| Course Code | Course Name | Course Category | L-T-P | Credits |
|---|---|---|---|---|
| **20CS4101** | **MACHINE LEARNING** | PEC | **3-1-0** | **4** |

**Objectives:**

- To understand the basic theory underlying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.To be
- able to apply machine learning algorithms to solve problems of moderate complexity.

**Course Outcomes:**

- Ability to understand what is learning and why it is essential to the design of intelligent machines.
- Ability to design and implement various machine learning algorithms in a wide range of real-worldapplications.

**UNIT I: INTRODUCTION**

Learning Problems – Perspectives and Issues - A brief introduction to Machine Learning's, Supervised Learning, Unsupervised Learning, Reinforcement Learning – Concept Learning – Version Spaces and Candidate Eliminations – Inductive Bias – Decision Tree Learning

**UNIT II: NEURAL NETWORKS AND GENETIC ALGORITHMS**

Neural Network Representation – Problems – Perceptron's – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

**UNIT III: BAYESIAN LEARNING**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

**UNIT IV: COMPUTATIONAL LEARNING**

Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules.

**UNIT V: INSTANCE-BASED LEARNING**

K- Nearest Neighbor Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

**UNIT VI: ADVANCED LEARNING**

SVM – Formulation, SVM – Interpretation & Analysis, SVMs for Linearly Non-Separable Data, SVM Kernels. Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TEXTBOOKS:


1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective Stephe Marsland, Taylor & Francis


REFERENCE BOOKS


1. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Trevor Hastie," *An Introduction toStatistical Learning: with Applications in R",* Springer, First Edition.
2. Kevin Murphy, "*Machine learning: a probabilistic perspective"*, MIT Press, First Edition.
3. Christopher Bishop, "*pattern recognition and machine learning",* Springer, First Edition.