Machine Learning and Data Mining

Course outcome as per Bloom's Taxonomy:

1. Remembering:
- Recall the architecture of a data mining system and differentiate between KDD and Data Mining.
- List and explain the various applications of data mining.
- Memorize the steps involved in data preprocessing including data cleaning, integration, and reduction.
- Recognize the concepts of frequent itemsets, closed itemsets, and association rules in data mining.

2. Understanding:
- Explain the Apriori algorithm and hash-based techniques for mining frequent patterns and associations.
- Comprehend the basics of machine learning, types of learning, hypothesis space, and inductive bias.
- Understand the concepts of regression including linear regression, logistic regression, and polynomial regression.
- Differentiate between supervised and unsupervised learning in classification and clustering.

3. Applying:
- Apply the Apriori algorithm to identify frequent patterns in a given dataset.
- Implement different regression techniques for data analysis and prediction tasks.
- Utilize various classification algorithms such as Support Vector Machine, Decision Tree, and Naive Bayes for creating predictive models.
- Apply clustering algorithms for grouping data points based on similarity.

4. Analyzing:
- Analyze the performance of different machine learning models using model evaluation techniques.
- Evaluate the quality of a classification model using metrics like confusion matrix, accuracy, recall, precision, F1 score, ROC, and AUC.
- Analyze the strengths and weaknesses of different clustering algorithms for different types of datasets.

5. Evaluating:
- Critically evaluate the effectiveness of neural network models in solving complex problems.
- Assess the impact of the choice of hyperparameters on the performance of machine learning models.
- Evaluate the trade-offs between accuracy and interpretability in different data mining and machine learning algorithms.

6. Creating:
- Design and implement data preprocessing techniques to clean and prepare raw data for analysis.
- Create and optimize machine learning models for regression, classification, and clustering tasks.
- Develop strategies for feature selection and engineering to improve the performance of predictive models.
- Design neural network architectures based on specific problem requirements and datasets.