E1 213 Jan 3:1

Pattern Recognition and Neural Networks

Instructor

P S Sastry
Email: sastry@iisc.ac.in

Teaching Assistant

Email:

Department: Electrical Engineering

Course Time: Tue, Thu, 3:30-5:00

Lecture venue: B308 EE dept

Detailed Course Page:

Announcements

Brief description of the course

This is a first level graduate course on Machine Learning (ML). The emphasis in the course is on supervised classification models. While students need not have any prior exposure to ML, they should have good familiarity with probability theory at the level of joint distribution of several random variables, expectation, conditional expectation, basics of stochastic convergence, and basics of stochastic processes. All first year MTech and Ph.D. students, who had a prior course on Prabability and random processes, can take this course. The course involves some programming assignments which are mostly about learning pattern classifiers on different data sets supplied to them using different methods. Some exposure to ML software tools in Python would be provided during the course.

Prerequisites

A graduate level course on Probability and Random processes. (e.g., E1 222)

Syllabus

Introduction to pattern recognition, Bayesian decision theory, supervised learning from data, parametric and non parametric estimation of density functions, Bayes and nearest neighbor classifiers, introduction to

statistical learning theory, empirical risk minimization, discriminant functions, learning linear discriminant functions, Perceptron, linear least squares regression, LMS algorithm, artificial neural networks for pattern classification and function learning, multilayer feed forward networks, backpropagation, RBF networks, deep neural Networks, CNNs, Autoencoders, RBMs, support vector machines, kernel based methods, feature selection and dimensionality reduction methods.

Course outcomes

The course equips the students with strong basics in Machine Learning (ML). The students would study different algorithms for learning pattern classifiers and would also explore different datasets to get a feel for ML algorithms. The statistical and/or optimization principles underlying different algorithms would be emphasized and thus the students would pick up the background needed to study more advanced topics in ML. The course would be useful both for students wanting to build a career in industry using ML as well as for students wanting to pursue research in ML.

Grading policy

25% weightage for programming assignments, 25% weightage for mid-term tests and 50% weightage for final exam.

Assignments

Resources

Dudo R O, Hart P E & Stork D G, Pattern Classification John
Wiley & sons, 2002.,

Bishop C M, Pattern Recognition and Machine learning, Springer, 2006

Some course notes that would be supplied and some papers from current literature.