

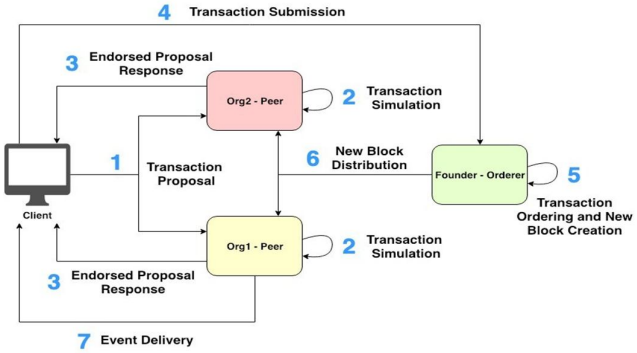

Fig. 2. E-Auction Implementation Architecture

C. The Bid Phase

Registered bidders who were interested in the commodities were authorised tobid beginning at time t1. The smart contract's bid() method was responsible for the following bidding duties.

- Like the owner of the items, the bidder's identity was likewise validated via smart contract.
- The bidders deposited the security deposit into the account designated bythe smart contract and under its supervision.
- A random number ri was generated by the smart contract's public key and recorded on the blockchain for each bidder bi. The bid price pi will never be made public by the smart contract.
- The commitment price Ci was obtained by each bidder bi using the Peder-sen commitment function, which was then put in the distributed ledger. A private key was used to encrypt Ci, the cost of committing to a deal. By decrypting Ci using a public key, all bidders and owners of commodities are able to decipher Ci's information.

D. The Open Phase

The following actions were performed by the smart contract at time t2:

- The smart contract counted the number of bidders present at the auction and checked the values of all bids. The auction was considered failed if thenumber of bidders was fewer than n or if all o□ers were less than the reserveprice pr. Additionally, the following measures were implemented.
- Bidders' prices were ranked from highest to lowest and the highest price, p,won the auction.
- The smart contract publishes to the blockchain the commitment price C tiedto p.
- The price of each variation in the commitment Each bidder's public key wasused to decrypt Ci before it was sent back to them through a smart contract.

E. The Verify Phase

When each bidder bi obtained C and Ci, he computed the di□erential commit- ment price and compared Ci to C. Then, all bidders used the Bullet proofs technique to prove p with Ci without disclosing the winning o□er price, p.

F. The Finish Phase

Following validation of all bids, the smart contract instructed the winning bidder to transfer p m from the specified account to the owner of the commodities before the total amount p was sent to the buyer of the goods. Additionally, thebid security of the other bidders was returned to their bank accounts.

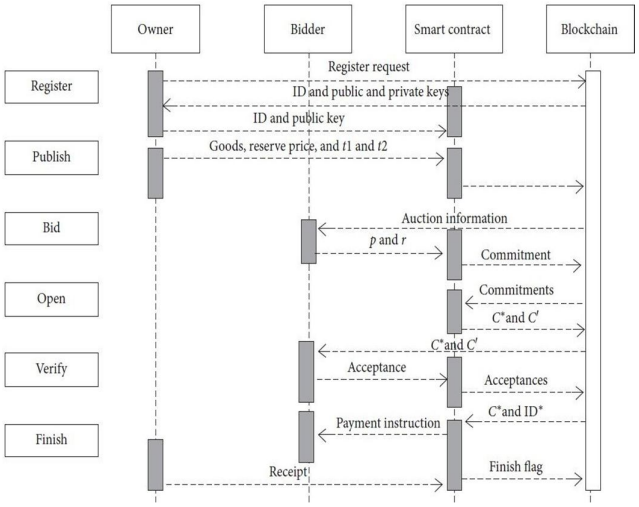

Fig. 3. E-Auction Process Flow Diagram

IV. IMPLEMENTATION

This framework enables us to conduct an auction for numerous identical objects.
Every item is sold at the price that allows the auction to close. We are also includean auditing firm in the auction. If the organisations administering the auction cannot agree, or if a technological issue prevents them from updating the auction, a participant in the auction may appeal to an auditing organisation. The smart contract for the auction demonstrates how to establish a sophisticated signature policy by developing a prototype and then using the state-based endorsement mechanism. A single seller wishes to sell 500 tickets to numerous bids using this framework's smart contract. We may add an auditor to the auction, allowing anybody to appeal to the auditor to halt the auction by superseding the regular endorsement policy. The procedure is as follows:

1. If the network is already running, then bring down the network and start from a clean initial state.
2. Deploy a new network by creating new channel
3. User can use default endorsement policy to deploy the auction smart contract or they can use Org1 and Org2 policy.
4. Add auditor as Org3 to the auction it can add bids, close the auction, or endthe auction.
5. On the Org3 deploy the smart contract and approve the chaincode On the Org3 we start the auction chaincode, auction can be created by Org1 and Org2. Once the auction is created the endorsement policy is added by the auditor. The auditor runs the smart contract which is other than the partici-pants using version its because creating new bids or auction is not performed by the auditor.
6. Install the application dependencies
7. Org1 and Org2 administrators has to enroll the respective Certicate Au- thority and to create the auction Seller has to register and enroll which is identied by both the organizations CA.
   - ✓ node enrollAdmin.js org1
   - ✓ node enrollAdmin.js org2
   - ✓ node registerEnrollUser.js org1 seller
   - ✓ node registerEnrollUser.js org2 bidder5
   - ✓ node registerEnrollUser.js org2 bidder4
   - ✓ node registerEnrollUser.js org2 bidder3
   - ✓ node registerEnrollUser.js org1 bidder2
   - ✓ node registerEnrollUser.js org1 bidder1
8. To sell 500 tickets seller is creating an auction from Org1, it can be createdwith or with out auditor. If Auditor is not included, we must use noAuditor; otherwise, we must use Org3 as the auditor. createAuction.js auction1 tickets 500 withAuditor org1 seller
9. Bidding procedure for an auction Using their wallets, bidders will place a bid to acquire the tickets for

a certain price. It generates a transaction-specific identifier BidID and adds bids to the auction. The bid hash is appended tothe list of private bids. The storage of the hash on the public auction ledger enables users to demonstrate the veracity of the bids they disclose after the auction has concluded. The application polls the auction to confirm that the bid was sent:

- ✓ node bid.js org1 bidder1 auction1 200 180
- ✓ node bid.js org1 bidder2 auction1 160 100
- ✓ node bid.js org2 bidder3 auction1 120 120
- ✓ node bid.js org2 bidder4 auction1 60 110
- ✓ node bid.js org2 bidder5 auction1 80 110

10. Once all the bidders has successfully bid their auction, the auction will be closed by the seller after that bids can be revealed by the buyers. nodecloseAuction.js org1 seller auction1
11. Before reveal the auction we need to verify:
    - ✓ The auction has ended.
    - ✓ The bid was generated by the individual that filed the transaction.
    - ✓ The hash of the disclosed bid and the hash of the bid on the channel ledger are identical.
    - ✓ The hash of the disclosed bid matches the hash of the submitted o ・er.
12. Auction will be ended nodeendAuctionwithAuditororg1sellerauction1

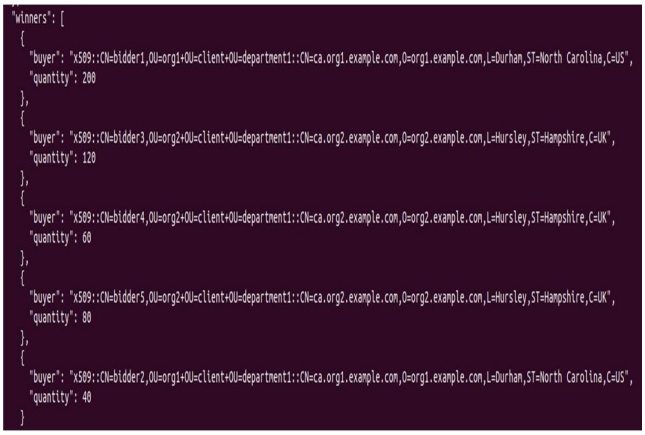

Fig. 4. E-Auction Bid Winners

V. Conclusions and Future Work

In our work, we examined most of the auction models, mechanisms and speci- cally applications which are developed using blockchain techniques. This frame- work proposes the design and implementation of the e-auction scheme using Hyperledger fabric so that all the users of this framework can use it securely. The employment of MSP and chaincode significantly reduces distributed denialof service (DDoS) assaults, restricts the access of a particular person and im- poses a time limit. It providing data security, privacy protection, fairness in the transactions, and veriability for entire process. Even though the framework has solved so many problems but, in the implementation, still there are few practi- cal problems and limitations exist like integrating the blockchain-auction models, payment using cryptocurrency, and standards regulations.

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Identifying Vertex Influential Nodes in Considerable Composite Networks using Grid Layout

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***Abstract*—Online social networks are famous for various activities like creativity, spreading information, and ideas, for the most part for viral marketing. The main focus in the social influence analysis, known as the influence maximization problem(IMP), aims to select Top-N nodes to maximize the expected number of nodes activated by the Top-N nodes (a.k.a seed nodes). This issue has gotten a lot of attention and has been looking into the issue of IMP; these studies are usually too time-consuming to be useful in a complex social media network. The problem of seed selection is NP-hard. Due to the utilization of time-consuming Monte Carlo simulations, which are confined to small networks, so a greedy method to the IM issue is insufficient? The greedy approach, on the other hand, offers a good approximation assurance. In this paper, we present an algorithm for identifying communities and computing the ranking scores of nodes in the identified communities to solve the IMP with a focus on time efficiency.**

***Index Terms*— Top-N influential nodes, Node ranking Score, Information propagation. K-Shell decomposition, Complex networks.**

I. INTRODUCTION

In recent years, with the advancement of communication technology and the widespread use of the internet, the number of people using social media sites is on the rise. Online social networks have grown ingrained in the lives of all users. As a result, a vast volume of information and ideas is transmitted every day across networks that may affect a big number of individuals for a brief period [1]. From the last two decades, many researchers have been concerned about the Influence Spread (IS) and influence among social networks, and their results have paved the way for many online applications such as viral marketing [2]. which is a successful strategy and practical platform that is used as a launching pad and spreads through W-O-M/word-of-mouth on social media sites. One of the oldest and most practical kinds of marketing, word-of-mouth, is a simple way of getting an advertising or promotional message out to people. For example, a firm may wish to target a limited number of people (a.k.a seeds) for a trial of a new brand via social-media-networking medium in the hopes that these early adopters would encourage their friends, and they influence their friends, to buy the product. The assumption is that word-of-mouth marketing will help the firm reach a large pool of targeted users. Under the spreading model, this situation is formally characterized as the influence maximization problem[3], which seeks to choose the initial seeds who can encourage the greatest number of consumers to accept a marketed product.
Domingo et al. [3]were the first to present the IMP from the standpoint of the algorithm inspired by the concept

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of viral marketing. Next, The IMP was formatted as follows by Kempe et al[4]: IMP seeks to find the k-influential vertices/nodes in graph G to maximize IS based on a predefined propagation model, a constant k, and the user influence probabilities. Each of the existing IM algorithms has its own set of flaws. The greedy methods produce high-quality seeds. But the method relies on time-consuming Monte Carlo (MC) simulations to determine correct marginal IS distribution. As a result, greedy methods' efficiency restricts their usefulness on large-scale networks. Heuristic techniques are introduced to increase scalability. To achieve great efficiency and scalability, heuristic methods sacrifice some accuracy. Mixed methods are used to maintain a trade-off between accuracy and convergence. These methods are just a trade-off between efficiency and accuracy.

A. Motivation and Main Contributions

Our research also involves combining community detection (CD) with a heuristic-based method. For community discovery and seed selection, a variety of algorithms and heuristic approaches are available. However, for a big social network, it remains a difficult challenge. Some methods require that the number and size of partitions into which the network will be divided are known ahead of time. As a result, our CD algorithm in this article aims to recognize the most natural communities, find community structures, and build a CD technique that does not define the number of communities.

The following are the key contributions of our work: The suggested IM method has two distinguishing characteristics. First, it can greatly improve the efficiency of the existing algorithms for identifying top-k influential nodes by dividing the complex network into clusters using an H-clustering algorithm to reduce the search space for finding influential users. Second, after dividing the network into clusters then applies a heuristic technique to directly find the target nodes to propagate information. To discover an approximation solution in an acceptable computation time, the Hybrid-IM method combines the strength of general community detection with problem-specific heuristics. In this work, we use the IC propagation model to model information dissemination in the network.

II. RELATED WORK

Kempe et al. [4] reframed the IMP as an optimization problem, presenting a greedy algorithm for locating seed users in order to maximize the network's influence spread and he presented a greedy[5] approximation method with $(1-\frac{1}{e}-\epsilon)$ approximation ratio to solve a (NP)-hard problem. Existing IM methods may be classified into three groups depending on how well they enhance the algorithmic design. The approaches are simulation-based, heuristic-based, and community-based IM.

Model generality is an advantage of simulation-based IM methods[6] [7] [8] [9] [10], i.e., these systems may simply include any conventional diffusion model. For influence spread estimates, these methods employed time-consuming MC simulations. As a result, these techniques have a significant disadvantage in terms of inefficiency and accuracy, as well as low time complexity and memory usage. As a result, simulation-based IM is best suited to small-scale networks. The greedy approximation method involves tens of thousands of MC simulations, which is the major reason. Many attempts have been presented in recent years to successfully handle the IMP. The pressure applied by a user (person) to change an individual's attitudes, views, or feelings is known as social influence. IMP is the formal term for social influence. On the vertex, the amount of social influence may be assessed. In a social network, the power that this node has over each of its neighbors to influence them with a concept, etc. is represented by the amount of social influence of a vertex or the importance of a node, which is a probabilistic value in the interval [0, 1]. The vertex's social influence may be seen as a measure of centrality. Diffusion models may be used to define the IS of nodes as well as rank them. In recent years, it has been frequently utilized for concept dissemination in social media networks[11]. Due to the difficulty and limitations of real-world network monitoring, these models mimic the dissemination process in the real world and assess the true dispersing capabilities of vertices by repeatedly repeating the procedure for each node. In complicated and vast networks, using diffusion models to determine the IS of nodes and rank them takes a long time.

The social influence of the vertex can be viewed as a measure of centrality. Many heuristic-based works of literature are based on centrality, and heuristic-based algorithms attempt to increase the propagation effect. As a result, in recent years, many techniques for node ranking have been suggested, to identify the ability to disseminate nodes based on network information without using propagation models. In heuristic-based approaches, one of the metrics used to specify the disseminating capability of vertices is the amount to which a vertex is placed near the graph's core. The topological placement of a node in the network determines its influentialness. The Top-N nodes in terms of particular centrality measures are regarded as the most influential set in all of these techniques. These techniques have the advantages of simplicity and low time complexity.

following are some of the most influential nodes that have been identified using centrality metrics such as degree [12], betweenness [13], closeness [14], and k-shell [15].
These approaches are categorized into local, global, and hybrid methods based on the type of information used in the network structure. Local techniques provide node impact only on local information; in other words, these approaches specify node influence based purely on the nodes and their neighbors. examples for local structural approaches are degree centrality[12] and H-index centrality[16]. The theory behind these approaches is that high-degree vertices with a large number of neighbors are more likely to spread successfully. These techniques have the advantages of simplicity and minimal time complexity. Global techniques, on the other hand, need traversing the whole network and accessing the network's global information. Closeness centrality[14], Betweenness centrality [13], and k-shell Decomposition [15] are examples of global approaches. K-shell decomposition [15] is a popular approach of this type. Because the global structure of the network determines node influence in these approaches, they have a larger temporal complexity than local methods.
k-shell centrality[15]: the authors suggested a time-efficient technique for determining coreness termed k-shell decomposition. Each node is given a K_s index in this measure. To do this, 1-degree nodes are eliminated one by one until there are no more 1-degree nodes. The deleted nodes are then given K_s= 1. In the following phase, degree-2 vertices are eliminated, and the pruning process is repeated until no vertices with degrees less than or equal to 2 are found. The nodes deleted in this stage are assigned K_s= 2. This procedure is continued until the graph is empty/eliminated of all nodes. A greater $K_s$value implies that the vertex is closer to the graph's core, and the vertices with the greatest $K_s$values are termed the graph's cores. Hybrid solutions: Because users' social information plays an essential part in defining their influence, hybrid approaches combine this data with network structure. Aside from network structure, [17] considers the number of messages transmitted between two users for determining the most significant nodes.
The importance of communities in the dissemination of information has inspired community-based algorithms. Instead of distributing the influence of each vertex over the whole network, these algorithms split the network into clusters and then spread the influence of each vertex inside its clusters. Another way to reducing time complexity in this context is to use community-based IM techniques[18] [19] [20] [21] [22] [23] [24] which can give solutions that take into account the social network's community structure. Almost majority of the research in this category follow a three-phase method (i) community identification, (ii) candidate generation (iii) Top-N user's selection either implicitly or explicitly. Authors Chen et al. [24] use the heat diffusion model to consider influence maximization and construct H-clustering, a hierarchical community discovery method that successfully detects social network communities. Following that, candidate set creation is carried out by identifying some major communities and picking candidate nodes from them, taking into account the size of the communities and their connections. Finally, a heuristic approach is used to choose the target set, with target nodes being chosen based on their position in the communities. Existing techniques rely on community structure and algorithmic community discovery.

III. PROPOSED METHOD

The proposed technique is novel in that it makes use of the network structure. This algorithm is split into two sections. In the first section, determine communities it uses an H-clustering algorithm, and second, within the clusters ranking scores are determined using cluster local information for nodes. In reality to select seed nodes from the cluster computed the node ranking scores independently. but to select multiple nodes from sub-network (big Cluster) not scattered over the complete .so propagation models are used to estimate the spreading capability of a node. by this novel technique, we can select multiple nodes effectively without clustered in the subgraph(cluster). This enhances performance by allowing information to spread more quickly. The suggested technique decomposes the nodes in the cluster to avoid MC simulations to choose the seed node, using the k-core decomposition [15]. Then it identifies Top-N nodes based on RS value.

Algorithm 1:
***Input*:** Graph -G (V, E); undirected and unweighted
Output: top k - Influential spreaders.
Begin:
1: IS ← Ø; // Influential spreaders or target nodes.
//* section (i): community/cluster identification/detection *//
2: $C = \{c_1, c_2, c_3 \dots \dots . c_p\}$← H_Clustering(G);
3:$C = \{c'_1, c'_2, c'_3 \dots \dots , c'_q\}$ ← pruning unimportant community in C;

//* section (ii): target/top-N nodes selection. *//

4: for all $v_i \in V$ in each community from network graph G.

Deg (v_i).-----compute the degree of every node.

