Machine Learning

**Pre Requisites:**

**AI, Algorithms, Probability, Data Structures**

**Objective:**

To introduce the students about the knowledge of basic concepts of machine learning systems, types of learning etc.

**UNIT- 1 Introduction**

Basic concepts:Definition of learning systems, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation

**UNIT- 2 Learning and Classification**

Types of Learning:Supervised learning and unsupervised learning. Overview of classification: setup, training, test, validation dataset, over fitting. Classification Families:linear discriminative, non-linear discriminative, decision trees, probabilistic (conditional and generative), nearest neighbor

**UNIT-3 Regression**

Logistic regression, Perceptron, Exponential family, Generative learning algorithms, Gaussian discriminant analysis, Naive Bayes, Support vector machines: Optimal hyper plane, Kernels. Model selection and feature selection. Combining classifiers: Bagging, boosting (The Ada boost algorithm), Evaluating and debugging learning algorithms, Classification errors

**UNIT-4 Unsupervised learning**

Clustering, K-means, EM Algorithm, Mixture of Gaussians, Factor analysis, PCA (Principal components analysis), ICA (Independent components analysis), latent semantic indexing, Spectral clustering, Markov models Hidden Markov models (HMMs)

**UNIT-5 Reinforcement Learning**

MDPs. Bellman equations, Value iteration and policy iteration, Linear quadratic regulation (LQR). LQG, Q-learning, Value function approximation, Policy search, Reinforce, POMDPs

Text Books:

[1] Tom M Mitchell, Machine Learning, McGraw Hill Education

[2] Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

[3] Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.

[4] Tom M. Mitchell, Machine Learning .ISBN – 9781259096952, McGraw-Hill Series, Edition – First

**Reference Books**:

[1] Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.

[2] Introduction to Machine Learning - Ethem Alpaydin, MIT Press, Prentice hall of India.