

# Machine Learning

L-T-P-C : 3-1-0-4

**Course Website:** {Needs to be given}.

## Weekly Syllabus

Module	Week	Lectures
Module1	Week1	Introduction to machine learning (ML). Various learning paradigms. Introduction to supervised learning. Introduction to the Bayes classifier.
	Week2	Bayesian decision theory. Various cases, especially with the Normal (Gaussian) density – discriminants, etc.
	Week3	Maximum-likelihood and Bayesian parameter estimation.
	Week4	Nonparametric techniques – Parzen Windows, K-nearest neighbor classification.
Module2	Week5	Linear discriminants – Perceptron
	Week6	Multilayer neural networks – Error backpropagation.
	Week7	Support Vector Machines (SVMs) and other kernel methods – SMO algorithm for learning.
	Week8	Regression – linear models – extension to nonlinear models.
Module3	Week9	Unsupervised learning – clustering, mixture models and EM.
	Week10	Dimension reduction techniques – PCA, SVD.
	Week11	Introduction to reinforcement learning – basic techniques. Introduction to semi-supervised learning .
	Week12	Theoretical aspects – Bias, variance tradeoff – No Free Lunch theorem – Etc.

## **Evaluation/Examinations**

20 Marks (16.6%) for Quizzes (best 2 out of 3 taken)

25 Marks (20.8%) for Assignments (3 assignments)

15 Marks (12.5%) for Mid1

25 Marks (20.8%) for Mid2

35 Marks (29.16%) for Endsem.

Total – 120 Marks (100%).

## **Text books/ References**

1. “Pattern Classification” by R. O. Duda, P. E. Hart and D. G. Stork.
2. “An Introduction to Statistical Learning” by Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani.
3. “Pattern Recognition and Machine Learning” by Christopher M. Bishop.
4. “Introduction to Machine Learning” by Ethem Alpaydin.
5. “Pattern Recognition: An Algorithmic Approach” by M. Narasimha Murty, V. Susheela Devi.
6. “Machine learning” by Tom Mitchell.