KD (v_i).-----compute K-Core Decomposition value for every node

δ_i ----find the value of each node's normalized iteration multiplier (NIM)

NGI (v_i) = Deg (v_i)*KD (v_i)*δi /|V|---- normalized global importance (NGI)

$RLGI(v_i) = \frac{NGI(v_i)*\deg(v_i)}{\sum_{\forall j \in \Gamma(v_i)} NGI(v_i)}$-----compute relative local–global importance (RLGI) $RS(v_i) = \frac{RLGI(v_i)}{\max(RLGI)}$----

--compute the ranking score.

IS← Add first rank node

5: Return IS.

Section i): A community is a group of individuals in the social network that connect with each other more intimately than individuals outside the community[25]. Hierarchical clustering (abbreviated as H-Clustering) is the clustering technique designed for phase one of IM. In H Clustering, we use a bottom-up strategy to repeatedly combine vertices with significant structural similarity(SS) into communities, including the concept of modularity [26].

H-Clustering first calculates the SS between a node and its surrounding nodes for every node in the provided social media network, where the SS functioning as the edge weight for the neighboring vertices. Eq-1 defines the similarity between two neighboring vertices u and v:

$$Sim(u_i, v_j) = \frac{|adj(u) \cap adj(v)|}{\sqrt{|adj(u)| \times |adj(v)|}} \quad (1)$$

H-Clustering initially treats every node as a community and clusters every pair of vertices into a community if the SS between those two vertices is the highest among their surrounding edges from each other after collecting the SS of all edges in the network. Until a termination condition is fulfilled, the procedure is repeated.

TABLE 1: SIMILARITY VALUES OF EACH EDGE IN THE GRAPH

Edge	$Sim(u_i, v_j)$	Edge	$Sim(u_i, v_j)$
v1, v2	0.816	v6, v7	0.755
v2, v3	0.577	v7, v9	0.377
v3, v4	0.612	v7, v8	0.654
v3, v5	0.670	v7, v10	0.566
v4, v14	0.288	v8, v10	0.866
v4, v5	0.912	v10, v11	0.707
v4, v6	0.816	v9, v13	0.707
v4, v7	0.617	v9, v12	0.707
v5, v6	0.894		
v5, v7	0.676		

To select whether to terminate the community identification process, we use the modularity gain(MG)[27] to assess the quality of identified communities. The modularity function is defined as follows, based on the SHRINK algorithm [28]:

$$Q(C) = \sum_{i=1}^{p} [\frac{IS_i}{TS} - (\frac{DS_i}{TS})^2] \quad (2)$$

whereIS_i, DS_i, TS_i defined as $IS_i = \sum_{u,v \in c_i} Sim(u,v)$, $DS_i = \sum_{u \in c_i, v \in V} Sim(u,v)$ $TS_i = \sum_{u,v \in V} Sim(u,v)$ is the sum of similarity between any two vertices in the network. MG value of any two different cluster C and C'for any graph defined as $\Delta Q_{c \to C'} = Q(C') - Q(C)$.The MG is used as the terminating criteria in H-Clustering. Every iteration, we aggregate all pairings based on the clustering outcome from the previous iteration. Consider that the last iteration's clustering result and the current iteration's clustering result are C and C', respectively.

If the gain in modularity from C to C' is negative, H-Clustering will halt clustering since the prior clustering result is good enough to generate larger communities of vertices with the strongest SS among their neighbors. As a result, the network has some homeless nodes that are not part of any community.

Section ii): Given a social media network G = (V, E), while decomposition for K-core process, the overall number of iterations for the k-degree iteration is m_k, and vertex $vi \in V$ is deleted in iteration number n_k. Then $1 \leq n_k \leq m_k$, the NIM is therefore defined as

$$\delta_i = (1 + \frac{n^k}{\max(m_k)}) \quad (3)$$

Where the maximum number of total iterations for every k is max(m_k). While conducting k-core decomposition, the NIM calculates the normalized iteration value at which a vertex is eliminated from the cluster. this concept is Adapted from [31]. We can establish how vital a vertex is and what its normalized k-core value in the cluster is by computing the NIM. From a cluster perspective, a vertex with a higher NIM is more significant, since the NIM calculates the node's local significance/importance.
In the present method computes the NGI using the NIM, the degree of vertex, and the k-core decomposition value as follows:

$$NGI(v_i) = deg(v_i)*KD(v_i)*\delta_i /|V| \quad (4)$$

The NGI calculates local significance by normalizing the NIM based on the cluster size. The NGI calculates a node's global importance in the cluster by combining its local and global significance if we want choose more than two nodes to select from the single cluster.
The proposed technique then computes the RLGI from the NGI, taking into consideration the nodes' immediate surroundings to avoid clustering of influential nodes. The following is how the RLGI is calculated:

$$RLGI(v_i) = \frac{NGI(v_i)*\deg(v_i)}{\sum_{\forall j \in \Gamma(v_i)} NGI(v_i)} \quad (5)$$

Calculate the RS of the nodes using the RLGI. Find the set of influential vertices in the cluster using the RS of the vertices by ranking the nodes according to the RS:

$$RS(v_i) = \frac{RLGI(v_i)}{\max(RLGI)} \quad (6)$$

TABLE II: RANKING SCORES OF NODES

Node	RS(vi)	Rank	Node	RS(vi)	Rank
v7	1	1	v6, v9	0.278	7
v4	0.755	2	v1	0.174	8
v5	0.463	3	v8	0.154	9
v10	0.363	4	v12, v13	0.116	10
v2	0.353	5	v11	0.077	11
v3	0.281	6	v14	0.031	12

After calculating the ranks of every node of each cluster we choose a best-ranked node from each cluster as seed nodes and apply the IC model to calculate the expected diffusion value (influence spread) of selected nodes. then we choose nodes that have the highest diffusion value depends on N-value (top n nodes).

IV. PERFORMANCE

Here, in fig 1. we compare running times of the five different community detection algorithms Kcut[29], shrink[28], METIS[30], H_Clustering[24], agglomerative clustering algorithm [31] on the NETHep dataset; in this scenario is the time performance of algorithms observed. From the observations, the H_Clustering method takes less time among all the methods for discovering the communities in the given network. next we find target nodes for IMP. The proposed scalable method is effective in finding the set of top N nodes. For NIM, degree computation,k-core decomposition, NGI, RLGI calculations take time in order of $O(n)$ and the time complexity of this method is $O(n)$.

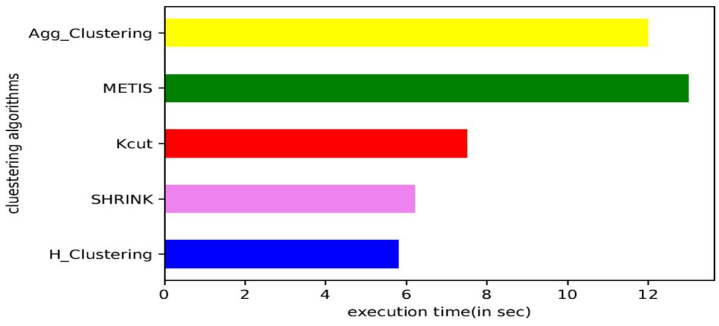

Fig.1.Run time-- on NETHep dataset

V. Conclusion and Future Directions

In this research, a few set of seed vertices in unweighted and undirected real-world social media complex networks are discovered using a unique approach used. In the present work, the technique is purely based on network structure, and no network information is required. It is good at locating key nodes and can quickly disseminate information throughout the large social media network. It's also scalable, because the ranking value of nodes is determined by the local network topology of each community and, as a result, identifies the network's Top-N influential vertices.

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Multi-Mode Detection and Identification of Biometric using Multilevel Scaler SVM

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***Abstract*—The Face, iris and fingerprint are most promising biometric authentication system that can be identify and analysis a person as their unique features that can be quickly extracted during the recognition process. To ensure the actual presence of a real legitimate trait in difference to a fake self-pretended synthetic or reconstructed sample is aimportant problem in biometric verification, which needs the development of new and efficient protection measures. Biometric systems are vulnerable to spoofing attack. A dependable and efficient countermeasure is needed in order to combat the epidemic growth in identity theft. The biometric detection and authentication deals with non-ideal scenarios such as blurred images, reflections and also faked by the other users. For this reason, image quality assessment approaches to implement fake detection method in multimodal biometric systems. Image quality assessment approach is used to construct the feature vectors that include quality parameters such as reflection, blur level, color diversity, error rate, noise rate, similarity values and so on. These features are stored as vector in database. Then implement Multi level Support Vector Machine classification algorithm to predict fake biometrics.**

***Index Terms*— Multimodal biometrics, Image Quality, Spoofing attack, Fake detection, Feature Vector.**

I. INTRODUCTION

Biometric is epidemically growing technology for automated acknowledgment or authentication of the uniqueness of a person using distinctive physical or behavioral characteristics such as fingerprints, face, iris, retina, voice, hand geometry and signature etc. To ascertain a personnel identity biometric relies on - who you are or what you do, as conflicting to what you remember -such as a PIN number or secrete keyword or what you use -such as an ID card. However, significant advances have been realized in biometrics, several spoofing techniques have been established to deceive the biometric systems, and the protection of such systems against attacks is still an open problem. Among the changed threats examined, the direct or spoofing attacks have provoked the biometric community to study the liabilitiesin contradiction of this type of duplicitous actions in performances such as the fingerprint, the face, the signature, or even the bearing and multimodal tactics.Spoofing attacks arise when a person tries to masquerade as someone else faking the biometrics data that are confined by the acquisition sensor in an attempt to avoid a biometric system and thereby aheadillegal access and advantages. Some type of falsely created artifact e.g. gummy finger, printed iris image, face mask, photograph, audiovisual, 3d Model or imitate the behavior of the actual user (e.g., gait, signature) etc. are used by the imposter to fake the biometric scheme.Consequently, there is an accumulative essential to detect such efforts of attacks to biometric systems. Liveness detection is one of the existing countermeasures in contradiction of spoofing attack. It aims at

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physiological signs of being in biometric illustration such as eye blinking, face expression changes, mouth movements, finger skin sweat, blood pressure, particular replication properties of the eye etc. by accumulating exceptional sensors to biometric system. Use of multimodal system is another beneficial countermeasure in contradiction of spoofing attack. Combining face or iris or fingerprint recognition by means of other biometric modalities such as bearing and language is perception of multimodal system. Indeed, multimodal systems are intrinsically more tricky to spoof than uni-modal systems. Multimodal systems are more complex than the single modal systems. The multimodal biometrics system illustrated in fig 1.

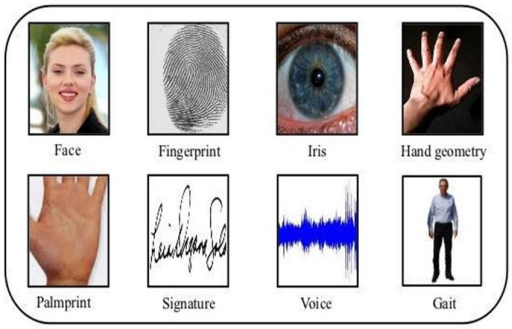

Figure. 1. Multimodal Biometric system

Therefore, there is an increasing need to detect such attempts of attacks to biometric systems. In addition to spoofing attacks, there are other ways to attack system. If an impostor (user that does not have permission to access the system) has access to scores of the recognition system, the user can easily circumvent the system. However, this type of attack is more difficult to be performed. Since the acquisition sensor is the most vulnerable part (any user has easy access to this part of the system), spoofing attack techniques have become more attractive for impostor users.

II. Related Work

Julian Fierrez, et.al [3] proposed a novel parameterization using quality events which is verified on a thoroughliveness detection system.Image quality can be assessed by measuring one of the following properties: frame strength or directionality, veracity of the ridge-valley structure ridge continuity, ridge clarity, or estimated authentication performance when using the appearance at hand. A number of information are used to measure these properties: (i)angle information provided by the direction field,(ii) pixel intensity of the
gray-scale image, (iii)Gabor filters, which represent another implementation of the direction angle, and power spectrum. (iv) Fingerprint quality can be assessed either examining the image in a holistic method, or combining the quality from local non-overlapped blocks of the image.

J. Galbally, et.al [2] studies two cases for attack detection in faces. The first case study examines the efficiency of the Bayesian-based hill-climbing attack on an Eigen face-based system. The second study employs the previously found optimal configuration to attack a GMM Parts-based system. By using the same optimal configuration between studies we can determine if the performance of the attack is highly dependent on the values of the parameters selected.

Javier Galbally, et.al [6] presented liveness detection solutions for great importance in the biometric field as they help to prevent direct attacks those accepted out by means of synthetic traits, and very difficult to detect), improving this mode of level of the security provided to the user.

Jaime Ortiz-Lopez,et.al, [4] introduced a publicly existing database, procedures and a typical technique to guesstimate counter measures to spoofing attacks in face recognition systems. There seems to survive no consensus on best practices and techniques to be situated on attack exposure using non-intrusive systems. The number of publications on the subject is little. A missing key to this puzzle is the absence of typical databases to test counter-measures, trailed by a set of protocols to evaluate performance and allow for objective comparison.

Alessandra Lumini, et.al[5] proposed the image reconstruction approach exploits the evidence stored in the pattern to recreated a accurate image by guessing several aspects of the original unknown fingerprint through four processing steps. The attacking scenario measured in this work supposes that only the mandatory evidence stored in a Impression Particulars Record of the ISO template is available.

Lacey Best-Rowden, et al.,[13] implement face quality actions to determine when the fusion of resource sources will help boost identification accuracy. The quality actions are also used to assign weights to altered media sources in fusion schemes.

A multimodal biometric recognition based on finger images was discussed in [20].The local binary patterns algorithm was used to extract features and match for the fingerprints and finger veins, while the oriented FAST and Rotated BRIEF algorithm was applied for knuckle prints. Finally, score-level fusion was performed on the matching results from the above three finger biometrics. In [21], a multimodal biometric recognition using iris and facial images was discussed. Contourlet transform and two dimensional principal component analyses were used here to extract the iris features and the facial features respectively, and a feature vector was formed by the combination of the iris and facial features. A fixed random matrix was used here, to improve the recognition efficiency. The excellence of sum rule-based and support vector machine based score level fusion were deliberated in [22]. Three biometric characteristics were taken into consideration, for the purpose of the investigation, including fingerprints, faces, and finger veins. Authors have formulated vigorous normalization systems, such as, diminution of high-scores effect normalization which has been obtained from min-max normalization technique.

ShubhangiSapkal [23] have smartly developed a novel level synthesis method to fine tune population coverage and scale down spoofing, that possess the quality of flexibility to error forbearance of various mono-modal biometric techniques. This method was intended as an access management system necessitating the enhanced safety in permitting access to significant data. Poh, N. [24] have proficiently proposed a technique to mechanically validate the uniqueness of an individual by way of biometrics, employing face and fingerprint. They established the fact that the superior performing fusion algorithms were those that make the utmost use of the mechanically mined biometric trait quality calculated with a view to detect the utmost possible biometric mechanism from which the query biometric data was obtained.

Recently, personal identification by means of hand print has attained progressively more research attention. Hand print recognition has been deliberated in [25], based on the statistical processing of the hand vein patterns. The hand vein database has been collected under practical conditions and subjected to go through different procedures. Here a combination of geometric and appearance-based techniques were used for feature extraction and distance metrics for recognition. A bank of Gabor filters was used for feature extraction [26] of finger print images, from which fingerprint codes were generated using the local and global features of S. Bharathi *et al*. Hand print -based Multimodal Biometric Recognition the hand print. Nearest cosine classifier was used for classification and fusion was carried out at the decision level. In [27], Palm-dorsal vein recognition method based on histogram of local Gabor phase XOR Pattern has been suggested. They have used chi-square distance measure for recognition. The modified two directional two-dimensional linear discriminant analysis was proposed by Lee [28] for personal verification approach using palm vein patterns. A minimum distance classifier was used here for identification. From these discussions, it is clear that the vein based biometrics provide improved security and it cannot be easily spoofed or falsified. Hence, in our proposed system, we have used hand vein biometrics, such as, finger vein, palm vein and dorsal vein of the hand, for multimodal biometric recognition.

III. IMAGE DISTORTION ANALYSIS BASED FACE SPOOFING DETECTION

Biometrics provides tools and techniques based on behavior, physical and chemical traits to recognize humans in an automatic and a unique manner. The most common cues are fingerprint, face, iris, hand geometry, hand vein, signature, voice and DNA. Due to recent pattern recognition advances applied to face recognition, biometric systems based on facial characteristics have been largely applied to problems, including access control, surveillance and criminal identification. At the same time that significant advances have been achieved in biometrics, several spoofing techniques have been developed to deceive the biometric systems, and the security of such systems against attacks is still an open problem.

Spoofing attacks occur when a person tries to masquerade as someone else falsifying the biometrics data that are captured by the acquisition sensor in an attempt to circumvent a biometric system.Security is main concern for today's scenario. A high level industry uses passwords like thumb, face, voice, iris, etc. So lots of security systems are available. But not so reliable. Here the developing system which is very precise and reliable. The system has two stages which is rooted system. Even if any stage is split incorrectly, unofficial entry will be identified. Existing framework analyzed image distortion analysis approach to identify the fake faces. IDA includes specular reflection, chromatic moment, blurriness and color diversity). Specular Reflection Features analyze illumination of the images.

Then blurriness is measured based on the difference among the actual input image and its blurred version. Then convert the normalized facial image from the RGB space into the HSV (Hue, Saturation, and Value) space and then calculate the mean, deviation, and skewness of each channel as a chromatic feature. Finally analyzed color reproduction loss in input images.Feature vectors are then fed into multiple SVM classifiers. The proposed scheme is to achieve a more stable face spoof detection performance.

IV. Multimodal Biometric System Using Image Quality Assessment

To ensure the genuine presence of a real rightful trait in difference to a fake self-manufactured imitation or recreated sample is a major trouble in biometric verification, which requires the improvement of new and effective security measures. Background to fingerprint detection describes the biometric use of fingerprints scanning is also done by biometric tools. The objective of proposed system is to enhance the security of biometric recognition frameworks, by adding liveness assessment in a speedy, user friendly and non-intrusive manner, through the use of image quality assessment. Image quality assessment divided into full reference and no reference methods.

Full-reference (FR) IQA methods rely on the accessibility of a clean undistorted reference image to estimate the quality of the test sample. Full reference IQA contains three types of measurements such as error sensitivity measures, structural likeness measures and information theoretic measures. No-Reference IQ Measures does not require of a reference sample to regulate the quality level of an image. This measurement contains such as distortion measures, training based measures and natural scene statistics measures. Then implement image fusion approach to combine all biometric features that includes iris, face and fingerprint features. And finally QDA based classification technique can be implement to finalize whether image is real or fake.

