

**Scheme of Instruction & Examination**  
**B. E. – MINOR –AI&ML**  
**V SEMESTER**

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
<b>Theory Courses</b>									
1	AML-01CS	Foundations of Data Mining and AI	3	0	0	3	40	60	3
2	AML-02CS	Statistical Analysis and Computing	3	0	0	3	40	60	3
<b>Practical / Laboratory Courses</b>									
3	AML-03CS	Statistical Analysis and Computing Lab	0	0	2	2	40	60	1
<b>Total Credits</b>						<b>08</b>	<b>120</b>	<b>180</b>	<b>07</b>

**VI SEMESTER**

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
<b>Theory Courses</b>									
1	AML-04CS	Machine Learning	3	0	0	3	40	60	3
	AML-05CS	Machine Learning Lab	0	0	2	2	40	60	1
OR									
2	AML-06CS	SWAYAM/NPTEL Course					40	60	4
<b>Total Credits</b>						<b>05</b>	<b>40</b>	<b>120</b>	<b>04</b>

**VII SEMESTER**

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
<b>Theory Courses</b>									
1	AML-07CS	Artificial Neural Networks	3	0	0	3	40	60	3
<b>Practical / Laboratory Courses</b>									
2	AML-08CS	Project Work	0	0	4	4	40	60	4
<b>Total Credits</b>						<b>07</b>	<b>80</b>	<b>120</b>	<b>07</b>

# **V SEMESTER**

# FOUNDATIONS OF DATA MINING AND AI

<b>Semester V</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Subject code – AML-01CS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

Prerequisite: DBMS

<b>Course Objectives:</b>	<b>Course Outcomes:</b>
<ul style="list-style-type: none"><li>➤ Introduce current trends in data mining</li><li>➤ Write association rules for a given data pattern.</li><li>➤ Choose between classification and clustering solution.</li><li>➤ Understand the importance of the field of AI.</li><li>➤ Learn methods of expressing knowledge by a machine with appropriate reasoning and different statistics.</li></ul>	<ol style="list-style-type: none"><li>1. Organize and prepare the data needed for data mining using preprocessing techniques</li><li>2. Implement the appropriate data mining methods like classification, association and clustering on a given data set.</li><li>3. Understand the informed and uninformed problem types and apply search strategies to solve them.</li><li>4. Examine the issues involved in knowledge bases, reasoning systems and planning.</li><li>5. Design and evaluate intelligent expert models for perception and prediction from intelligent environment.</li></ol>

## UNIT I

**Introduction:** What is data mining, Challenges, Data Mining Tasks, Major issues in data mining.

**Data:** Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity.

**Association Analysis:** Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm.

## UNITII

**Classification and Prediction:** - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Classification by Back propagation – Support Vector Machines. Accuracy and Error Measures – Evaluating the Accuracy of a Classifier.

## UNITIII

**Cluster Analysis:** - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods –Outlier Analysis.

## UNITIV

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation

## **UNITY**

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A\* ,AO\* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

## **TEXT BOOKS**

1. Data Mining -Concepts and Techniques, Jiawei Han, MichelineKamber, Jian Pei, III Edition, Morgan Kaufmann Publisher, 2012.
2. Artificial Intelligence – A Modern Approach, S. Russel and P. Norvig, II Edition, Pearson Education.

## **REFERENCE BOOKS**

1. Data Warehousing in the Real World, Pearson,Sam Anahory, Dennis Murray, X Impression,2012.
2. Mastering Data Mining, Michael. J. Berry, Gordon. S.Linoff, Wiley Edition, II Edtion,2012.
- 3.Computational Intelligence: a logical approach, David Poole, Alan Mackworth, Randy Goebel, Oxford University Press.

