DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

RCETECAC05 - Machine Learning

Course outcomes:

- Recognize the characteristics of Machine Learning techniques that enable to solve real world problems.
- Recognize the characteristics of machine learning strategies.
- Apply various supervised learning methods to appropriate problems.
- Identify and integrate more than one technique to enhance the performance of learning.
- Create probabilistic and unsupervised learning models for handling unknown pattern.

Syllabus:

UNIT I

Introduction to Machine Learning

Introduction, Components of Learning, Learning Models , Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension.

UNIT II

Supervised and Unsupervised Learning

Decision Trees:ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perception, Multilayer Perception, Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors. Introduction to clustering, K-means clustering, K-Mode Clustering.

UNIT III

Ensemble and Probabilistic Learning

Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking. Gaussian mixture models - The Expectation-Maximization (EM) Algorithm, Information Criteria, Nearest neighbour methods - Nearest

Neighbour Smoothing, Efficient Distance Computations: the KD-Tree, Distance Measures.

UNIT IV

Reinforcement Learning and Evaluating Hypotheses

Introduction, Learning Task, Q Learning, Non deterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning. Motivation, Basics of Sampling Theory: Error Estimation and Estimating Binomial Proportions, The Binomial Distribution, Estimators, Bias, and Variance.

UNIT V

Genetic Algorithms

Motivation,Genetic Algorithms: Representing Hypotheses,Genetic Operator, Fitness Function and Selection, An Illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning: Lamarkian Evolution, Baldwin Effect, Parallelizing Genetic Algorithms.

Reference Text Books:

1. "Pattern Recognition and Machine Learning" by Chris Bishop (Springer 2006) and "Probabilistic Graphical Models" by Daphne Koller and Nir Friedman (MIT Press 2009) and "Deep Learning" by Goodfellow, Bengio and Courville (MIT Press 2016).