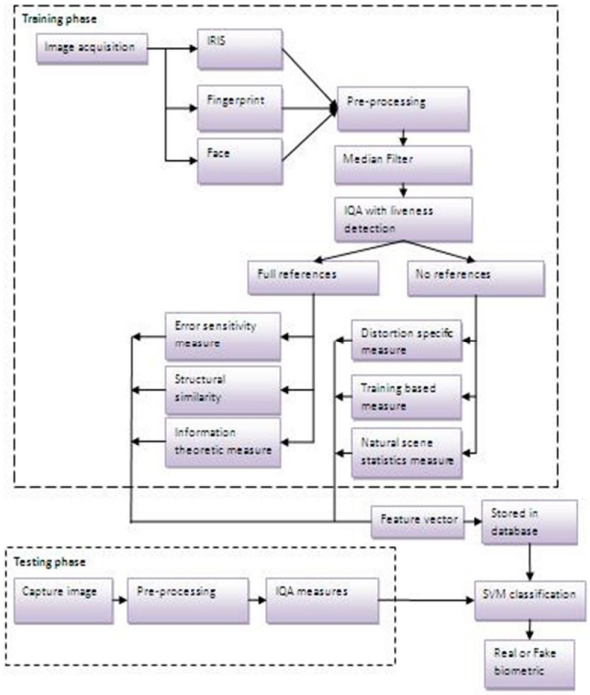

Figure 2. Proposed Framework

A. Fingerprint Recognition System

Every fingerprint of each person is considered to be distinctive, Even the Twins also contain different fingerprint. Fingerprint recognition is the most conventional biometric recognition method. Fingerprints impressions have been used from long time for identifying individuals. Fingerprints contain of ridges and

furrows on the surface of a fingertip. Now fingerprint identification system is used in iphone, there are numerous areas where the fingerprint recognition system used.

But attackers attack on fingerprint recognition system. Attackers first detain real fingerprint then they make fake fingerprint by using silicon, gelatin and playdoh and try to access the system.

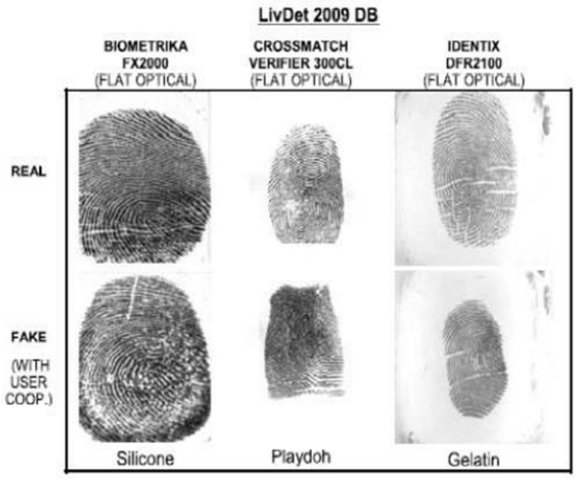

Figure. 3. Fingerprint datasets

B. IRIS Recognition System

Iris recognition is a computerized method of biometric identification which uses numerical Typical recognition methods on video images of the irises of an individual's eyes, whose multifaceted random patterns are distinct and can be seen from some distance. Iris cameras perform detection of a person's identity. The iris examines practice start to get approximately on film. It combines computer vision, statistical inference, pattern recognition and optics.

The iris is the highlighted ring around the pupil of every human being and like a snowflake; no two are the same. Each one is distinctive. An attack on the iris is not so easy but how to attack on the system is as shown below. To create a fake iris is of three step.

1) Novel images are capture for a better quality, then
2) They are printed on a dissertation using a commercial printer
3) Printed images are presented at the iris sensor.

The iris datasets are gathered from CASIA database and then images in fig 4.

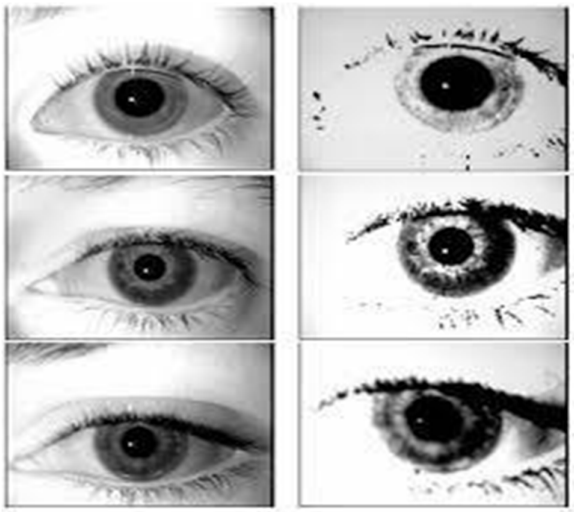

Figure 4. IRIS datasets

C. Face Recognition System

The most acceptable biometrics is Face recognition, because it is one of the most general methods of documentation that humans employ in their visual interactions and acquisition of faces. The face acknowledgment systems make different among the contextual and the face. It is most substantial when the system has to categorize a face within a multitude. The system then creates use of a person's facial features – its valleys and heights and milestones and indulgences these as lumps that can be equated and plannedin contradiction of those which are stored in the system's database.

There are about 80 lumpsencircling the face print that makes use of the system and this includes the eye socket depth, jaw line length, distance between the eyes, cheekbone shape, and the size of the nose. It is very challenging to develop this recognition technique which can recognize the effects of facial expressions, age, slight variations in the imaging environment.

Attack on the face recognition system is shown in the following figure in that figure fake and genuine image are shown and that images are discover out due to different method of face recognition. In face recognition system fake users attack on system by detaining the picture to the mobile devices or camera. And try to authenticate. Possible scenarios in face database in fig 5.

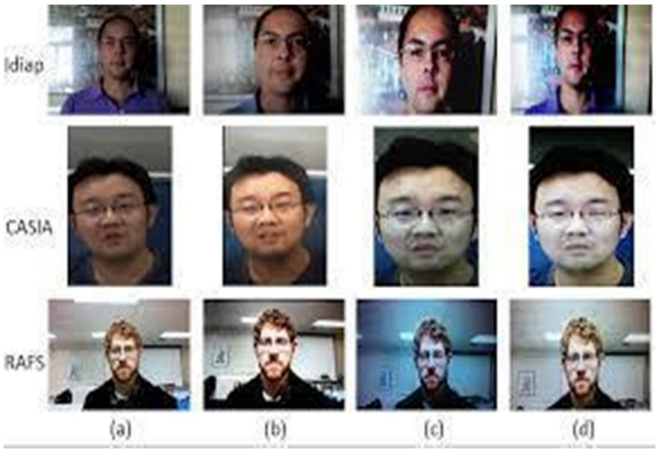

Figure. 5. Face datasets

V. PROPOSED METHOD

Biometric recognition has the advantage of being reliable and secure for authentication purposes. Multi-biometrics uses more than one trait and overcomes the draw backs of using single modality. It improves security, but choosing the right modality and techniques involved, is of utmost importance. Finger vein, palm vein and dorsal vein of the hand are used here as the biometric modalities. The proposed technique employs Shearlet transform and SIFT for feature extraction and the fusion is carried out using maximum likelihood ratio-based technique. The block diagram of the proposed technique is given in Fig. 1.

A. Formation of feature set

In order to generate the required feature set, the input vein images of hands are transformed using Shearlet transform and Scale-invariant feature transform.

B. Shearlet Transformation

The Shearlet is an affine system with a single generating mother Shearlet function parameterized by a scaling, shear, and translation parameter. The Shearlet transform thus overcomes this drawback while retaining most aspects of the mathematical framework of wavelets. Shearlet has the properties that the associated system forms an affine system and the transform can be regarded as matrix coefficients of a unitary representation of a special group.

Shearlet can be represented as:

$$\Psi_{a,s,t}(x) = a^{-3/4}\Psi((D_{a,s}{}^{-1}(x-t)), \quad where \quad D_{a,s} = [a, -a^{1/2}s; 0, a^{1/2}] \qquad (1)$$

1. Input data sets
2. Perform SVM-Sheralt Transformation
3. Check for scale invarant
4. Perform mapping with MATCH IDENTIFICATION

4.1 Check For Like hood Base Function
4.2 Check Scaler-Sheralt Invert Transformation

5. If True
   5.1 Match Is Accurate
   Else
   5.2 Match Is Not Accurate

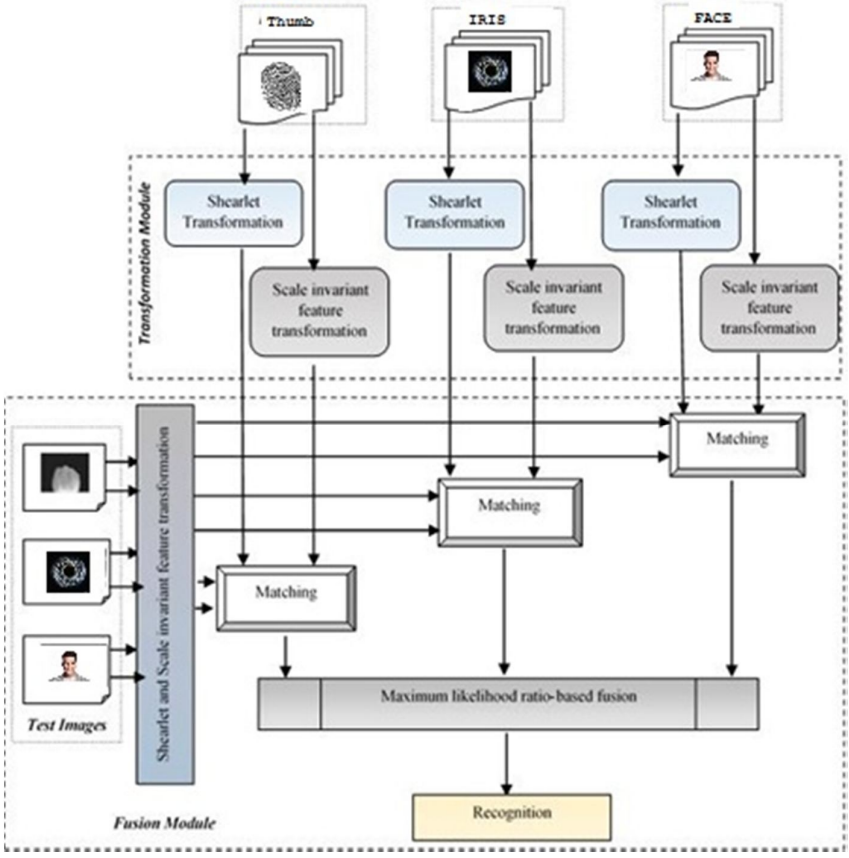

Figure 5. Algorithm flow for multi-mode Detection of Biometric data sets

Where, *a* is a scaling parameter, *s* is a shear parameter and *t* is a translation parameter.
The mother Shearlet function Ψ is defined as:

$$\Psi(\xi_1,\xi_2) = \Psi_1(\xi_1)\Psi_2\left(\frac{\xi_2}{\xi_1}\right) \quad (2)$$

Where, Ψ_1 is a wavelet and Ψ_2 is a bump function.

The associated continuous Shearletscaler transform depends on the scaling, shear and translation parameters and is defined by

$$ST[f(a, s, t)] = \langle f, \Psi_{a,s,t} \rangle \quad (3)$$

This transform can also be regarded as matrix coefficients of the unitary representation:

$$\sigma(a, s, t)(\Psi)(x) = \Psi_{a,s,t}(x) = a^{-3/4}\Psi(D_{a,s}^{-1}(x-t)) \quad (4)$$

Let the input hand vein, finger vein and palm vein images be represented as

$$H = \{h_1, h_2, h_3, ..., h_n\},\ D = \{d_1, d_2, d_3, ..., d_n\} \text{ and}$$
$$P = \{p_1, p_2, p_3, ..., p_n\} \quad (5)$$

Here, n is the number of images. Then the Shearlet transformed thumb, Iris, and face images can be represented by

$$SH = \{sh_1, sh_2, sh_3, ..., sh_n\},\ SD = \{sd_1, sd_2, sd_3, ...sd_n\} \text{ and}$$
$$SP = \{sp_1, sp_2, sp_3, ...sp_n\} \quad (6)$$

C. Scale-Invariant Feature Transformation

Scale-invariant feature transform (SIFT) is a step by step procedure to identify and delineate the local features in images. There are mainly four steps involved in SIFT algorithm namely scale space extrema detection, key point localization, orientation assignment, key point descriptor and key point matching.

Scale-space extrema detection is employed to detect larger corners using larger windows. Here, Laplacian of Gaussian (LoG) is found for the image with various scaling parameter values (θ). LoG acts as a blob detector which detects blobs in various sizes. As LoG is a little costly, SIFT algorithm uses Difference of Gaussians which is an approximation of LoG. Difference of Gaussian (DoG) is obtained as the difference of Gaussian blurring of an image with two different θ and $k\theta$. Once this DoG is found, images are searched for local extrema over scale and space.

Once potential key points locations are found, they have to be refined to get more accurate results in the key point localization. If the intensity at this extrema is less than a threshold value, it is rejected so as to eliminate low contrast key points. Similarly, edge threshold is used to remove low edge key points. These processes would rise to retain of strong interest points.

The SIFT transformed images of Thumb, Iris and Face images can be represented by

$$FH = \{fh_1, fh_2, fh_3, ..., fh_n\},\ FD = \{fd_1, fd_2, fd_3, ... fd_n\} \text{ and}$$
$$FP = \{fp_1, fp_2, fp_3, ...fp_n\} \quad (7)$$

D. Maximum Likelihood Ratio-based Fusion and Recognition

The feature set obtained from the transformations are matched and fused for recognition. Initially, images of hand Thumb, Iris and face are transformed using the above transforms and stored in the database. The database (DB) would consist of both the Shearlet and the SIFT transformed images:

$$DB = \{SH, SD, SP, FH, FD, FP\} \quad (8)$$

Where,

$SH = \{sh_1, sh_2, sh_3, ..., sh_n\}$, $SD = \{sd_1, sd_2, sd_3, ..., sd_n\}$, $SP = \{sp_1, sp_2, sp_3, ..., sp_n\}$, $FH = \{fh_1, fh_2, fh_3, ..., fh_n\}$

$FD = \{fd_1, fd_2, fd_3, ..., fd_n\}$ and $FP = \{fp_1, fp_2, fp_3, ..., fp_n\}$

Subsequently, the matching score is compared to the test input images and those in the database. The test images are represented by:

$$T = \{h_{test}, d_{test}, p_{test}\} \quad (9)$$

The transformed images are represented as:

$$T^* = \{sh_{test}, sd_{test}, sp_{test}, fh_{test}, fd_{test}, fp_{test}\} \quad (10)$$

These features are compared with those in the database using the Euclidean distance measure which gives the matching score. If the Euclidean distance between the test image and that of the data base image is less than the

threshold set, then the images are said to be in a matched condition. Suppose the Euclidean distance between images Im_1 *and* Im_2 is represented by *dis* and the threshold set is represented as d_{thr}, then,

$$if\ dis < d_{thr}\ ,\ then\ \ Im_1\ and\ Im_2 \text{are in matched condition} \qquad (11)$$

Each of the images are matched with the database image and then matching scores of all images are discovered. After the matching process, a fusion process is carried out with the use of maximum likelihood ratio based fusion. It is basically a density based score fusion which requires explicit estimation of genuine and impostor match score densities. Each comparison of the test image with that in the database would yield a matching score and for the fusion process each of the matching scores are taken into consideration. It is supposed that total of *m* matching is carried out, to get the matching score vector given by

$$SV = \{sv_1, sv_2, ..., sv_m\} \qquad (12)$$

Let the conditional joint densities of the M match scores for the genuine and impostor classes be represented by *Ge(sv) and Ip(sv)*. The respective class of genuine or impostor is assigned by analyzing the score vector and Gaussian mixture model is employed for finding out the score densities.

Let the M-variant Gaussian density be represented as $g(sv;\mu,c)$, where μ is the mean vector and c is the covariance matrix.

The estimates obtained can be represented as $\hat{Ge}(sv)$ *and* $\hat{Ip}(sv)$. Then the maximum likelihood ratio is given by:

$$L(sv) = \frac{\hat{Ge}(sv)}{\hat{Ip}(sv)} \qquad (13)$$

The matching score vector *sv* is assigned to genuine class, if $L(sv) >$ decision threshold or assigned to impostor class, if $L(sv) \leq$ decision threshold. The
decision threshold is determined based on the specified False acceptance rate (FAR).
The performance of the system is measured using False Fake Rate and False Genuine Rate. Compare to existing system, our work provide reduced number of FFR and FGR. The graphical representation is in fig 6.

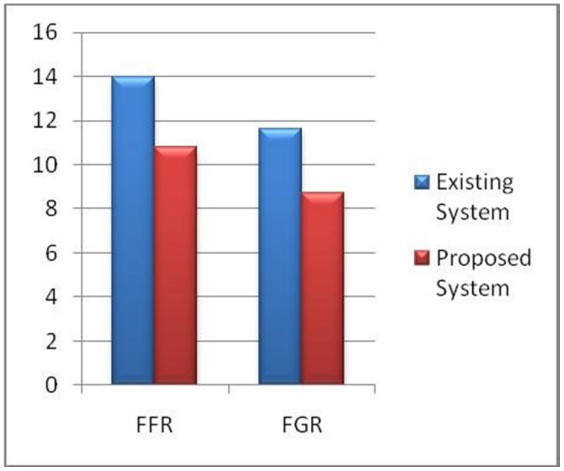

Figure 6. Performance evaluation

VI. CONCLUSION

Image quality assessment is used to detect the fake biometrics. Due to Image quality dimensions it is simple to find out real and fake users because fake identities often have some different features than original it always enclosed different luminance and color levels, general artifacts, extent of evidence, and magnitude of sharpness,

found in both type of images, natural appearance or structural distortions. Multi- Biometric system is challenging system. It is more secure than uni-biometric system. This technique can analyze multi modal biometric system with image fusion approach. Implement image fusion approach to combine both biometrics (fingerprint and iris, iris and face, face and fingerprint). So we can implement image SVM Scalar technique to fuse all biometric features as in one image format. This method is used to improve security in database level. The dynamic IQA is a very promising technique in making recognition system more robust against fake based spoofing attempts to provide alert system to intimate mobile message to person who are authorized by the system.