# STATISTICAL ANALYSIS AND COMPUTING

<b>Semester V</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Subject code – AML-02CS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>Course Objectives:</b>	<b>Course Outcomes:</b>
<ul style="list-style-type: none"><li>➤ To understand Statistical parameters for data analytics</li><li>➤ To use Numpy for organizing and analyzing data</li><li>➤ To use pandas for summarizing and analysis of data</li><li>➤ To use of statistical methods for cleaning and preparation of data</li><li>➤ To performs aggregation of data and understand analysis of time series data</li></ul>	<ol style="list-style-type: none"><li>1. Understand and explore different aspects of python environment</li><li>2. Understand python Built-in Data Structures, Functions, and Files</li><li>3. Use Numpy for organizing and analyzing data</li><li>4. Use pandas for summarizing and analysis of data</li><li>5. Use of statistical methods for cleaning and preparation of data and performs aggregation of data</li></ol>

## UNIT I

**Python Language Basics, IPython, and Jupyter Notebooks:** The Python Interpreter, IPython Basics, Python Language Basics

**Built-in Data Structures, Functions, and Files:** Data Structures and Sequences, Functions, Files

## UNIT II

**NumPy Basics: Arrays and Vectorized Computation:** The NumPyndarray: A Multidimensional Array Object, Universal Functions, Array-Oriented Programming with Arrays, File Input and Output with Arrays, Linear Algebra.

## UNIT III

**PANDAS:** Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics, Reading and Writing Data in Text Format, Interacting with Databases

## UNIT IV

**Data Cleaning and Preparation:** Handling Missing Data, Data Transformation, String Manipulations

## UNIT V

**Data Aggregation and Group Operations:** GroupBy Mechanics, Data Aggregation, Apply: General split-apply-combine, Pivot Tables and Cross-Tabulation

## TEXTBOOKS

1. Python for Data Analysis- DATA WRANGLING WITH PANDAS, NUMPY, AND IPYTHON, Wes McKinney, O-Reilly, 2018
2. Python Data Analytics, Fabio Nelli, Apress, 2015

## REFERENCE BOOKS

1. Data Analysis from Scratch with Python Step By Step Guide, Peters Morgan , II Edition, AI Sciences
2. Python for Data Analysis: A Step-By-Step Guide to Master the Basics of Data Science and Analysis in Python Using Pandas, NumpyAndIpython, Volume 2, Andrew Park,

## STATISTICAL ANALYSIS AND COMPUTING USING PYTHON LAB

<b>Semester V</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Subject code -AML-03CS</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

<b>Course Objectives:</b>	<b>Course Outcomes:</b>
<ul style="list-style-type: none"><li>➤ Install Numpy and Pandas</li><li>➤ Work with 1D and 2D arrays in Numpy</li><li>➤ Explore multi-dimensional arrays in Numpy</li><li>➤ Perform statistical analysis using Numpy</li><li>➤ Perform statistical analysis using Pandas</li></ul>	<ol style="list-style-type: none"><li>1. Install Numpy and Pandas</li><li>2. Work with 1D and 2D arrays in Numpy and process data in arrays</li><li>3. Explore multi-dimensional arrays in Numpy and perform conversions</li><li>4. Perform statistical analysis using Numpy by calculating measures of central tendency, deviation, distances, and correlation</li><li>5. Perform statistical analysis using Pandas</li></ol>

### List of Programs

1. Installing Numpy
2. Working with arrays
  - a. Create a 1D array
  - b. Create a boolean array
  - c. Extract items that satisfy a given condition from 1D array
  - d. Replace items that satisfy a condition with another value in numpy array
  - e. Replace items that satisfy a condition without affecting the original array
  - f. Reshape an array
  - g. Extract all numbers between a given range from a numpy array
3. Multiple arrays
  - a. Stack two arrays vertically
  - b. Stack two arrays horizontally
  - c. Get the common items between two python numpy arrays
  - d. Remove from one array those items that exist in another
  - e. Get the positions where elements of two arrays match
4. Multi-dimensional arrays
  - a. Convert an array of arrays into a flat 1d array
  - b. Swap two columns in a 2d numpy array
5. Statistical analysis
  - a. Compute the mean, median, standard deviation of a numpy array
  - b. Find the percentile scores of a numpy array
  - c. compute the euclidean distance between two arrays
  - d. Find the correlation between two columns of a numpy array
  - e. Probabilistic sampling in numpy
  - f. compute the moving average of a numpy array
6. Data Cleaning
  - a. Find the position of missing values in numpy array
  - b. Drop rows that contain a missing value from a numpy array
  - c. Replace all missing values with 0 in a numpy array
  - d. Drop all missing values from a numpy array
7. Data Transformation
  - a. Normalize an array so the values range exactly between 0 and 1

