**Assignment List:**

**Course Outcome 1: Design and evaluate various machine learning algorithms**

1. **Implementing Classification Algorithms:**  
   Design and implement decision tree, SVM, and k-NN classifiers.

Evaluate their performance using confusion matrices, ROC curves, and other metrics on a dataset of your choice.

1. **Hyperparameter Tuning:**  
   Develop and compare machine learning models (e.g., logistic regression, random forest) with different hyperparameters.

Use grid search or random search to optimize them.

1. **Custom Algorithm Design:**  
   Design your own variant of a clustering algorithm (e.g., a modified k-means).

Compare its performance with standard algorithms on real-world datasets.

1. **Implement Decision Tree Algorithms for Credit Card Fraud Detection:**  
   Build a model to classify fraudulent and non-fraudulent transactions, emphasizing interpretability and accuracy.

**Course Outcome 2: Use machine learning methods for data analysis in various scientific fields**

1. **Healthcare Data Analysis:**  
   Analyze a dataset related to medical diagnosis (e.g., diabetes or breast cancer) using machine learning.

Use feature importance to identify key factors influencing outcomes.

1. **Environmental Data Modeling:**  
   Apply machine learning models to predict air pollution levels or rainfall based on historical data.

Evaluate the model's effectiveness using error metrics like MAE and RMSE.

1. **Medical Diagnostics Using Genetic Algorithms:**  
   Develop a genetic algorithm-based system to detect diseases. Compare its accuracy with traditional approaches.

**Course Outcome 3: Choose and apply appropriate machine learning techniques for analysis, forecasting, and categorization of data**

1. **Time Series Forecasting:**  
   Develop and compare ARIMA, LSTM models for stock price or weather forecasting. Evaluate their predictive performance.
2. **Artificial Neural Network for Stock Market Prediction:**  
   Implement a neural network to predict stock market trends using historical stock data.

Analyze the impact of different architectures.

1. **Twitter Sentiment Prediction Using Machine Learning Techniques:**  
   Use text classification models to analyze sentiment in a Twitter dataset. Explore different feature extraction and classification approaches.

**Course Outcome 4: Understand reinforcement learning and its applications**

1. **Reinforcement Learning Model for Tic Tac Toe:**  
   Implement Q-Learning or Deep Q-Learning to train an agent to play Tic Tac Toe.

Evaluate its performance across multiple scenarios.

1. **Reinforcement Learning for Traffic Light Control System:**  
   Design a reinforcement learning agent to optimize traffic flow by controlling traffic signals.

Use simulations to evaluate its effectiveness.

**Course Outcome 5: Real-world applications of advanced techniques**

1. **Fuzzy-Based Model for Grading System:**  
   Implement a fuzzy logic system to grade students based on multiple parameters (e.g., attendance, assignments, exams).

Test it on hypothetical or real data.

1. **E-commerce Recommendation System:**  
   Build a recommendation engine using collaborative filtering or content-based filtering for an e-commerce dataset.

Evaluate its system performance using precision and recall.

**Guideline:** Students are expected to complete atleast 1 assignment from each outcome category.

**Rubrics:**

**Evaluation Rubric for 50 Marks**

**Parameters and Weightage**

1. **Implementation and Functionality (12marks) + Advancement 3 marks**
2. **Technical Depth and Orals (20 marks)**
3. **Report and Clarity (10 marks)**
4. **Orals (5 marks)**

**1. Implementation and Functionality (15 marks) – PO1**

Focus: Evaluate the correctness, completeness, and functionality of the implemented model.

| **Criteria** | **Marks** | **Description** |
| --- | --- | --- |
| **Algorithm Implementation** | 7+3 | Correct implementation(7). Novelty has 3 marks |
| **Model Training and Learning** | 5 | Evidence of successful model training, with learning behavior demonstrated. |
|  |  |  |

**2. Technical Depth and Explanation (20 marks) – PO2**

Focus: Assess the understanding and technical depth demonstrated in the submission.

| **Criteria** | **Marks** | **Description** |
| --- | --- | --- |
| **Algorithm Explanation** | 10 | Clear explanation of reinforcement learning concepts and their application. |
| **Parameter Tuning** | 5 | Explanation of hyperparameters (learning rate, discount factor, etc.) and their impact. |
| **Performance Analysis** | 5 | Metrics or qualitative analysis of how well the agent performs the task. |

**3. Report and Clarity (10 marks) – PO3**

Focus: Evaluate the quality of the report, code documentation, and overall clarity.

| **Criteria** | **Marks** | **Description** |
| --- | --- | --- |
| **Code Documentation** | 5 | Well-documented code with comments explaining logic, steps, and functions. |
| **Report Presentation** | 3 | A structured report with proper sections: introduction, methodology, results, and conclusion. |
| **Clarity of Results** | 2 | Clear graphs, tables, or visualizations (if applicable) to present outcomes. |

1. **Plagiarism check with Orals (PO4)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | **Criteria** | **Marks** | **Description** | | --- | --- | --- | | **Orals** | 5 | . | | Clear Explanation | 3 | Demonstrates a deep understanding of the code’s purpose, how it works, and its intended impact. | | Conceptual Understanding | 2 | Can explain the underlying principles and algorithms (e.g., reinforcement learning, data processing) behind the code. | |  |  |

**Course Teacher**