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Roles of IoT in Business and Marketing Areas Challenges and Prediction

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***Abstract*—This paper explores IoT applications in marketing research and provides information on how organizations are using IoT devices and other emerging technologies such as artificial intelligence (AI), machines learning (ML), and social networks to promote various products and services. Moreover, this study shows how the consistent use of IoT technologies leads to significant organizational competitiveness. Paper too explains how IoT can be called a new component of business intelligence and digital marketing discusses the challenges associated with implementing IoT solutions. The Internet of Things (IoT) is now evolving into a global infrastructure that provides complex services connection of different things (physical and virtual) based on information system technology. This research shows the role of Internet of Things (IoT) technology in business and marketing. In particular, this study is also deeply revealing IoT technology to understand the various key elements, operational domains and their various use cases technology in business and marketing.**

***Index Terms*— Internet of Things, Marketing, Prediction, Challenges.**

I. INTRODUCTION

The Internet of Things (IoT) was initially accredited as a concept in 1999 to support radio frequencies. Identification Technology (RFID) and Interconnected Computing Devices. The range of devices includes computers, smartphones, wireless sensor networks, home/building automation, manufacturing tools, software applications and smart appliances (Lo and Campos, 2018). Collection, processing and sharing of data enable a wide range of benefits for consumers and organizations through IoT. For example, by adoption IoT devices enable the diagnosis, treatment and prevention of diseases using electronic means (Vermesan and Fries, 2014). In addition, it is possible to integrate consumer devices into a single IoT system, increasing energy efficiency (Ray, 2018). In marketing smart devices related to IoT can track product deliveries, resulting in recommendations to owners regarding new purchases, offers and trends. At the same time, the number of IoT devices is expected to reach 30 billion by 2020, as many researchers and IT experts predicted [1][2].
IoT technology enables everyone, processes, data, and different things to put together to form the appropriate

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networks and have value for information transformation specific actions that can create new experiences and opportunities for every business person [3]. These the possibilities are unprecedented, with technology which allows you to interact with 4.5 billion Internet users today. These conditions provide a wide playing field companies to develop new business models to benefit wider market share [4]. Today there are more devices connected to Internet, sensors and robots. Not only companies, but also people receive data from IoT devices [5]. The The purpose of this study is to answer the following research questions:
RQ1: What is the role of IoT in creating business and more interactive and intelligent marketing customer interaction?
RQ2: What topics are opportunities for the future research results bibliometric analysis?

II. Related works

Computer technology along with networking and of telecommunication technologies, cooperated with form a more sophisticated network connection platform people with people, people with cars and machines to machines [6]. Integration of these technology in modern marketing is crucial [7].
This is based on the literature; IoT has significant potential, where 51% of the world's leading marketers expect IoT to revolutionize the marketing landscape 2020 [8]. It also matches what was delivered Institute of Telecommunications Union (ITU). IoT is the global infrastructure for the information society which can connect anything (physical and virtual). About existing and developing information that may be managed by information and telecommunications technologies [9]. Based on research [10] IoT will continue to evolve into a technology that is widely seen as a way future and underpin other trends, such as how smart there will be more products that are connected widespread, automation and connectivity a processes and devices, increasing datafication trends [11] and increased investment.
IoT can be a key tool for improving aspects of marketing research. Technical possibilities. IoT can empower marketing managers to plan and conduct comprehensive marketing research (Pauget and Dammak, 2019; see Figure 1. There are many factors to consider when conducting this research respectively (Ray, 2018). For example, convenience has become a strategic marketing tool because it is important an attribute of the customer experience and the brand as a whole. Using IoT platforms for marketing research, approach and communication methods enable marketing managers to establish good relationships with consumers. IoT features such as machine-to-machine (M2M) communication, automation and big data can quickly assist marketing managers in identifying marketing opportunities and accurate segmentation market (Allhoff and Henschke, 2018). IoT can be called a new component of business intelligence and digital marketing. Organizations can offer a new product or service based on the consumer market segmentation (Vermesan and Friess, 2014). This characteristic can also be the basis for customer-oriented marketing (Pauget and Dammak, 2019). IoT devices tend to make the advertising process easier become less inconvenient as these technologies provide the target audience with the opportunity to purchase the product or brand-related information (Moradi and Badrinarayanan, 2021) based on their choices and preferences.

III. IoT analysis and Applications

In the context of communication, IoT platforms create a significant number of new opportunities for organizations. IoT and social media can play a critical role in expanding marketing channels and tools. Nowadays, organizations use social media to get feedback about products and services (Ray, 2018). The integration of IoT and social media technologies can create a digital space where the company and purpose the audience may have a closer relationship (Caro and Sadr, 2019). In addition to sharing personal data, the possibility increasing the customer base above (Vermesan and Friess, 2014). In general, IoT technologies can become integral component of integrated marketing communications (IMC) and transform the overall architecture business communication.
Conducting marketing research is one of the main tasks of a marketing manager. Getting Big Data from the IoT marketing research tools can create many opportunities such as attracting the desired audience, increasing conversion rates, increasing brand awareness and making quick business decisions (Ray, 2018). IoT platforms enable the collection of consumer data in limitless volume, speed and variety. Data type typically includes age, gender, preferences, social status, income, interests, purchasing patterns, location, and more. types of behavior (Pauget and Dammak, 2019).
There are more opportunities related to market segmentation comprehensive and powerful. Because communication between interconnected computing devices is faster due to Using IoT, industrial automation

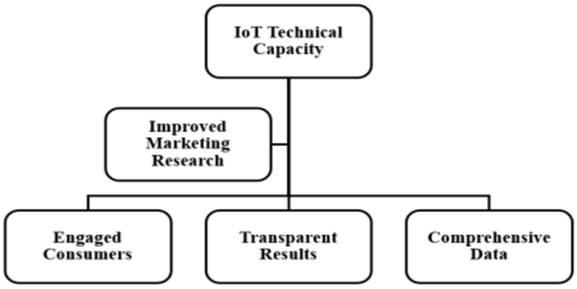

Fig 1: IoT Marketing Research Strategies

tools can help marketing managers quickly get detailed and different consumers behavioral traits (Ray, 2018). As a result, this process significantly improves marketing research and organizational productivity. A significant number of consumers have already adopted modern technologies such as social media, gadgets and smartphones to make purchasing decisions and facilitate payment options.

Consumers are gradually showing a greater willingness to use mobile and wearable applications shopping. This trend is particularly exciting for companies, as they can collect information about purchases consumer patterns and types (age, gender, social status, etc.) (Madakam et al., 2015). This will still help organizations develop qualitative and quantitative databases that can improve product development process, supply chain method, advertising strategy and marketing research. Organizations should emphasize the ability of IoT platforms to obtain location-based consumer information [12].

One of the main components marketing research (market information, market trends, data analysis, SWOT analysis and PEST analysis). market segmentation (Pauget and Dammak, 2019). This is of the greatest importance to organizations recognize target customer segmentation. In the context of marketing research, IoT as a tool can help marketing managers integrate various factors into an analytical process to make data-driven decisions (Madakam et al., 2015). Organizations should collect quality data from effective marketing analytics whenever possible maximize efficiency, productivity and optimal return on investment (ROI).

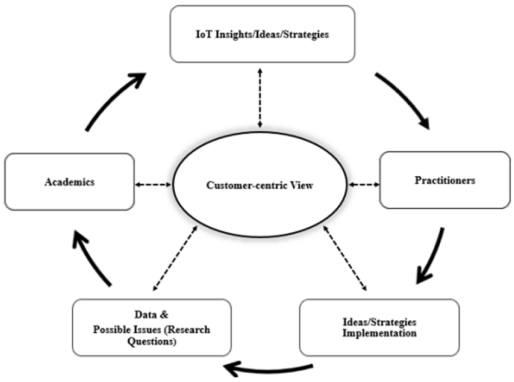

Figure 2: Customer Centric and Collaborative View

The aforementioned device enables the use of new services for consumers, for example, an alert function or product change notification e.g as middleware with sensors installed in the sink the machine can provide regulatory information about washing through the customer's smartphone on how to use the washing machine is optimal and saves energy as well as IoT application software that is built into the machine can notify consumers via smartphone when some parts require maintenance or replacement. The example shows that the product's intelligent connectivity enables companies to build closer relationships with customers and create a more interactive business and marketing experience patterns. Businesses now need to be able to read marketing more social media-oriented trends where The possibilities of the Internet and social networks are used for marketing purposes that are much more interactive and make customers' lives more comfortable. In Art in the long run, IoT technology can provide different solutions in the integration of the back and the front. This trend should be defined as part of the potential corporate marketing strategy in the age of social networks, where states that there

are at least six business trends which can be defined as: personalization, engagement, integration, analytics, monitoring and protection.

IV. Synchronization and Methodology Specification

Confirm marketing decisions and implement the product companies is one IoT role that cannot be ruled out. Engagement Marketing through IoT Gifts evolution through interaction proposed to solve business problems. However, this should also be remembered that there is a growing need for regulations which perform technical measures to ensure this customer rights are protected if they may not exercise their potential privacy. Different IoT devices can provide huge amount of data such as location, user movement, health, shopping preferences, and human activities, all of which are significant impact on privacy issues. On the other hand, IoT technology is making smarter and more connected products so that the communication style will be more attentive during interaction. It affects strengthening the brands of manufactured products. To better understand the role IoT has in business, this can also be considered from two perspectives: users and prospects of companies. IoT support can create Records detected through the database search (n = 1,166) Additional records defined through other sources (n= 143) Records after duplicates removed (n = 1,220) Records screened (n = 394) Records turned off (n = 826) Full text articles are evaluated for suitability (n = 116) Records turned off (n = 278) Make a final list primary is included studies (n = 52) Identities a fiction Screening Included Eligibility Advances in Economics, Business and Management Research, Volume 187 340 value, strategy, innovation, design and security from a company perspective. On the other hand, from the user in terms of IoT affects products significant impact on consumer purchase intentions defined by six characteristics and mediated customer experience namely:

1) IoT connectivity, the degree to which things are related,
2) IoT interactivity related to the customer's feelings in two-way communication takes place and a timely response,
3) IoT Telepresence, the client's subjectivity regarding the degree which media represent physical and social environment,
4) IoT intelligence, the ability to think, accurate recognition function and correct judgment,
5) IoT convenience, depending on the degree to which consumers can save time when planning, shopping, and product use,
6) IoT security to what extent vulnerable and valuable assets can be protected.

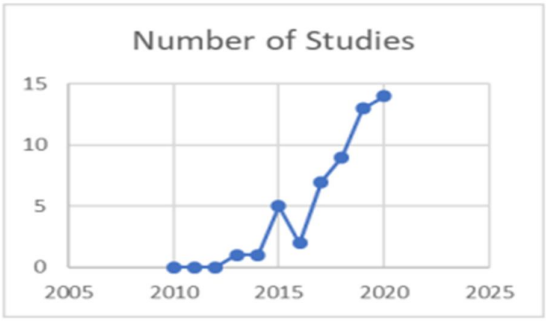

Figure 3: Distribution Reference on each study

In this mapping, the minimum requirements for the appearance of keywords in the article (title and abstract) as many as five times, then obtained 1473 items with 77 items meeting the specified threshold. Figure 3 above shows the mapping is divided into 7 clusters, namely:

1) First cluster: business; business model; data; device; everything; field; implication; information; internet; literature; number; opportunity; organization; person; sensor; things; time; user; year
2) Second cluster: access; addition; analysis; application; business model innovates; case study; context; framework; frontier market; industry; research; solution; value
3) Third cluster: adoption; case; challenge; domain; firm; future; impact; influence; IoT technology; marketing; new age technology; technology
4) Fourth cluster: big data; company; concept; interest; IoT device; network; process; product; system
5) Fifth cluster: consumer; demand service; factor; interaction; model; risk; service; smart customer experience

6) Sixth cluster: customer; Indian context; IoT; marketer; need; preference; restaurant; study
7) Seventh cluster: approach; dark side; dark side behavior; development; form; type.

Meanwhile, the color difference Fig. 4 provides a visual affirmation, where the yellow color indicates the keyword is widely researched and is a topic used as a tendency in research. In contrast, the green color indicates keywords that still rarely appear in research, so it has the opportunity to be research material in the future.

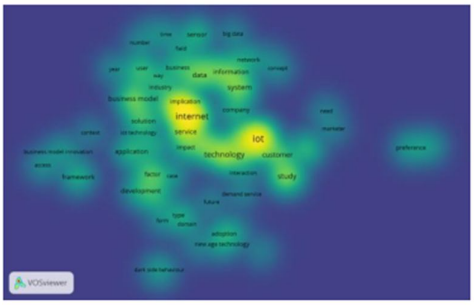

Figure 4: Selection of IoT model representations

V. Conclusion

IoT in business and marketing is important with from the back end to the front, creating smart products and campaigning for customers. IoT support can create value, strategy, innovation, design and customer service security from the company. Meanwhile, from Art from the customer side, IoT has a huge impact on the product purchase intentions. The paper shows how the consistent use of IoT technologies results in essential organizational competitiveness. In addition, there was a conversation about cooperation between scholars and practitioners in developing IoT tools. It was claimed that there was such cooperation some what useful for obtaining relevant information that can be used to advance marketing research on IoT technologies. The ideas shared by academics and practitioners also showed certain trends in consumer experiences about using IoT tools. However, the document noted that the accumulation of important data is associated with the emergence of specific problems, the solution of which requires an integrated approach developing useful and competitive IoT tools. The main challenges associated with the implementation of IoT solutions where are described as ethical and data privacy concerns. Undoubtedly, consumers in the digital age expect adequate secured, which will increase the speed of IoT decision-making. Future research should perhaps focus on ways to improve collaboration between scientists and practitioners to produce more compelling results on the strategic direction of development of transparent and integrated IoT solutions.

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Auction based Resource Allocation in Cloud Computing using Blockchain Techniques

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***Abstract*—As the spine innovation of decentralized cryptocurrencies, blockchain has additionally proclaimed numerous applications in different fields, for example, resource allocation in cloud computing, Internet of Things (IoT) and resource offloading. The database state is decentrally kept up, and any part hub in the overlay blockchain organize is allowed to partake in the state support without character confirmation. The exchanges among part hubs are recorded in cryptographic hash-connected information structures known as squares. A progression of affirmed blocksis orchestrated in ordered request to shape a consecutive chain, henceforth named blockchain. All part hubs in the system are required to pursue consensus protocol on the value-based information, cryptographic hashes and computerized marks put away in the block to ensure trustworthiness of the blockchain.**

***Index Terms*— Resource allocation, auction, blockchain consensus protocol.**

I. INTRODUCTION

A typical cloud computing architecture is encompasses the following techniques like ubiquitous computing ,on-demand network, pervasive computing and access to a different computing resources like storage, network, server, services and applications for human computer interaction. Virtualization techniques also sharing of resources like storage, network, server, services and applications by using three deployment models, four service models and five characteristics.Five characteristics of cloud computing and implemented in block chain technology such as Measuredservice: Utilization of resource are monitored, reported, measured by transparently. In this service another term called by pay for use. On-demand self-service: [1] cloud user is capable to use of cloud server or provider recourses without requiring of human interaction. It frequently done by web based self-service portal. Rapid elasticity: A resources are on-demand based cloud provider bid released his own based on cloud user bid. Our application will have capacity to extend the resource based on user needs at any time. Recourse pooling: More number cloud user access the same physical resource means this service separating the resources on logical level. Broad network access: cloud computing resource are access by over the network and supporting the heterogeneous user platform in form of mobile devices and workstations.
As the spine innovation of decentralized cryptocurrencies, blockchain has additionally proclaimed numerous

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applications in different fields, for example, resource allocation in cloud computing, Internet of Things (IoT) and resource offloading. The database state is decentrally kept up, and any part hub in the overlay blockchain organize is allowed to partake in the state support without character confirmation. The exchanges among part hubs are recorded in cryptographic hash-connected information structures known as squares. A progression of affirmed blocksis orchestrated in ordered request to shape a consecutive chain, henceforth named blockchain. All part hubs in the system are required to pursue consensus protocol on the value-based information, cryptographic hashes and computerized marks put away in the block to ensure trustworthiness of the blockchain.

The consensus protocol incorporates a basic figuring concentrated process, called Proof-of-Work (PoW). With the end goal to have their nearby perspectives of the blockchain acknowledged by the system as the accepted condition of the blockchain, accord hubs (i.e., square diggers) need to understand a cryptographic puzzle, i.e., observe a consensus nodeto be contained in the block to such an extent that the hash estimation of the whole block is littler than a preset target. This computational procedure is considered mining, where the consensus nodes which contribute their computational capacity to mining are known as diggers. Commonly, the digging procedure for Pow can be viewed as a competition. Initially, every digger gathers and confirms a specific number of unsubstantiated exchange records which are accumulated into another square. Next, all mineworkers pursue each other to be the first to acquire the coveted nonce esteem as the PoW answers for the new square which joins the gathered value-based data1 and square metadata. When the PoW baffle is settled, this new square will be promptly communicated to the whole blockchain arrange. In the meantime, alternate mineworkers get this message and play out a fasten approval examination procedure to choose whether to affirm and add recently produced square to the blockchain. The digger which effectively has its proposed square connected to the blockchain will be given a specific measure of remuneration, including a settled reward and a variable exchange expense, as a motivation of mining.

Since no prior authorization is required, permissionless blockchains are especially suitable for serving as a platform for decentralized autonomous data management in many applications. Some representative examples can be found in data sharing, electricity trading in smart grid and personal data access control. Apart from the feature of public access, permission less blockchains have the advantage in quickly establishing a self-organized data management platform to support various decentralized applications (DApps). With the incentive mechanism of the PoW-based Nakamoto consensus protocol, DApp users are encouraged to become consensus nodes, i.e., miners, for an extra income. Unfortunately, solving the PoW puzzle needs continuous,high computational power which resource-limited devices, such as mobile devices and IoT devices, cannot afford. To alleviate the computational bottleneck, the consensus nodes can access the cloud/fog computing service to offload their mining tasks, thus enabling blockchain-based DApps. Existing cloud-mining protocols, e.g., Stratum can be adopted by computationally lightweight devices to avoid heavy communication overhead. As cloud/fog computing service can breed more consensus nodes to be able to execute the mining process, it would significantly improve the robustness of the blockchain network and then raise the valuation of DApps, which further attracts more DApp users to join, forming a virtuous circle.

Since no earlier approval is required, authorization less blockchains are particularly appropriate for filling in as a stage for decentralized self-governing information administration in numerous applications. Aside from the component of community, consent less blockchains have the favorable position in rapidly building up a self-composed information administration stage to help different decentralized applications (DApps). With the motivator component of the PoW-based consensus protocol, DApp clients are urged to end up accord hubs, i.e., miners, for an additional wage. Tragically, comprehending the PoWpuzzle needs persistent, high computational power which asset constrained gadgets, for example, cell phones and IoT gadgets, can't manage. To mitigate the computational bottleneck, the accord hubs can get to the cloud computing service to offload their mining assignments, hence empowering blockchain-based DApps. Existing cloud-mining conventions, e.g., Stratum can be received by computationally lightweight gadgets to maintain a strategic distance from substantial correspondence overhead. As cloud computing servicecan breed more agreement hubs to have the capacity to execute the mining procedure, it would essentially enhance the strength of the blockchain system and after that raise the valuation of DApps, which additionally draws in more DApp clients to join, shaping a prudent circle.