- b. Compute the min-by-max for each row for a numpy array 2d
8. Pandas Basics
    - a. Installing Pandas
    - b. Import pandas and check the version
    - c. Create a series from a list, numpy array and dict
    - d. Convert the index of a series into a column of a dataframe
    - e. Combine many series to form a data frame
  9. Statistical analysis in pandas
    - a. Get the minimum, 25th percentile, median, 75th, and max of a numeric series
    - b. Get frequency counts of unique items of a series
    - c. Bin a numeric series to 10 groups of equal size
    - d. Compute the euclidean distance between two series
  10. Data Preparation in pandas
    - a. Normalize all columns in a dataframe
    - b. Compute the correlation of each row with the succeeding row
    - c. Compute the autocorrelations of a numeric series

# **VI SEMESTER**



## MACHINE LEARNING

<b>Semester -VI</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Subject code – AML-04CS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>Course Objectives</b>	<b>Course Outcomes:</b>
<ul style="list-style-type: none"> <li>➤ To learn the concepts of machine learning and types of learning</li> <li>➤ To study various supervised learning algorithms.</li> <li>➤ To learn ensemble techniques and various unsupervised learning algorithms</li> <li>➤ To understand assessment methods and evaluation parameters of machine learning algorithms</li> </ul>	<ol style="list-style-type: none"> <li>1. Describes types of data and their preprocessing methods</li> <li>2. Describes supervised, unsupervised learning methods and their appropriate evaluation procedures and metrics</li> <li>3. Applies different supervised and unsupervised machine learning algorithms to different datasets</li> <li>4. Evaluates different machine learning approaches and infers the best learning model for a given scenario</li> </ol>

### UNIT I

**Introduction:** Types of Machine Learning Algorithms: Parametric and Non-parametric Machine Learning Algorithms, Supervised, Unsupervised, Semi-Supervised and Reinforced Learning.

**Data Objects and Attribute Types:** Nominal Attributes, Binary Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. **Basic Statistical Descriptions of Data:** Measuring the Central Tendency: Mean, Median, and Mode. Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation.

## UNIT II

**Representation and Learning:** Feature Vectors, Feature Spaces

**Supervised Algorithms: Regression:** Linear Regression, Logistic Regression. Evaluation Measures: SSE, RMSE, R<sup>2</sup>

## UNIT III

**Classification:** Decision Tree, Naïve Bayes, K-Nearest Neighbors, Support Vector Machines.

**Evaluation of classification:** cross validation, hold out The Confusion Matrix, Accuracy, precision, recall, F-Score, Receiver Operator Characteristic (ROC) Curve

## UNIT IV

**Unsupervised Learning:** Cluster Analysis: Similarity Measures.

**Categories of clustering algorithms,** k-means, Hierarchical Clustering.

## UNIT V

**Ensemble Algorithms:** Bagging, Random Forest, Boosting

## TEXTBOOKS

1. Machine Learning, Tom Mitchell, McGraw-Hill Science/Engineering/Math; (1997).
2. Data Mining -Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, III

Edition, Morgan Kauffmann Publisher, 2012.

## REFERENCE BOOKS

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, II Edition, Chapman & Hall/CRC
2. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer. (2006)
3. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson, 2014.

## MACHINE LEARNING LAB

<b>Semester -VI</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Subject code – AML-05CS</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

Course Objectives:	Course Outcomes:
<ul style="list-style-type: none"> <li>➤ To Demonstrate different classifiers on different data.</li> <li>➤ To Apply different Clustering techniques</li> <li>➤ To use different machine learning techniques to real world data</li> <li>➤ To Evaluate different supervised models for different datasets</li> </ul>	<ol style="list-style-type: none"> <li>1. Demonstration of different classifiers on different data.</li> <li>2. Application of different Clustering techniques</li> <li>3. Analysis of different machine learning techniques to real world data</li> <li>4. Evaluation of different supervised models for different datasets</li> </ol>

### List of Programs:

1. Build model using linear regression and apply it to classify anew instance
2. Build model using logistic regression and apply it to classify anew instance
3. Write a program to demonstrate Decision tree classifiers. Use an appropriate data set for building the model.
4. Write a program to demonstrate K nearest neighbour classifier. Use an appropriate data set for building the model.
5. Write a program to demonstrate Naïve bayes classifier. Use an appropriate data set for building the model.
6. Write a program to demonstrate Support vector machine classifiers. Use an appropriate data set for building the model.
7. Demonstrate Clustering using k-means Clustering algorithm
8. Demonstrate Clustering using Hierarchical Clustering algorithm

