E0 270 Jan 3:1

Machine Learning

Instructor

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Teaching Assistant

Usually three PhD students
Email:

Department: Computer Science and Automation

Course Time: Varies

Lecture venue:

Detailed Course Page:

Announcements

Brief description of the course

This course is intended for first-year graduate students who have some knowledge of linear algebra and probability. Some UG students at IISc also attend this course.

Prerequisites

Probability and Statistics

Syllabus

Introduction to machine learning. Classification: nearest neighbour, decision trees, perceptron, support vector machines, VC-dimension. Regression: linear least squares regression, support vector regression. Additional learning problems: multiclass classification, ordinal regression, ranking. Ensemble methods: boosting. Probabilistic models: classification, regression, mixture models (unconditional and conditional), parameter estimation, EM algorithm. Beyond IID, directed graphical models: hidden Markov models, Bayesian networks. Beyond IID, undirected graphical models: Markov random fields, conditional random fields. Learning and inference in Bayesian networks and MRFs: parameter estimation, exact inference (variable elimination, belief propagation), approximate inference (loopy belief propagation, sampling). Additional

topics: semi-supervised learning, active learning, structured prediction.

Course outcomes

Students learn both theory and practical aspects of machine learning models. Towards the end of the course, they also get a flavor of machine learning research by doing course projects.

Grading policy

3 Assignments - 10 marks

1 Project - 20 marks

2 Mid Term Exam - 15 marks each

1 Final Exam - 40 marks

Assignments

Resources

Bishop. C M, Pattern Recognition and Machine Learning. Springer, 2006.

Duda, R O, Hart P E and Stork D G. Pattern Classification. Wiley-Interscience, 2nd Edition, 2000.

Hastie T, Tibshirani R and Friedman J, The Elements of Statistical Learning: Data Mining, Inference and Prediction. Springer, 2nd Edition, 2009.

Mitchell T, Machine Learning. McGraw Hill, 1997.