II. LITERATURE SURVEY

Hongbing Wang [1] introduced the fitness enabled auction method for allocating cloud resource between cloud service provider and cloud user which guarantees for fitness in terms of performance traits. The allocating algorithm taking the constraints of economic efficiency, system performance and experiments have given the results stating that the allocation is far more efficient in comparing it with the continuous double auction in

which the idea of fitness is not introduced. Cloud resource allocating algorithm via fitness enabled auction (CRAA/FA) it has dealt and introduced a new measure like fitness, new asking/bidding strategy, the dynamic asking/bidding strategy, active bargaining model, auction theory, and equivalent price and calculating the final dealing price and profit.

Auction theory can be classified by four basic types like ascending auction, descending auction, first price and second price sealed auction and the double auction. Cloud environment with a combination of Cloud services (CS_J) and cloud resources (D_J) has identified three types of service features like Type-I, Type-II and Type-III service for QoS. Type-I service includes the required response time T_j^{RST} and ratio of service request n it permitted to required response time. Type-II services are assigned with deadlines and user request are satisfied within the prescribed time limit. Type-III services in turn don't restricted with any deadline but has been successful in dealing the user request in a short span of time. All the Type-I, Type-II and Type-III services are typically based on the OLTP and OLAP services. These types of service have given the better QoS which eliminates the bottleneck problem in deploying the cloud environment. Fitness and equivalent price are argument.

Fitness mainly contributes in analyzing the cloud services which in turn monitors the level of Cloud Resource consumption in the cloud environment[3]. Equivalent prices together with the fitness provide the higher fitness value associated with the cloud services, cloud resources, cloud user and auctioneer of cloud environment. The active bargaining set is calculated and inspected over the fitness which is based in equivalent price in terms of some auctioning process. Finally they concluded the overall market efficiency with fully improvement as it's shown more efficient than the allocating methods. However, this algorithm is not suitable for thousands or ten thousands of servers due to the limitation in research funding. Moreover it is impossible to experiment more than a thousand servers or virtual machine. The future enhancement has proposed the oligopoly and monopoly algorithm that may overcome the above limitation.

Zhen Xiao et al., [4] have proposed a dynamic resource allocation method based on the application demands using the virtualization technology together with the data center adopted by green computing with optimized number of servers. The authors have also introduced the multidimensional resource utilization of a server for unevenness of resource in terms of "skewness" which improves the performance utilization of the server workload and prevents and saves the energy used. Physical resources are mapped with virtual machine and that are monitored by the virtual machine monitor (VMM). Data center enclosed with different generation hardware for heterogeneous Physical machine (PM). Their proposed work achieved with two goals like overload avoidance and green computing. Overload avoidance works in the sense of using the effective utilization of the physical machine to satisfy the cloud user and the needs of cloud service provider. Green computing primarily is used to found the idle PMs and turned off the same to minimize the energy. The skewness algorithms periodically evaluate the resource allocation by using hot and cold spots methods. A Server is defined as a hot spot, if the utilization of any of its resources is above a hot threshold and a server in other terms is defined as a cold spot if the utilization of all its resources is below a cold threshold. Irrespective of both the hot and cold spots, it is mainly used for utilization of resource in case if idle resources should be turned off. Finally they have concluded, stating that the skewness algorithm is well implemented in achieving the overall avoidance and it is well effective of using the green computing for monitoring the utilization of all resources.

Xingwei Wang et al., [5] introduced multiple cloud users that can facilitate multiple cloud providers by accessing and enabling the combinatorial double auction protocol with a new intelligent economic approach for dynamic resource allocation (IEDA). Now a days Cloud resource allocation is very competitive in the real world. Variant cloud services such as distributed Cloud, inter cloud and open cloud exchange (OCX) are considered as emerging methods and it's been implemented in the resource allocation. Price matching algorithm and price prediction algorithm are used for different mechanisms such as price formation, bidding and multi round auction which in turn is used to determine the suitable transaction with provider and customer which is comprised of back propagation neural network (BPNN) based on price matching and prediction algorithm. This proposed method resulted as unfair with the participants from the cloud market, in order to overcome such anomalies paddy field algorithms (PFA) were implemented with winner determination problem (WDP). Combinatorial double auction protocol is used for tender description in terms of cloud service consumer tender (CSC) and cloud service provider tender (CSP).

III. System Model: Blockchain Mining and Auction based Market Model

Figure 1 shows the auction-based market model for cloud computing resource trading.The miners buy computing resources from the CFP and join the miner network. Then, theminers take part in the mining and consensus

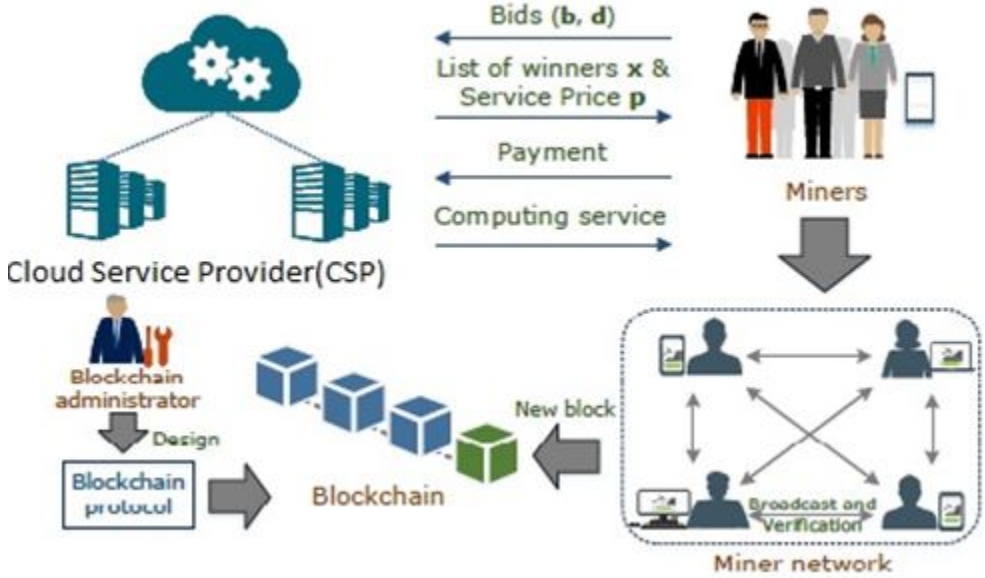

Figure 1. cloud computing resource market for blockchain networks

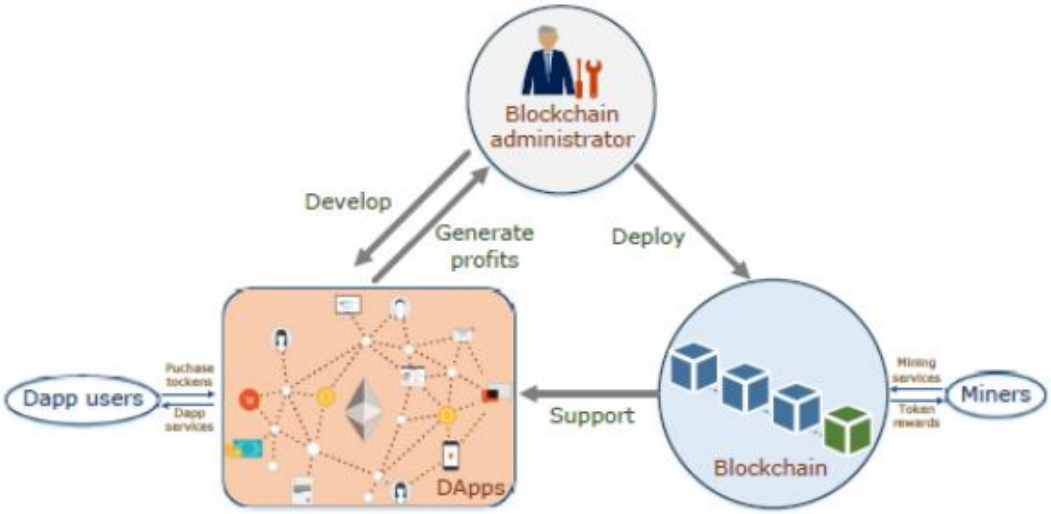

Figure 2. Business ecosystem for blockchain based DApps

process to verify and contribute new blocks tothe blockchain. The blockchain administrator develops a blockchain-based DApp and adopts ordesigns the protocol for blockchain operation.

A. Cloud Computing Resource Trading

As shown in Fig. 1, we consider a scenario where there is one CFP and a community ofminers N =f1; : : : ;Ng. Each miner runs a blockchain-based DApps to record and verify thetransactional data sent to the blockchain network. Due to insufficient computing capacity of theirdevices, the miners can offload the task of solving PoW to nearby cloud/fog computing servicewhich are deployed and maintained by the CFP. To perform the trading, the CFP launches anauction. The CFP first announces auction rules and the available service to miners. Then, theminers submit their resource demand profile d = (d1; : : : ; dN) and corresponding bid profileb = (b1; : : : ; bN) which represents the valuations of their requested resources. After havingreceived miners' demands and bids, the CFP selects the winning miners and notifies all minersthe allocation x = (x1; : : : ; xN) and the service price p = (p1; : : : ; pN), i.e., the payment foreach miner3. We assume that miners are single minded, that is, each miner only accepts itsrequested quantity of resources or none. The setting xi = 1 means that miner is within thewinner list and allocated resources for which it submits the bid, while xi = 0 means no resourceallocated. The payment for a miner which fails the auction is set to be zero, i.e., pi = 0 if xi = 0.At the end of the auction, the

selected miners or winners make the payment according to theprice assigned by the CFP and access the cloud/fog computing service.

Here, we describe the business ecosystem for blockchain based DApps in Fig. 2. In developinga blockchain based DApps, there exists a blockchain administrator which is responsible fordesigning or adopting the blockchain operation protocol. The administrator specifies the fixedbonus T, the transaction fee rate r and so on. Through adjusting the difficulty of finding thenew nonce, the blockchain administrator keeps the average block time _ at a reasonabl constantvalue. To support the DApps, in the deployed blockchain network, miners perform mining andtoken reward, i.e., R, is used to incentivize them. The reward may come from the token thatDApps users pay to the blockchain network.When auctioning for computing resources, miners always evaluate the value of the tokens. Infact, the value of tokens depends on the trustworthiness and robustness, i.e., the value of theblockchain network itself. From the perspective of trustworthiness, the PoW-based blockchain isonly as secure as the amount of computing power dedicated to mining tasks [12]. This results inpositive network effects [12] in that as more miners participate and more computing resourcesare invested, the security of the blockchain network is improved, and hence the value of rewardgiven to miners increases. For example, with more computing resource, 51% attack or doublespendingattack becomes harder to be successful. To confirm this fact, we conduct a realworldexperiment (see Section VI-A) to evaluate the value of the tokens and reward by examiningthe impact of the total computing power on preventing double-spending attacks.

Multi-Demand miners in Blockchain networks (MDB) AuctionAlthough the FRLS auction is capable solving the social welfare maximization problemapproximately, it is not realistic to be directly applied in a real market since it cannot preventthe manipulation of bids by bidders, i.e., lacking of truthfulness. As mentioned before, we aimto design an auction mechanism that not only achieves a good social welfare, but also possessesthe desired properties, including computational efficiency, individual rationality andtruthfulness.Therefore, we present a novel auction mechanism for Multi-Demand miners in Blockchainnetworks (MDB auction). In this auction, the bidders are limited to be single-minded in thecombinatorial auctions. That is, we can assume safely that the mechanism always allocates tothe winner i exactly the di items that it requested and never allocates anything to a losing bidder.

IV. Conclusions

In this paper explored the cloud computing resources with implemented the blockchain based DApps. It efficiently allocates resources based auctioning method to study the social welfare and cloud service provider. For miners with constant demand, wehave proposed an auction mechanism that achieves optimal social welfare.For mineworkers with consistent interest, we have proposed a bartering component that accomplishes ideal social welfare. For excavators with numerous requests, we have changed the social welfare boost issue to a non-monotone submodular augmentation with backpack requirements issue. At that point, we have planned two proficient components augmenting social welfare roughly. We have demonstrated that the proposed closeout components are honest, exclusively judicious and computationally effective and can tackle the social welfare boost issue.

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Implementation of Kernels, Hybridization and Optimizers to Enhance SVM Classifier Accuracy

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***Abstract*—The paper deals with improving the results of SVM (Support Vector Machine) by selecting the best kernel (Radial Bias Function kernel, Linear kernel, Sigmoid kernel, Polynomial kernel) and merging the best kernel with a compatible kernel that will overcome the disadvantages in one kernel and increases the overall accuracy of the prediction and finally, converting the Support Vector Machine into a neural network that accepts an optimizer to improve the model and make it effective, as well as adding a Stochastic Gradient Descent (SGD) optimizer to increase the SVM's prediction accuracy, and using SoftMax and Linear activation functions as SVM kernels gives us an SVM model that is more effective than the original SVM model. Once all three techniques have been finished, the model with the highest accuracy among all models will be chosen. The classification of a class decision obtained on the basis of the SVM hyperplane is based on sub-objects determined by experiments close to the class-to-class hyperplane and which include both precise and incorrectly placed objects in the vector space. In the case of improving the quality of the item separation from the original database, the proposed item classification methods may be recommended for the classification of new items. When you upgrade the SVM section, the default parameters used are used. Comparative analysis of the classification results obtained during a test in the compilation of the Multi-class SVM. MPKF and MKF work and functions, similar to the results obtained in the SVM phase modification test using a stochastic gradient drop optimizer that has the functionality of SoftMax, where the parameter values are randomly determined, ensures the suitability of using these composite characters to enhance the quality of the SVM partition. In many cases, the mixing and preparation of the SVM planes work best in terms of improving the quality of the SVM partition.**

***Index Terms*— Machine Learning, Neural Networks, High Dimensional Datasets, Support Vector Machines, SVM Kernels, Hybrid Model, Optimizers, Activation Functions.**

I. INTRODUCTION

The Support Vector Machine (SVM) is normally based on the VC concept and the principle of minimizing structural risk. In some learning environments that require more accurate learning functionality, SVM can be upgraded to meet this goal. This paper describes different Boost-SVM methods, such as changing the SVM

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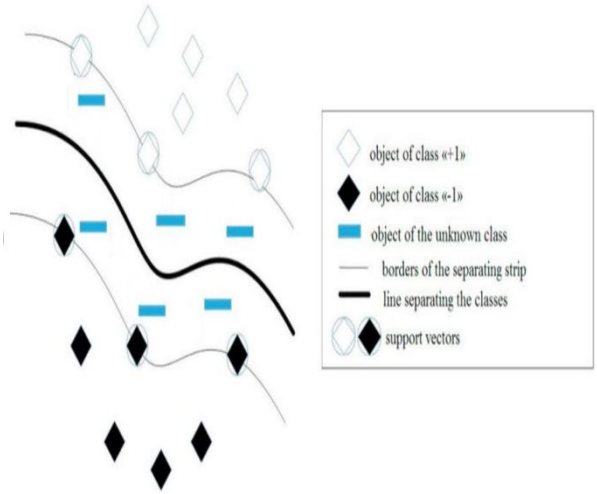
separator by bundling and using the settings to improve the learning accuracy of the SVM algorithm. So in this paper, we have introduced 2 new kernel functions called RBF-MPKF and RBF-MQF that can improve the accuracy of vector support partitions (SVMs). The proposed kernel function includes Radial Bias Function (RBF) and Multi-layer Perceptron Kernel Function (MPKF) as well as Radial Bias Function (RBF) and Multi-Quadratic Kernel Function (MKF) and is specified in the standard format.
It is shown that the proposed kernels work faster than the Radial Bias Function, Multi-Quadratic kernel Function, and Multi-Layer Perceptron. The accuracy of the proposed algorithms is compared to algorithms based on both Gaussian and Multi-Layer Perceptron kernels along with Multi-Quadratic Kernel Function for use in various indistinguishable data sets with fewer to many attributes. we have also used applied optimizers such as the Stochastic Gradient Descend optimizer in SVM, and phase accuracy is measured using different data sets for a variety of diseases.

II. SVM

Support Vector Machine (SVM) is defined as a classifier that divides or classifies patterns into only two classes. The process of combining objects into available classes is called separation. On a website, sometimes a category (or labels) for each pattern (or class) is provided in advance. If an unknown pattern category is found based on that known pattern, such a distinction is called a controlled category. The Support Vector Machine (SVM) separates data by determining the optimal hyperplane between all data points in one category and those in another. The highest SVM hyperplane means the one with the highest limit between the two categories. Margin refers to the maximum width of a plane associated with a large plane with no internal data points. The vectors supporting the data points are close to the hyper-dividing plane; these points are on the edge of the plane. An important problem for SVM is finding the hyperplane to separate the two different classes. But some divisions are divided between the two types. The leading hyperplane is the one that makes the maximum limit.



III. SVM KERNELS

A. Kernel Functions

To map non-linear input data with high dimensional locations, kernel functions are utilised (feature space). A line is used to divide the new drawing from the previous one. The kernel function allows tasks to be done in the input field, rather than the potentially powerful feature, rather than the kernel function.
Because of this, the internal product does not need to be evaluated in the feature area. When the scalar product is replaced, the mapping is accomplished (x. y)→Φ(x).Φ(y) this mapping is defined by the kernel,
K(x, y) = Φ(x).Φ(y).
Linear data may be separated using an appropriate kernel. The following is a list of some of the many kinds of kernels. Consider the linear kernel, which just calculates the dot product of two matrices (one for each dimension).

$$K(x,z) = x \cdot z = \|x\|\|z\|\cos(u)$$

U seems to be the angle between x and z, which is u.
Consequently, if the two vectors are orthogonal, their dot product is zero. If they are all facing the same way, their dot product is the highest. Kernels are sometimes compared to similarity functions among input vectors because of this relationship. The following requirements must be met by every conceivable kernel before it can be utilised as a kernel.
a. The kernel function should be symmetrical in order to be valid and implementable.
b. Mercer's theorem [32] must hold.
Here are some of the most popular kernels.