## SWAYAM / NPTEL

Semester -VI	L	T	P	Credits	
Subject code – AML-06CS		0	0	0	4

Student can choose any one of the two courses

### 1. Computer Fundamentals

Duration : 12 weeks

Week 1	Introduction to Computer: Functional Block Diagram Computer: History and Development Evolution of Computer An Introduction to Computer
Week 2	Overview of Computer: Input Devices, Part-1 Overview of Computer: Input Devices, Part-2 Overview of Computer: Input Devices, Part-3 Overview of Computer: Output Devices, Part-1
Week 3	Overview of Computer: Output Devices, Part-2 Computer: Audio Input and Output Devices Computer: An Introduction to Storage Device Permanent Storage Devices - An Overview of Computer An Overview of Computer Memory Computer: Memory Management
Week 4	Computer: Working of CPU Computer: Working of 8088 CPU Evolution and Development of Microprocessors, Part-1 Evolution and Development of Microprocessors, Part-2 Cooling Mechanism of Computer Components Computer: Components of Motherboard Computer : Cabinet, Power Supply &UPS
Week 5	Micro-Programming, Part-1 Micro-Programming, Part-2 Central Processing Unit: Interrupt, Part-1 Central Processing Unit: Interrupt, Part-2 Device Driver, Part- 1 Device Driver, Part- 2
Week 6	Internet: An Introduction An Introduction to Computer - Networking Multimedia, Basic Elements Multimedia System Overview of Computer Hardware & Software
Week 7	Operating System Softwares

Computer Softwares - Application Software  
An Introduction to Computer - Operating System

Operating System: Utility Software Tools  
Disk Operating System, Part-1

Week 8	Disk Operating System, Part-2 Disk Operating System, Part-3 Flow Charts & Programs Basics of Linker & Loader Assembly Language & Assembler Introduction to Compilers Debugger Software Computer Software: Editor Part 1
Week 9	Computer Software: Editor Part 2 Simulator Emulator Programming Languages Control Panel Settings
Week 10	Instruction Set of 8086/8088 Microprocessor Part 1 Instruction Set of 8086/8088 Microprocessor Part 2 Instruction Set of 8086/8088 Microprocessor Part 3 Instruction Set of 8086/8088 Microprocessor Part 4 Instruction Set of 8086/8088 Microprocessor Part 5
Week 11	Keyboard Controller Interrupt & DMA Controller Clock Generator & Bus Controller Math Co-processor Hard Disk Drive and Controller
Week 12	Display Controller Serial Interface Part-1 Serial Interface, Part-2 Parallel Interface & Printer Port Universal Serial Bus (USB)

### TEXT BOOKS

1. Structured Computer Organization, Tanenbaum A.S, EEE, Prentice hall India, V Edition.
2. Computer Organization & Architecture, Stallings W, Prentice hall India, V Edition.
3. Fundamentals of Computers, Rajaraman V, EEE, Prentice Hall India.
4. Computer Peripherals and Interfaces, Kamra A. and Bhambri P (2008), Technical Publication, Pune.
5. IBM PC and Clones- hardware Troubleshooting & Maintenance, B. Govindrajalu, Tata McGraw Hill.
6. The Complete PC Upgrade and Maintenance Guide, XVI Edition, Mark Minasi, Wiley India.
7. Hardware Bible, Premier Edition, Winn L Rosch, Techmedia.

## 2. Ecommerce Technologies

Duration : 12 weeks

Week 1	Introduction to e-commerce Technical components and functions of e-commerce Advantages and disadvantages of e-commerce
Week 2	Scope and applications of e-commerce E-commerce and E-business
Week 3	Evolution of Internet, Domain names and Internet Organization Types of Network Role of internet in B2B application and Building own website
Week 4	Web Promotion Target email, Banner exchange and Shopping Bots Secure Transaction Over Internet
Week 5	Privacy issues Computer crime Threats and Attacks on Computer System
Week 6	Software Packages for Privacy Hacking and computer virus Security algorithms
Week 7	Authorization and Authentication, Digital Signature Firewall Basic Concepts of EDI
Week 8	Applications of EDI EDI Model and Disadvantages of EDI Model
Week 9	Introduction to electronic payment systems Electronic Payment types
Week 10	Planning E-commerce Initiates, Linking Objectives to Business Strategies Managing Costs, Strategies for Developing E-commerce Websites
Week 11	Pros and cons of online shopping Case Study - Cons of Online Shopping, E-cycle of Internet Marketing
Week 12	Internet Marketing Techniques Personalization of e-commerce

