INTRODUCTION TO MACHINE LEARNING

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IIT Madras

TYPE OF COURSE : Rerun | Elective | UG/PG
COURSE DURATION : 12 weeks (20 Jul’20 - 09 Oct’20)
EXAM DATE : 18 Oct 2020

INDUSTRIES APPLICABLE TO : Any company in the data analytics/data science/big data domain would value this course.

COURSE OUTLINE

With the increased availability of data from varied sources there has been increasing attention paid to the various data driven disciplines such as analytics and machine learning. In this course we intend to introduce some of the basic concepts of machine learning from a mathematically well motivated perspective. We will cover the different learning paradigms and some of the more popular algorithms and architectures used in each of these paradigms.

ABOUT INSTRUCTOR

Prof. Balaraman Ravindran is Currently an Associate Professor in the Department of Computer Science and Engineering, Indian Institute of Technology, Madras. He has nearly two decades of research experience in machine learning and specifically reinforcement learning. Currently his research interests are centered on learning from and through interactions and span the areas of data mining, social network analysis, and reinforcement learning.

COURSE PLAN

Week 0 : Probability Theory (Recap), Linear Algebra (Recap), Convex Optimization (Recap)
Week 1 : Introduction: Statistical Decision Theory - Regression, Statistical Decision Theory - Classification, Bias Variance
Week 2 : Linear Regression, Multivariate Regression, Subset Selection, Shrinkage Methods, Principal Component Regression, Partial Least squares
Week 3 : Linear Classification, Logistic Regression, LDA
Week 4 : Perceptron, SVM
Week 5 : Neural Networks - Introduction, Early Models, Perceptron Learning, Neural Networks - Backpropagation, Neural Networks - Initialization, Training & Validation, Parameter Estimation
Week 7 : Bootstrapping & Cross Validation, Class Evaluation Measures, ROC curve, MDL, Ensemble Methods - Bagging, Committee Machines and Stacking, Ensemble Methods - Boosting
Week 8 : Gradient Boosting, Random Forests, Multi-class Classification, Naive Bayes, Bayesian Networks
Week 9 : Undirected Graphical Models, HMM, Variable elimination, belief propagation
Week 10 : Partitional Clustering, Hierarchical Clustering, Birch Algorithm, CURE Algorithm, Density-based Clustering
Week 11 : Gaussian Mixture Models, Expectation Maximization
Week 12 : Learning Theory, Introduction to Reinforcement Learning + Optional videos (RL framework and TD Learning, Solution Methods and Applications)