B. Exponential Radial Basis Function

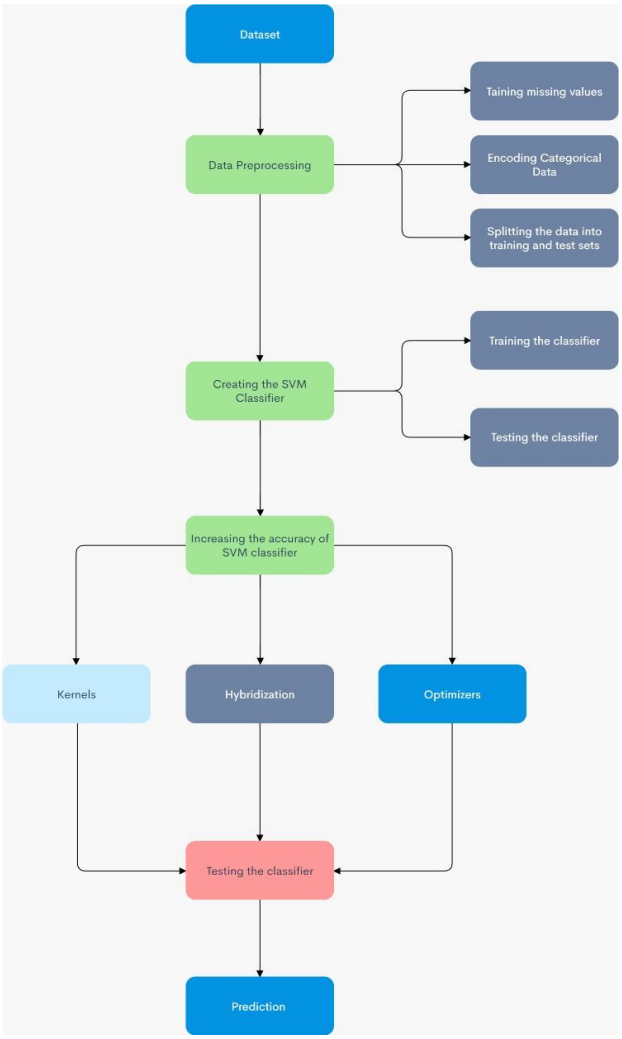
A Radial Basis function of the form,

$$K(x, x`) = \exp((-|| x - x`||) / (2\sigma)),$$

produces a piecewise linear solution that can be attractive when discontinuities are acceptable.

IV. Proposed Model

In this paper, we will choose the best SVM kernel for predicting or classifying data, a hybrid kernel that is a hybridization or combination of two kernel function properties, and optimizers that help reduce data weights and improve the learning rate of the classifier model, and we will choose which method in the above list gives the best results for a given dataset and we will choose that optimal method for our data. We discovered that the model's accuracy has greatly improved following the steps outlined below.



V. HYBRIDIZATION

Hybridization is an advanced high-level technique in machine learning that is used to combine multiple or more than one model or algorithm to achieve a better functional model, even better than either of the models used and to minimize the error/loss in the model, and to get better accuracy and predictions, In Machine Learning hybridization of models can be done in multiple ways, some of which are,

a. Models' hybridization using Ensemble Learning.
b. Hybrid Models based on the Feature Selection.
c. Machine Learning models' hybridization by the means of the Mathematical approach.

In this paper, we have used the last approach, which is machine learning model hybridization, by using the mathematical approach for developing the hybrid machine learning models. The main reason is that this way of hybridization will have the most promising results as the very root of the models are taken and a thorough analysis of the algorithm and the model's mathematical approach is done before hybridizing. Finally, the mathematical formulae will be derived based on the models that are taken, and the new algorithm will be developed based on the newly developed formula.

A. RBF with MPKF

The handling of non-separable data has been suggested for kernel functions, as we all know. They're used to create a high-dimensional representation of data (feature space). A suitable kernel must be found for a given set of non-separable data if the data is to be linearly separable. There are data sets where classical kernel functions like Gauss and Multi-Layer Perceptron kernel functions perform better. We are attempting to create a new kernel that is capable of handling all types of data sets, particularly those with a large number of dimensions (data sets with many attributes).

Except for very large data sets, the following Multi-Layer Perceptron kernel function works rather well, so to cancel out this problem and provide the Multi-Layer Perceptron Kernel the ability to work effectively even with the higher dimensional dataset too, we are using the hybridization technique to hybridize or to combine both the Multi-Layer Perceptron Kernel Function (MPKF) with Radial Bias Function (RBF).

The kernel function for Multi-Layer Perceptron Kernel function in mathematical terms is given by

$$\text{MPKF}(c_1, c_2) = \text{Tanh}(< c_1, c_2 >)$$

And when plotted on the graph we get the below graph.

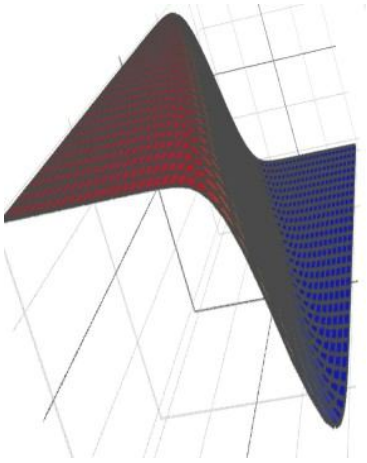


Fig: Graphical representation of MPKF kernel function

As well as for the Radial Bias Function (RBF) the mathematical representation of kernel function is given by.

$$RBF(c_1, c_2) = \exp\left(-||c_{1i} - c_{2i}||^2\right) / (PD)$$

Where p is the kernel parameter and D is the dimension of the input vector (number of attributes).

We propose a new form of kernel function that is more complex than could handle high dimensional data sets, we denote it as MPKF (RBF).

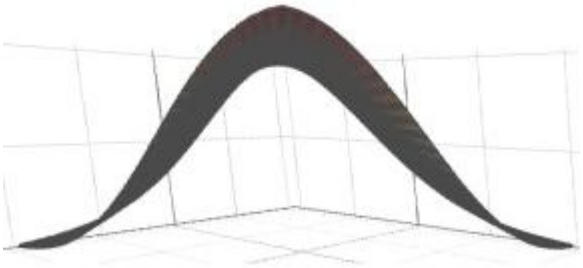


Fig: Graphical representation of RBF kernel function

$$MPKF(RBF(c_1, c_2)) = \frac{\left[\exp\left(-2*\|c_1 - c_2\|^2\right)/PD - 1\right]}{\left[\exp\left(-2*\|c_1 - c_2\|^2\right)/PD + 1\right]}$$

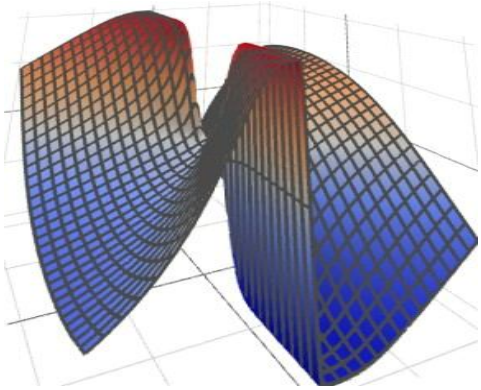


Fig: Graphical representation RBF – MPKF hybrid kernel function

This kernel combines both Gauss and Polynomial functions, so it performs better with nearly all data sets, this function is decreasing when x decreases and it is continuous. If we calculate the limit of (MPKF(RBF)/RBF) we will get the following derivation.

$$\text{Let } T = \|c_1 - c_2\|^2$$

$$V = PD \qquad RBF = e^{-T/v}$$

$$MPKF(RBF(c_1, c_2)) = \frac{\frac{e^{-2T}}{v} - 1}{\frac{e^{-2T}}{v} + 1}$$

$$\lim_{c_1, c_2 \to \infty} \left[\frac{\frac{e^{-2T}}{v} - 1}{\frac{e^{-2T}}{v} + 1} \Big/ e^{-T/v} \right]$$

$$\Rightarrow \lim_{c_1, c_2 \to \infty} \left[\frac{\frac{1}{ve^{2T}} - 1}{\frac{1}{ve^{2T}} + 1} \Big/ \frac{1}{ve^{T}} \right] = \infty$$

B. RBF with MKF

The following multi-Quadratic kernel function performs good with nearly all data sets, except smaller dimension ones, so in order to prevent this error in the kernel function and to cancel out this problem and provide the Multi-Quadratic Kernel the ability to work effectively even with the smaller dimensional dataset, we are using hybridization technique to hybridize or to combine both the Multi-Quadratic Kernel Function (MKF) with Radial Bias Function (RBF).

The kernel function for Radial Bias Function in mathematical terms is given by

$$RBF\ (c_1, c_{2)} = \exp\ (-||c_{1i} - c_{2i}\ ||^2)\ /\ (PD)$$

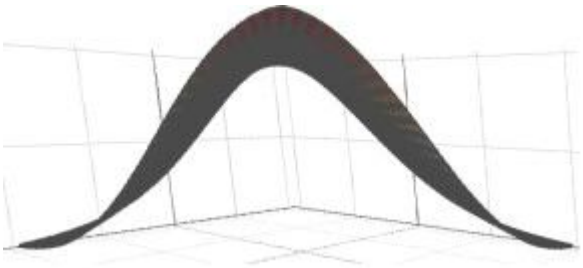


Fig: Graphical representation of RBF hybrid kernel function

As well as for the Multi-Quadratic Kernel Function (MKF), the mathematical representation of kernel function is given by.

$$MKF\ (c_1\ ,\ c_2) = \sqrt{||c_1^2 - c_2^2|| + E^2}$$

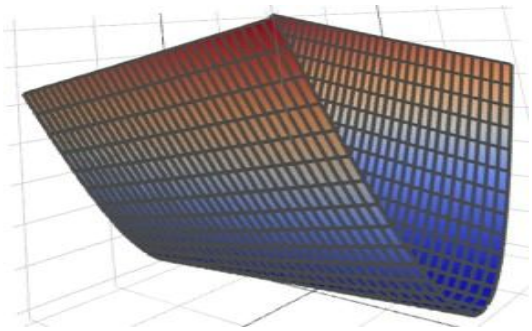


Fig: Graphical representation of MKF kernel Function

For the hybridized kernel i.e, Multi-Quadratic Kernel and the Radial Bias Function, the graph is given in the figure below

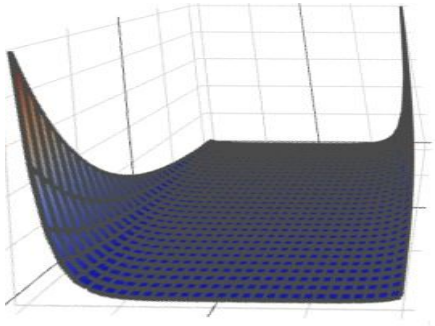


Fig: Graphical representation of RBF with MKF hybrid kernel function

$$RBF(MKF(c_1,\ c_2)) = \exp(-\sqrt{(c_1 - c_2)^2 + E^2}\ /\ PD)$$

$$\text{Let } T = ||c_1 - c_2||^2$$

$$V = PD \qquad RBF = e^{-T/v}$$

$$RBF(MKF(c_1, c_2)) = \frac{e^{-\sqrt{T^2+E^2}}}{v}$$

$$\lim_{c_1,c_2 \to \infty}\left[\frac{e^{-\sqrt{T^2+E^2}}/v}{e^{-T}/v}\right]$$

$$\rightarrow \lim_{c_1,c_2 \to \infty}\left[\frac{\frac{1}{v*e^{\sqrt{T^2+E^2}}}}{\frac{1}{v*e^{T}}}\right] = \infty$$

VI. OPTIMIZERS

Optimizers are algorithms or methods used to convert attributes, such as weight and level of learning to reduce losses. Optimizers are used to solve development problems by reducing performance. A configuration is a function or algorithm that changes the characteristics of a neural network, such as weight and learning level. Therefore, it helps to reduce total loss and improve accuracy. The problem of choosing the right model weights is a daunting task, as a deep learning model usually contains millions of parameters. It raises the need to select the optimization algorithm for the appropriate program.

We can use different settings to make changes in your weight and level of reading. However, choosing the best optimizer depends on the application. This may not be a problem at first, but when working with hundreds of gigabytes of data, even a single session can be time-consuming. Therefore, the preparation algorithms are responsible for minimizing losses and providing the most accurate results possible. Various optimizers have been investigated in the last couple of couples, each with its own set of benefits and drawbacks.

A. STOCASTIC Gradient Descent

The SGD algorithm is an adaptation of the GD method that overcomes some of the GD algorithm's weaknesses. Decreasing the gradient to big data may not be the best option. To deal with the problem, we have a decrease in the stochastic gradient. The word stochastic means disorder on which the algorithm is based. In descending stochastic gradient, instead of taking the entire database for each duplication, we randomly select data sets. That means we take only a few samples from the database.

Stochastic Gradient Formula Deep Learning Optimizer Formula

$$w := w - \eta \nabla Q_i(w).$$

The first process is to select the first parameters w and the level of learning n. Then randomly push data into each duplicate to achieve a minimum. Since we do not use all the databases but their collections in each duplication, the method taken by the algorithm is full of noise compared to the algorithm down gradient. Thus, SGD uses a high number of repetitions to achieve a minimum of space. Due to the increase in the number of repetitions, the whole calculation time increases. But even after increasing the multiplication value, the calculation costs are still lower than that of the gradient descent optimizer. So the conclusion is that if the data is large and the calculation time is an important factor, a decrease in stochastic gradient should be preferred to the lowering batch gradient algorithm.

B. SOFTMAX Activation Function

A neural network's activation function is an essential component. A neural network is a linear regression model that does not include an activation function. This indicates that the activation function is non-linear.

Why Not Sigmoid?

Assume we utilize the sigmoid activation function above these values to determine the Z value using the weights and biases of this layer. The sigmoid activation function, we know, returns a value between 0 and 1. The chance that a data point corresponds to category 1 ignores the other two possibilities.

In the output layer of the example above, we will utilize the SoftMax activation function instead of the sigmoid. Related opportunities are calculated using the SoftMax activation algorithm. The SoftMax function, like the

sigmoid activation function, yields the opportunities for each class. The activation equation for SoftMax is as follows. When the number of classes is two, the function is similar to sigmoid activation. To put it another way, the sigmoid is not the same as the SoftMax function.

VII. EXPERIMENTS

Data sets:
To test the performance of the proposed kernel with SVMs, we have done some experiments with different data sets. The below table shows the definition of these data sets. We can classify these data sets according to the training set size into two types,

TABLE I. DATASETS

No	Dataset	Classes	Attributes	Training	Test
1	Cleveland	5	14	240	60
2	Lung Cancer	2	16	240	60
3	Breast Cancer	2	11	559	140

We compare the results of Polynomial, Gauss, and the proposed kernels with the proposed kernels (RBF-MKF and RBF-MPKF) and the modified SVM that uses optimizers. The results are displayed below.

TABLE II. SVMS CLASSIFICATION ACCURACY

datasets	sigmoid	RBF	linear	poly	HSVM	SoftMax	Linear
Heart disease	53	66	85	71	85	85	86
Lung cancer	87	87	88	87	90	71	72
Breast cancer	92	97	97	92	92	97	97

VIII. CONCLUSION

In this paper, SVMs have been developed to solve the problem of fragmentation problems by mapping training data into a replacement with the help of new kernel functions and then separating the data using a large genetic hyperplane. We tested the proposed kernel function separately from data sets and different attributes. Obviously, RBF test results provide better accuracy with data sets smaller than the Multi-Layer Perceptron kernel and have arguably better accuracy than the Multi-Quadratic Kernel Function. However, Multi-Layer Perceptron Kernel Function works best and provides better results than the RBF kernel over the larger data sets. Although our proposed kernels RBF-MPKF AND RBF-MKF get the best accuracy in almost all datasets and especially in the largest number of annotations dataset. Test results were reported for display compatibility and functionality of the proposed kernel. test results indicate the proposed kernel function gets the best accuracy in almost all data sets, especially for a very large set of feature data. So Proposed kernel functions can be considered positive for some of the Gaussian works and other kernels on some datasets. Finally adding the optimizers to the SVM has highly improved the accuracy of the SVM for the majority of the datasets that have been tested and the activation functions and the optimizers had a great deal of effectiveness in improving the accuracy of the SVM.

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A Review on Aspect-based Sentiment Analysis for Online Products

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***Abstract*—In this modern world, product reviews on online shopping sites are become an essential resource to help the customers make better decisions about purchasing products and achieve good sales for the products. Customers share their opinion about a recently purchased product on online shopping sites, it is important to find a smart system to detect emotions from customer reviews. Aspect-based sentiment analysis tasks aim to determine consumers' opinions on various aspects of services. For starters, the text cleaning is done for preparing raw text for NLP so that machine can understand the human language. The following preprocessing will be done to prepare the text for classification. Then Tokenization takes place, after that Stop words will be removed to improve the performance of the model, then lemmatization takes place. Then, Fast text will be deployed to achieve scalable solutions for text classification tasks. Then we get similar words with underlying sentiments. Then train the model with the folds and finally we test the model.**

***Index Terms*— Sentiment Analysis, Aspect-Based Sentiment Analysis, NLP, Tokenization, Lemmatization, Pre-processing.**

I. INTRODUCTION

With the rapid expansion of e-commerce, there is an increasing number of sources available and typical for gathering public opinions about businesses such as products, services, brands, and events. Reviews on online shopping sites assist other customers in navigating the maze of product selection. People want to know the advantages and disadvantages of a product before purchasing it, and this clears up any doubt about product selection. As a result, businesses should monitor consumer thoughts and feedback frequently, as the above data may be used to improve business performance and services. Monitoring and analysis might be complex due to the abundance of social networking websites on the Internet, and information may not be as comprehensive. Before buying a product, consumers cannot quickly read all the reviews. A system can be used that identifies a product's advantages and disadvantages by studying a sizable number of comments posted on the same portal regarding different features of the product. Categorize the materials as good or bad, using machine learning techniques, accurately classify sentiment, supervised classification algorithms are frequently utilized. Customers may learn how they feel about various product characteristics using aspect-based sentiment analysis.

II. LITERATURE SURVEY

In this section, we discussed recent research on aspect-based sentiment analysis. Movie reviews, hotel reviews,

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approach development, etc. Sentiments expressed about each aspect of a product or service are identified using aspect-based sentiment analysis. Some of these are provided in this section as a literature review.