### TEXTBOOKS

1. E-Commerce Concepts, Models, Strategies, G.S.V.Murthy, Himalaya Publishing House, 2011.
2. E- Commerce, Kamlesh K Bajaj and Debjani Nag, 2005.
3. Electronic commerce, Gray P. Schneider, International Student Edition, 2011,

## **VII SEMESTER**

## ARTIFICIAL NEURAL NETWORKS

<b>Semester -VII</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Subject code – AML-07CS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisites:** Basic Knowledge about Data Mining

<b>Course Objectives:</b>	<b>Course Outcomes:</b>
<ul style="list-style-type: none"> <li>➤ To understand the biological neural network and to model equivalent neuron models.</li> <li>➤ To understand the architecture, learning algorithms</li> <li>➤ To know the issues of various feed forward and feedback neural networks.</li> <li>➤ To explore the Neuro dynamic models for various problems.</li> </ul>	<ol style="list-style-type: none"> <li>1. Interpret the importance of neural network and neural network architecture.</li> <li>2. Understand the similarity of Biological networks and Neural networks.</li> <li>3. Perform the training of neural networks using various learning rules.</li> <li>4. Understanding the concepts of forward and backward propagations.</li> <li>5. Understand and Construct the Hopfield models.</li> </ol>

### UNIT I

**Introduction:** A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

**Learning Process:** Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning.

### UNIT II

**Single Layer Perceptrons:** Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

**Multilayer Perceptron:** Back Propagation Algorithm XOR Problem.

### UNIT III

**Back Propagation:** Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

### UNIT IV

**Self-Organization Maps (SOM):** Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification



## **UNIT V**

**Neuro Dynamics:** Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models, restricted boltzmen machine.

### **TEXT BOOKS**

1. Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.,.
2. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

### **REFERENCE BOOKS**

1. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003.
2. Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.
3. Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd 2005.

## PROJECT WORK

<b>Semester VII</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Subject code: AML-08</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>

The Viva-Voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner nominated by the University. The Internal Evaluation shall be made by the departmental committee, on the basis of two seminars given by each student on the topic of his/her project.

### **Project Proposal:**

- Begin by developing a clear and well-defined project proposal. This should include a project title, objectives, scope, and a brief overview of the problem or area of interest.
- Specify the technologies, tools, and programming languages that will be used in the project.

### **2. Project Advisor:**

- Assign a faculty member as a project advisor to guide and mentor the student throughout the project.

### **3. Project Selection:**

- Choose a project that aligns with the program's objectives and your own interests. The project should be challenging and relevant to the field of computer science and engineering.
- Consider projects that involve software development, algorithm design, database management, data analysis, or other relevant areas.

### **4. Research and Literature Review:**

- Conduct a thorough literature review to understand existing solutions and research related to your project.
- Identify gaps in the current knowledge and explain how your project will contribute to addressing these gaps.

### **5. Implementation:**

- Begin the implementation phase by writing code, developing algorithms, or creating software as per your project's requirements.
- Ensure that your code adheres to coding standards and best practices.

### **6. Testing and Debugging:**

- Rigorously test your project to identify and resolve bugs and errors.
- Perform unit testing, integration testing, and user acceptance testing as applicable.

#### **7. Documentation:**

- Maintain comprehensive documentation throughout the project. This includes code comments, user manuals, design documents, and technical reports.
- Properly cite and reference any external sources or libraries used in your project.

#### **8. Presentation and Demo:**

- Prepare a well-structured presentation and a live demonstration of your project's functionality.
- Highlight the problem statement, methodology, key features, and the impact of your project.

**11. Final Report:** - Submit a comprehensive final report that summarizes your project from start to finish. Include all documentation, code, and research findings.

**12. Presentation:** - Be prepared to present and defend your project in front of panel.

**13. Future Work and Impact:** - Discuss potential future work or enhancements that could be made to your project.