Srinivasulu Reddy Uyyala et al [1] A proposed model for facet-based sentiment analysis using LSTM with FL adopts the properties of the ClausIE framework for breaking long sentences into meaningful small sentences. The performance of the developed model was experimented with and without the word embedding technique for feature extraction. We observed this from the results: the word embedding technique was well suited for facet-based sentiment analysis. Instead of classifying consumer review sentences as positive and negative, the proposed LSTM with a fuzzy logic model classified consumer review sentences as highly negative, negative, positive, and highly positive. The developed model was experimented on three publicly available datasets with 96.93% accuracy on ACPR, 83.82% accuracy on AVGR and 90.92% accuracy on CRAP datasets. The proposed model also classified consumer review sentences based on consumer location and current trends. The proposed model can be further extended to facet-based sentiment analysis with a highly complex facet corpus on live datasets from various online shopping portals.

Sangeet Srivastava et al [2] The presented paper introduced an ontology framework suitable for feature-level sentiment analysis of online reviews. The importance of the weighted product aspect in mining online reviews was also argued. We took the word-in-topic probability value from the LDA as the word-in-topic weight of, and corrected the sentiment score by the topic weight. Currently, only three aspects of the are considered: display, battery life, and camera quality. However, mobile phone products include more attributes such as ergonomics, memory and operating system.

Guangyao Pang et al [3] In this article, we establish a transformer encoder based on BERTs to capture long-term dependencies of contexts and generate interactive semantic information between aspect words and contexts. Next, we propose a location model of aspect features to extract more aspect features from context information. Experiments on multiple datasets show that the proposed approach (that is, ALM-BERT) outperforms other methods. Moreover, the proposed approach of increasing the length of text still maintains excellent performance. In other words, the ALM-BERT approach can better handle long text data and better dig into the user's sentiment at the aspect level. The proposed approach focuses primarily on using natural language text to identify user sentiment. However, his representations on social platforms have increased by times. Therefore, in the future we are interested in combining image processing techniques to analyze multimodal data.

Pimpa Cheewa et al [4] In this study, we performed an experiment and compared the learning algorithms of SVM and Naive Bayes. The results show that SVM outperforms Naive Bayer, and the results agree with those of Joachims (1998) and Yang and Pedersen (1997). The accuracy of Naive Bayes was slightly lower than SVM. Aspect-based sentiment analysis techniques ideally capture customer opinions in terms of both positive and negative aspects (service, drinks, location, food) in order to serve customers efficiently. Very useful for companies that need to know.

Peiman Barnaghi et al [5] We proposed a new model for extracting aspects from text-based reviews. It uses a convolutional neural network and two word embedding layers: a general layer and a domain-specific layer. These are trained with data from specific domains of review. Analysis of two SemEval benchmark datasets containing reviews of restaurants and laptops shows that the model performs as well as or better than more complex neural network architectures that take longer to train. In the future, we plan to evaluate more aspect extraction methods, deep learning architectures, and embedding types for different domains.

Samuel Onalaja et al [6] This project was conducted to find out which movie aspects influence the mood of the reviews using different driving factors. Four different sentiment classification methods were used to find sentiment. Three supervised machine learning logistic regression, naive Bayes, support vector machines, and one deep learning recurrent neural network. Despite the challenge of creating a good vocabulary list of aspect-related words, the additional feature of aspect- and genre-related elements improves the accuracy of aspect-based models and makes rating sentiment predictions reasonable. Improved. Research results also suggest that these models, supported by driving factors, can provide insight into which aspects of a particular genre most influence sentiment on an unseen test dataset. I'm here.

SOWMYA B et al [7] This study aims to provide a comprehensive overview of aspect-based sentiment analysis techniques, including various tasks, approaches, algorithms, and potential directions. We first created a description of the ABSA study, including some elements, definitions, and general modeling approaches. Each ABSA approach is then discussed along with the current progress of connected ABSAs.The implicit side is hard to recognize, but very important. With advances in technology, deep learning techniques and other algorithms have yielded some promising results for ABSA. However, sometimes the results are not as expected.

Satarupa Guha et al [8] This paper describes a system submitted by Team SIEL for SemEval 2015 Task 12. On all three subtasks, our system performed very well, ranking from 4th to 8th. In the future, we would like to adapt the system to other domains.

Mickel Hoang et al [9] In this article, we proposed an ABSA model that can predict aspects related to in-domain and out-of-domain text. This is achieved by taking a pre-trained language model BERT and fine-tuning it into a sentence pair classification model for the ABSA task. In addition, we train an aspect classifier model with data consisting of 'related' and 'unrelated' labels. We further validated this approach to sentiment classifiers by refining the model to find relationships between aspects and texts and allowing the model to learn when contextual representations indicated mood context. I experimented. In addition, we proposed a joint model that can classify both aspects and sentiments using only the-sentence pair classification model. Experimental results show that the combined model out performs previous state-of-the-art results on aspect-based sentiment classification.

Fredrik Olsson et al [10] We found that the multiple supervised model achieves better performance on SemEval records compared to the unsupervised dependency parser approach. This makes sense, but as explained in Section 7.5, the model has the following advantages: B. Extracted Opinion Words. The annotated dataset for aspect-based opinion mining is also very few and has not yet been found in Swedish. Therefore, unsupervised models are essential to create a general framework that works independently of the domain without the need for extensive annotation processes. Some of the improvements we considered were that it might be useful to tweak the hyperparameters used for the Transformer model to see if this leads to improvements in the dataset (batch size, maximum sequence length, change learning rate, etc.). This task was very time consuming due to the potentially large number of configurations using multiple models, datasets and languages. Based on the background information, we determined that these add little value to the overall project and were also limited by the amount of GPU hours allocated to Google Colab.

Toma´s Brychc et al [11] This paper describes Semeval 2014's participation in the ABSA-task. ABSA-Task consists of four subtasks. For each subtask, we propose both constrained (no external knowledge) and unbounded approaches. A limited version of the system is based solely on machine learning technology. The unrestricted version extends the limited capabilities of LDA, Semantic Space, and Mood Dictionary. The proposed approach has achieved very good results. The restricted version was consistently above average, often by a large margin. The unlimited version was ranked the best system.

Yangyang Yu et al [12] In this project, we explored various class balancing techniques and data models. We achieved an encouraging predictive accuracy of on text review sentiment. Prediction accuracy reached 70% to 75% for star rating and 85% to 90% for polarity we abstracted the problem into a multi-class classification problem, used phrases of 2/3 word length to select his model for the Bag of Words feature, and performed the machine learning process using the SVM algorithm . Among design decisions, feature selection played a very important role in the design process, and choosing the right features could improve prediction accuracy by about 15%. Therefore, further optimization in feature selection could further improve prediction accuracy. The Bag of Words model used in this Project contained complete review text even when trained on specific aspects.

Md Shad Akhtar et al [13] In this document, we proposed a Hindi Aspect Category Detection and a benchmark setup for its sentiment classification. We collected review articles from various online sources and commented on his 5,417 review articles on 12 domains. Based on these datasets, we develop a framework for aspect category detection and sentiment classification based on supervised classifiers. Theaspect category recognition problem was cast as a multi-label classification problem and the sentiment classification was modeled as a multi-class classification problem. The proposed model reports F-measures of 46.46%, 56.63%, 30.97%, and 64.27% for aspect category detection in electronics, mobile apps, travel, and movies, respectively. The model's sentiment classification yields accuracies of 54.48%, 47.95%, 65.20%, and 91.62% in the four domains, respectively

Abdulganiyu O. Harazeem et al [14] In our study, a new model of aspect-based sentiment analysis was presented. Themodel employs the Emoticon Lexicon Technique, the Part of Speech (POS) tagging technique, and the SentiWordNet, which are used respectively for sentence tagging and denomination identification. This project evaluated the accuracy, precision, and recall of Novel Model compared to existing models that do not include emoticons and implicit aspects of the results show that Novel Model is the previous model, which means that aspects and emoticons implicitly mentioned in product reviews have a great impact on sentiment analysis. In this, they evaluated the results of the new model compared to the FSBA model by Jayasekara and Wijayanayake (2016), which manually integrated some emoticons, and the results also show an overall accuracy of 88.5%. It indicates that it is a new model of Better performance. 88.1% accuracy and 84.6% recall of values. This shows that the model performs better when using emoticons and considering the implicitly mentioned aspects.

M. Ali Fauzi et al [15] In this study, they used the Word2Vec model to represent the characteristics of the product review sentiment classification in Indonesian. SVM was used as the classification method. We also used Binary TF, Raw TF, andTF.IDF to compare the classification performance based on Wor2Vec and Bag of Words functions. In general, SVM works well for sentiment classification. However, the Word2vec model has lower precision values than the other methods. This is because we only have a small data set to train the Word2Vec model. Word2Vec needs large examples to learn word representations and place similar words closer together. Otherwise there are too many examples in a small dataset to move words to better places than Future work could use larger datasets to create Word2Vec models. This record does not need to be marked as positive or negative first. This data set doesn't even have to be the Sentiment Analysis data set. You can use another data set such as news, articles, Wikipedia, etc.

Bo Wang et al [16] analyzed aspect-based mood and designed a deep learning model that performs competitively or better compared to the best results of SemEval'15 on all subtasks. Based on the constituency parse tree, we propose a new approach to associate sentiments with corresponding aspects. This model shows promising performance even in the invisible domain. In future work on, we are interested in testing the model on other (larger) datasets and evaluating transfer learning performance. We also want to investigate a more sophisticated model that uses adaptive thresholds to predict aspects.

Sonal Meenu Singh et al [17] determined the semantic direction of aspect-based reviews. The system hit the target with an efficiency of 75%. The proposed system is compared with the existing online tool to measure the performance of the proposed system. The proposed system successfully handles negatives, emphatic terms, and synonyms that were not effectively handled by other systems, and the proposed system is also useful for defining the semantic polarity of input mobile reviews. Effective. Systems that achieve such high efficiencies suffer from the fact that the polarity of the "cost" aspect is not defined correctly. To address this shortcoming, the system has been made more efficient. In the future, we will work on implicit traits and group two or more together.

Sheeraz Akram et al [18] With the advent of e-commerce platforms, one platform used web mining to make product information such as daily prices, specifications, speculations, trends, and rating-based ratings available on the, users can make the right decision when purchasing the product meeting. The proposed system allows users to analyze pricing, product and feature reviews, trends, and specification-based ratings in a single platform. The proposed system also provides real-time review sentiment analysis based on each product's specifications to save users' time and effort. Finally, combines web crawling, web scraping and machine learning techniques to provide analytic reviews from leading online stores to help shoppers make simple decisions online. This helps in designing user-friendly recommendation systems.

Syeda Maliha Marium et al [19] This paper primarily contributes algorithms, methods, and emoticon dictionaries for analyzing sentiment in social media data (both text and emoticons). For example, airline data collected by Twitter this study also shows the effect of considering emoticons along with text when analyzing emotion. This study was performed using both the ML and DL- algorithms. The proposed system applied multiple features and models to collected reviews based on text and emoticons to determine emotion. Overall results show that including emoji alongside text has a positive impact on sentiment analysis. We also found that the DL algorithm performed better than the ML algorithm. Ultimately, this study outperformed existing studies. In the future, this research may be extended to the realm of multilingual data.

Mohammad Aman Ullah et al [20] This presents both opportunities and challenges for his researchers in the field. Therefore, this paper summarizes some of these possibilities. From the latest article, we provide his guidelines for future researchers. This study also provides a single pictorial representation of MSA tasks and approaches. Thus, it brings great potential to his researchers in the future in this field. In the future, we plan to conduct a Study to identify and summarize many other opportunities and challenges in MSA research.

T Praveen Kumar et al [21] This paper mainly contributes to a multimodal sentiment analysis method using both text and emoji. The product example tests the Samsung M21 mobile phone. This research mainly focuses on the analysis of all kinds of emojis. This is because we strongly believe that emojis play an important role in analyzing emotions on social media. A supervised automated approach that applies machine learning algorithms for greater accuracy. The proposed model considers two feature extraction methods to determine sentiment. This method was successful in improving the performance measurements of the. H. Accuracy is improved by 7.3% compared to pure text product reviews. This model records a mining analysis of a total of positive opinions, considering both text and emoji.

T Praveen Kumar et al [22] This review paper presents a review of multimodal sentiment analysis for multimodal data classifications. It can leverage all modalities such as text, visual and emoji features. Various types of MSA and deep learning techniques for emotion classification are described. In addition, specific his feature extraction, multivariate data fusion, and sentiment data classification are also included in this study. This

survey helps conduct a thorough MSA survey. The pros and cons of various his methods are covered, allowing researchers to choose the technique that best suits their needs. This review of existing literature shows that SA is a promising approach for transmission channels that complement information to SA, often overcoming unimodal techniques. In multimodal classification task, accuracy was better using the deep empty method compared to the unimodal classification method.
Mayur Wankhade et al[23] In this article, we discussed sentiment analysis and related techniques. The main purpose of this work is to examine and complete a taxonomy with strengths and weaknesses in mood analysis. We first described several levels of sentiment analysis, followed by an overview of the necessary steps such as data collection and feature selection. We then categorized the methods of the sentiment classification system and compared their strengths and weaknesses. Due to its simplicity and good accuracy, supervised machine learning methods are often the most widely used techniques in the field. Classification using NB and SVM algorithms are commonly used as benchmarks against which newly proposed approaches can be compared. After discussing the most common uses of, the study examines the importance and consequences of sentiment analysis challenges in sentiment evaluation.

III. METHODOLOGIES

LSTM: Deep learning and artificial intelligence make use of a Long Short-Term Memory (LSTM) artificial neural network [1]. Unlike conventional feedforward neural networks, LSTM has feedback connections. In addition to single data points (like images), a recurrent neural network of this type can assess entire data sequences (such as speech or video). For instance, networked, unsegmented handwriting identification, speech recognition, machine translation, robot control, video games, healthcare, and other uses are all possible using LSTM. The LSTM neural network has been utilized the most in the 20th century. This methodology is used in the [1] resource paper.
Fuzzy logic: Uncertain or ambiguous items are regarded as fuzzy. Their fuzzy logic offers highly significant flexibility for thinking since in the actual world we frequently run into situations where we are unable to discern whether the state is true or untrue. This allows us to consider any situation's errors and uncertainties. The absolute truth value in the Boolean system is represented by 1.0, and the absolute false value by 0.0. However, the logic for absolute truth and absolute false value does not exist in the fuzzy system. However, there is also an intermediate value existent in fuzzy logic that is both partially true and partially false.This methodology is used in the [1] resource paper.
LDA: It is among the most widely used subject modeling techniques. Each document is composed of a variety of words, and each topic likewise has a variety of terms. Based on the words in a text, LDA seeks to determine the themes to which those words belong. This methodology is used in the [2][6][7] resource papers.
BERT: BERT is a machine learning framework for handling natural language that is free and open-source (NLP). To help computers understand the meaning of ambiguous words in a text, BERT uses the surrounding text to provide context. The BERT framework may be modified using question-and-answer datasets after being pre-trained on Wikipedia text. A deep learning model based on Transformers is known as BERT (Bidirectional Encoder Representations from Transformers). Each input and output element in Transformers is coupled together, and the weightings between them are dynamically chosen based on the relationship between them.This methodology is utilized by [Classification and regression problems are resolved using Support Vector Machine, or SVM, one of the most used supervised learning techniques. It is mostly used, nevertheless, in Machine Learning Classification problems. In order to swiftly categorize new data points in the future, the SVM algorithm aims to define the best line or decision boundary that can split n-dimensional space into classes. The name of this best choice boundary is a hyperplane. The extreme vectors and points that help create the hyperplane are chosen via SVM. Due of these unusual circumstances, the method is referred to as a "support vector machine." This methodology is used in the [4][7][15][23] resource papers.
Naïve Bayes:: Naive Bayes classifiers are a subset of classification algorithms based on the Bayes theorem. Instead of being a single technique, it is a family of algorithms, and they are all predicated on the notion that every pair of qualities being classified is independent of the other. Naive Bayes classifiers are very scalable since the number of parameters needed is linear in the number of variables (features/predictors) in a learning job. Maximum-likelihood training may be carried out by simply evaluating a closed-form expression, which takes linear time, as opposed to utilizing an expensive iterative approximation, as is the case for many other types of classifiers.This methodology is used in the[4][[12][23] resource papers.
Crisp-DM:A tried-and-true method for managing your data mining operations is the Cross-Industry Standard Process for Data Mining, or CRISP-DM. The CRISP-DM methodology offers a methodical approach to project

planning for data mining. It is a dependable and tested strategy. It provides descriptions of the typical project stages, explanations of the tasks involved in each phase, and connections between these tasks. CRISP-DM offers a summary of the data mining life cycle. The CRISP-DM paradigm is flexible and straightforward to modify.This methodology is used in the [10] resource paper.

NLP: The field of natural language processing (NLP), which integrates linguistics, computer science, and artificial intelligence, investigates how computers interact with human language by training the latter to generate a massive amount of data. The main subjects concern processing and processing of natural language data. The end goal is to create a machine that is capable of "understanding" a document's content, including the nuances of language used in diverse contexts. After successfully retrieving the information and concepts from a document, the technology may classify and organize the document by itself. This methodology is used in the [10] resource paper.

TF-IDF: : Tf-idf, short for term frequency-inverse document frequency, is a numerical statistic used in information retrieval that aims to capture the significance of a word to a document within a corpus or collection. [1] In information retrieval, text mining, and user modeling searches, it is frequently employed as a weighting factor. To account for the fact that certain words are used more frequently than others overall, the tf-idf value rises according to the number of times a word appears in the document and is offset by the number of documents in the corpus that contain the term. One of the most common term-weighting techniques used nowadays is tf-idf. This methodology is used in the [12][19][20] resource papers.

Countvectorizer: A fantastic utility offered by the Python scikit-learn module is Count Vectorizer. It is used to convert a given text into a vector based on the number of times (count) that each word appears across the full text. When we have several of these texts and want to turn each word into a vector, this is useful. This methodology is used in the [9] resource paper.

Word2Vec: Word embeddings may be learned from big datasets using a series of model designs and optimizations called word2vec, which is not a single approach. The effectiveness of word2vec-learned embeddings on several subsequent natural language processing tasks has been demonstrated. A text corpus is provided as input to the word2vec tool, which outputs word vectors. It initially creates a vocabulary from the training text data before learning how to represent words graphically. Many programmers for machine learning and natural language processing can utilise the generated word vector file as features. This methodology is used in the [15] resource paper.

IV. Conclusion

Sentiment analysis is an important component of public reviews evaluation for a product. The journals that were referred to were missing few of the important aspects like understanding the implicit aspects, translation of reviews in different languages. They also fail to analyze emoji as emoji. The future scope will be to address the pre-existing issues. The projects need to be evaluated with larger datasets, in order to get higher accuracies in models. They need to be evaluated by implicit data. They need to add multilingual data in order to work with different language data sentiments. They need to add emoji and voice as input to evaluate and give more accurate predictions.

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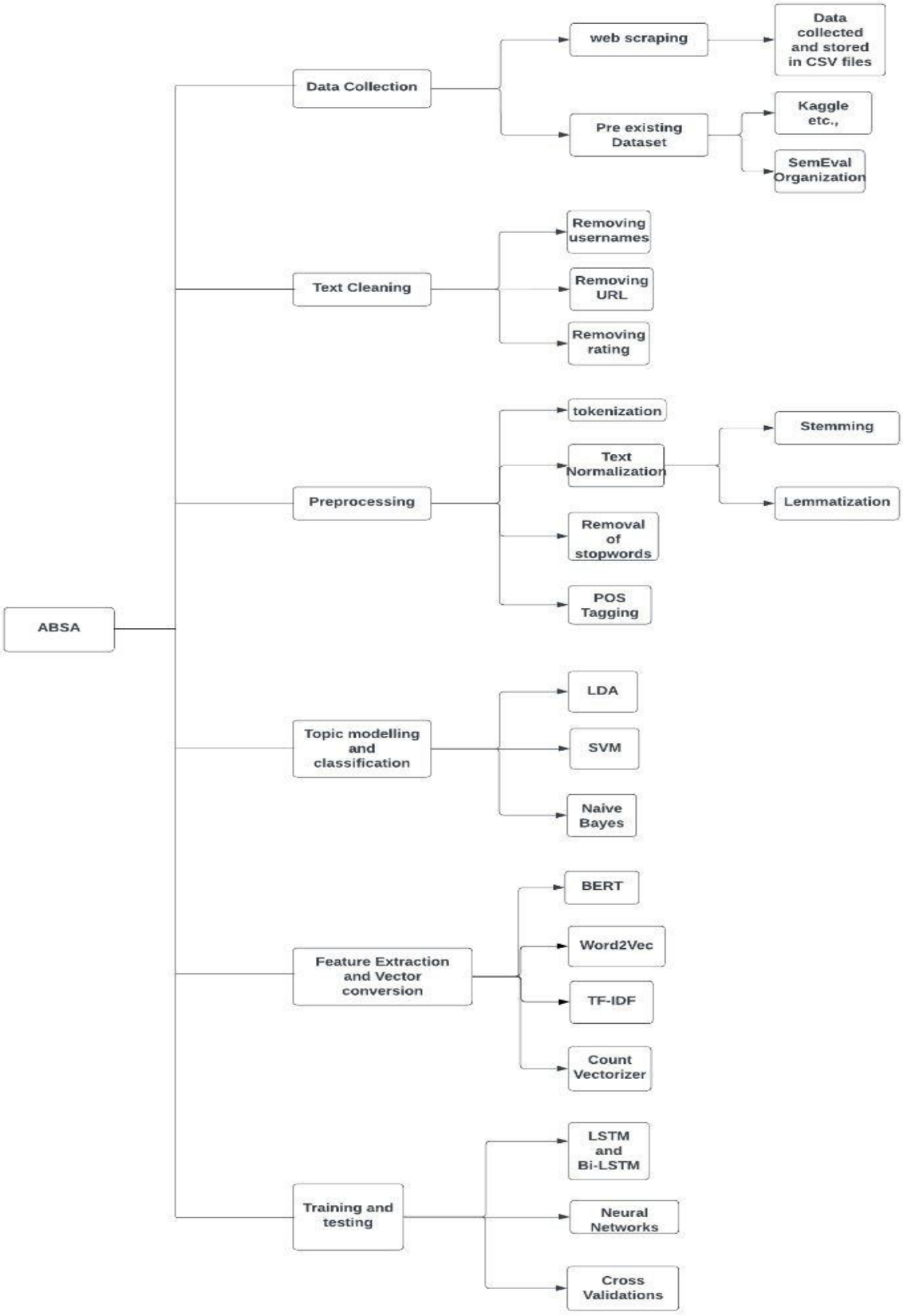

Figure 3.1. Aspect Based Sentiment Analysis using multiple Methodologies

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[23] Mayur Wankhade1,2 · Annavarapu Chandra Sekhara Rao1,2 · Chaitanya Kulkarni1,2 Published online: 7 February 2022 © The Author(s), under exclusive licence to Springer Nature B.V. 2022 on A survey on sentiment analysis methods, applications, and challenges

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Issues and Challenges in Energy Efficient 5G Networks

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***Abstract*—The emergence of the fifth generation (5G) wireless networks opens the avenues for the networks to have more number of base stations and other connected devices. This increased scalability with versatile devices possess more stringent challenges to achieve energy efficient networks. Additionally, literature and existing environmental conditions shows that the energy efficiency is the key element that is required in the designing of a reliable communication networks without compromising Quality of service (QOS) and Quality of experience (QOE) parameters. It motivates us to analyze the prevailing techniques to provide energy efficient solutions in the 5G networks in order to draw issues and challenges to meet out in the near future.**

***Index Terms*— Wireless networks, 5G, Energy Efficiency, D2D, Massive MIMO.**

I. INTRODUCTION

5G Network is the impending transformation of mobile innovation. Its features and its convenience like lower latency, higher capacity, increased bandwidth etc. as shown in Fig. 1 has a vast scope to improve the experience of a user. In fact, 5G frameworks will serve large number of devices, providing universal connectivity with lot of services like smart cities, smart homes, enhanced security etc. It is predicted that in coming years, it can be used to connect millions of devices for human to human as well as for device to device (D2D) communication [1][20].

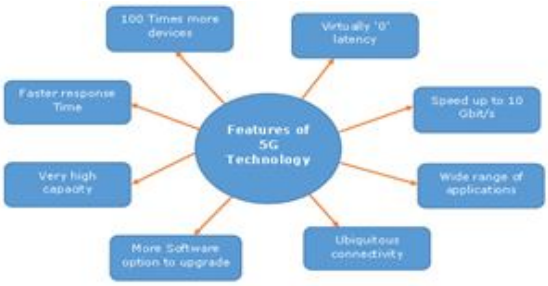

Figure 1. Features of 5G technology

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Therefore, the implementation of such a huge network implies to incorporate a very high cardinal set of versatile interconnected devices [2] where energy efficiency is one of the major performance indicators in these networks. Here, the term energy efficiency (EE) is an indicator to estimate the consumption of energy (Joules) for the communication of a set of bits [3]. Therefore, EE is a notion of throughput per unit energy consumed [4]. The energy consumed for the communication and to achieve throughput, shows that EE has two different dimensions: User Equipment (UE) side known as Device EE as well as Base Station side known as Network EE.

A. Device EE

The term Energy Efficiency arises from the energy constrained networks like adhoc networks, wireless sensor networks where the devices are operated by stored energy sources like battery. Therefore, the life span of a device is an outcome of the battery life. In this way, to enhance the life span of a device the energy utilization should be reduced to minimum as possible. But the energy consumption of these devices is very much high as compared to the development in battery technology. Therefore, the mobile terminals must be energy efficient. Furthermore, the rising demand of bandwidth rich communication by engaging robust complex processing thrust the need of efficient utilization of the available energy source. The energy efficiency also means to reduce the CO_2 emissions and reinforces the resource allocation in a sustainable fashion for attaining the EE of the networks.

B. Network EE

Rise in a capacity demands for a proportionate increase in the number of transmitters also. However, merely increasing the number of transmitters cannot cope up the demand of connecting more number of devices with the existing standards. Further, every increase in the number of transmitters contributes a proportionate rise in the demand of the energy consumption of the whole network. This rise in the demand for the energy becomes a cause of concern for the efficient utilization of the energy source. Moreover, the unwise use of energy sources will create concerns for economic and environmental sustainability. Therefore, to avoid unwise use of energy sources requires the use of new techniques for the designing and implementation of wireless networks which provide increase in capacity with improved energy efficiency [5].

The major application areas under 5G communication are divided into three main categories mainly, ultra-reliable low latency, massive machine type and enhanced mobile broadband [6]. All the three categories of 5G communications have distinct metrics to analyze the performance. Here, enhanced mobile broadband is used to analyze the applications based on database. Similarly, ultra-reliable low latency and massive machine type is used to evaluate in terms of reliability, latency and the number of connections respectively. But the energy efficiency is a key performance indicator for all types of traffic on both user and network side.

The traditional energy efficient techniques consider only transmit power but it is true for the networks where transmit power is much larger than total transmit power i.e. in the case of high data rate applications [7] and for the longer transmission distance.

From this it is concluded that a good EE metric must consider both transmit as well as circuit power. Various techniques like SWIPT, Small Cells, Machine to Machine Communication (M2M), Massive MIMO, Millimetre waves etc. have been proposed for 5G network in the literature to implement energy efficiency.

These various techniques are required to analyze to understand future issues and challenges to design high capacity, ubiquitous connectivity, low latency, faster response time, high speed energy efficient network.

Thereby, in this paper out of these various techniques we will discuss SWIPT, Small Cells, Beamforming, and Massive MIMO.

II. TECHNIQUES

A. Simultaneous Wireless Information and Power Transfer (SWIPT)

Wireless networks are constrained by energy because the capacity and the charging of batteries becomes the major problem of mobile communication system [8]. Radio Frequency Energy harvesting (RF-EH) for wireless communication system is regarded as a new technology that helps in extending the life time of the battery powered devices by allowing them to charge from the RF signals rather than from fixed power grids and the conventional energy sources making it suitable solution for powering low power devices. Out of various EH technologies, SWIPT as shown in Figure 2 suggests harvesting part of the energy carried by the wireless communication signals. The SWIPT scheme are majorly contributed by two other schemes i.e. time switching (TS) and power splitting (PS) [9]. PS uses the same modulated signal for the transmission of power and information. At the PS receiver, RF power divider is used to divide the incoming RF signal and then the divided

signals are recovered using information decoder and energy harvester whereas in TS technique, either the information or the power is used at the receiver through the incoming RF signal. Here, out of TS and PS, the TS needs less computations, however, PS equips the receiver with information or with energy instantaneously because of multiplexing the both in the same slot. But PS scheme creates a problem in the networks where there is a large gap between the power requirements for data communication and data transfer [10]. The high power modulated EM wave used for the power transfer needlessly occupies some bandwidth and causes interference in nearby wireless communication systems. Moreover, there is a significant degrade in the efficiency of the high-power amplifier (HPA) in the transmitter due to high power ratio by estimating peak to average ratio of the transmitted signal.

One solution to resolve these problems is to send the wireless power using unmodulated continuous wave and a small modulated signal is used for transmitting information to reduce the interference and to increase the efficiency of power amplifier[11].

In this way this technique can be used in wireless charging of power constrained relay nodes. In future where we come across with massive networks we can use this scheme with MIMO (massive MIMO), where large number of RF signals available can be harnessed at the relays to produce power.

B. Beam Forming

Literature shows that transmission energy can be saved using cooperative communication (CC) [12] [14] and collaborative beamforming [13]. MIMO is one of the CC techniques that uses multiple antennas. In MIMO, both the receiver and the transmitter apply number of antennas to enhance the communication performance. Although, MIMO improves the performance, however, the tiny sized resource constrained wireless nodes find less scope to have multiple antennas and it is too costly to use multiple antennas at each node.

Further, in MIMO, a receiver get poor signal strength caused by multi-path signal fading. Therefore, to support the signal strength at the receiver, beamforming is used for the communication. Here, the beamforming is used in a collaborative manner to achieve energy efficiency. The beamforming employs an array of antennas to send signals in a particular direction. Since, beamforming uses electromagnetic signals in a constructive form, therefore, this technique is able to communicate to a longer distance between receiver and transmitter. Thereby, using only one transmitter at the sender side results in less consumption of the energy. In this way the concept of beamforming is able to lower down the energy requirement of the whole network which yields an enhanced lifetime of the network. In this manner, throughput per unit energy for these applications will increase and subsequently energy efficiency is relied upon to be improved. Therefore, 5G networks with beamforming are more energy efficient than equivalent 4G networks [15].

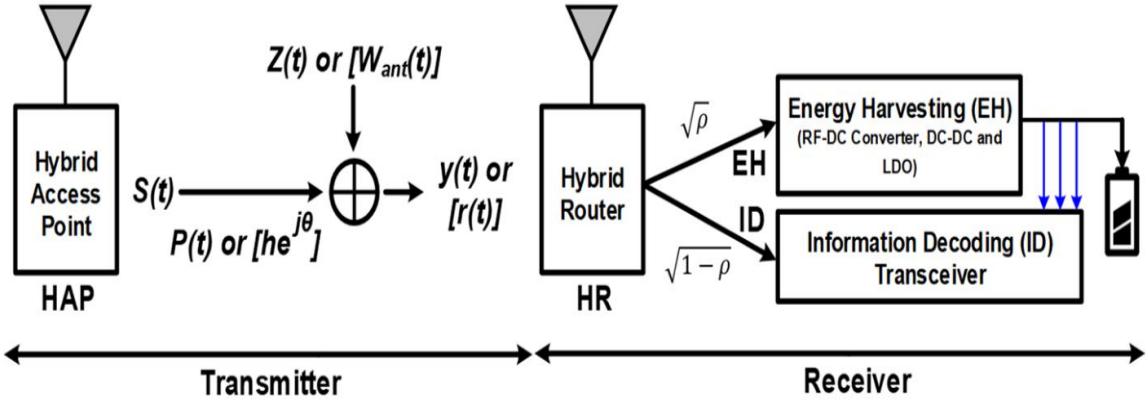

Fig. 2 Idea of Simultaneous Wireless Information and Power transfer

C. Small cells

Small cells is a broad term utilized for low cost, low power base stations operating in licensed and unlicensed spectrum and depending upon size they can be of different types like femto cells, pico cells, microcells etc. They are usually deployed in wireless networks to increase capacity and to have high data rates. Small cells can have wired or wireless centralized base stations with core network. Since using small cells distance between the user and the base station is reduced and hence small cells are used to reduce the transmit power needed. The reduced transmitted power results in a lesser path loss and consequently able to achieve better energy efficiency

for downlink transmission as well as for uplink transmission. The small cells have different types of policies to access like closed access in which user can connect with each other only if they are in closed subscriber groups, open access in which every user can connect with each other and hybrid access that can be operate in open access and also there is a provision of priority for a specific user, if needed [16]. To reduce the energy consumption further, literature supports the use of specialized access points known as small cell access (SCA) points. The use of SCA enables the mobile nodes to communicate with it (i.e. SCA) instead of base station directly. Now, SCA requires to communicate with a distant located base station only. Therefore, all the mobile nodes are need not to communicate with high energy signals to travel longer distance to the base station directly. In this manner, SCAs are installed on the locations from where they can work as a connecting device between base station and the mobile stations. Precisely, SCAs are able to support the concept of the small cells further without altering the existing communication protocols which supports the theme of the efficient utilization of the energy for the mobile stations.

D. Massive MIMO (scaling up MIMO)

Compared with conventional MIMO, Massive MIMO (Massive multiple-input multiple-output (MIMO)) uses multiple base station antennas. Therefore, massive MIMO is able to transmit multiple data streams at the same time. It implies an increased spectral gain and pulls down the energy requirements of the whole network. After the development of MIMO technology from point to point MIMO[17], multi-user MIMO[18] and now massive MIMO it becomes a promising technology to be used for today's and next generation wireless communication systems because of its very high reliability, spectral efficiency and other strong points. Massive MIMO helps the base station to communicate with multiple users at the same time in the same frequency band and thereby offering high multiplexing and array gain simultaneously.

EE can be achieved in massive MIMO by the deployment of large number of antennas or by using the simple linear processing methods on both the uplink and downlink.

By using large number of antennas

Consider a propagation scenario where a base station (BS) with M number of antennas (massive MIMO) is used to service K number of user equipments (UEs) using the same time-frequency resource such that $M \gg K$. Using large number of antennas at the base station results in a near deterministic wireless channel as the wireless links between BS and UE become non orthogonal w.r.t each other as in the large M system the influence of uncorrelated noise, intracell interference and small scale fading disappear asymptotically. Now, by applying the Shannon capacities [19] for a flat fading multi-user MIMO for both uplink and downlink where $M \gg K$ and by considering the power control strategies for normalization of the flat fading coefficient it is find that UE transmission power reduces correspondingly /proportionately with M . This implies that the net throughput of the system increased by adding more number of users in the system whereas the throughput per UE remains unaltered. This increased throughput of the system by consuming the same energy as that of the 4G LTE system implies a significant gain in the EE of 5G networks.

By using the simple linear processing methods

Massive MIMO provides a large capacity to accommodate more number of users in the 5G system. This gain in capacity can be achieved utilizing low energy of circuit energy expenditure by the use of less difficult and linear processing methods like maximal- ratio combining (MRC) for uplink detection and maximal-ratio transmission (MRT) for downlink detection, which can give near optimal throughput performance. This results in very much higher EE than conventional multi-user MIMO systems since they uses complex processing techniques for detection.

All the above discussed techniques can be summarized in following TABLE I.

III. CONCLUSION

5G networks strive hard on the energy source to achieve its goals like high throughput, low latency, low energy, high speed, ubiquitous connectivity etc. However, these goals need to accomplish within the predefined energy bounds. Thus, the aim of having improved throughput, energy harvesting, and reduced interference draw the favorable boundaries to have the concepts like- massive MIMO, SWIPT, small cells, and beamforming in 5G. Further, it is inferred from the above discussion that these energy efficient concepts work in harmony with each other. It shows the future research challenge to define an optimum balance between these concepts by analyzing and defining their interdependency.

TABLE I: ADVANTAGES AND ISSUES OF DIFFERENT ENERGY EFFICIENT 5G TECHNIQUES

Technique	Advantages	Issues
SWIPT	No wires, no contacts, no batteries. Carries both energy and information simultaneously. Efficient use of RF spectrum. Use of smaller, lighter and compact devices. Increased link capacity and range. Cost effective.	Efficiency is not satisfactory for long distance communication. Susceptible to security attack dur to broadcast nature. Circuit models of SWIPT are not so much efficient.
Beam-forming	Increased link capacity Increased range. Low path loss. Low user-user interference. Low fading. Faster and reliable communication. High system security.	Increasedhardware complexity. High cost. Optimization methods are needed to satisfy the throughput requirements of terminal.
Small Cells	Low propagation losses. Low cost. Easy deployment. Improved energy efficiency. Low user's battery consumption. High data rate with low power consumption. Base station is smaller.	Management of interference. Massive energy consumption. Deployment of low power consuming small cells.
Massive MIMO	High multiplexing gain. Little interference leakage. High spectral efficiency. High energy efficiency. High data rate. Low power consumption. Less fading. Low latency. Increased reliability.	Difficulty in the selection of devices that are need to be connected. Designing cost effective hardware for MIMO systems. Effect of pilot contamination in uplinks and downlinks.

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