

Learning Theory

Fall 2017

- **Instructor:** Rahul Vaze
- **Class Timings:** Tu-Thu 2-3:30 pm
- **Course Objectives:** Learn the basics of estimation theory, and machine learning algorithms. The key topics we will study are as follows.

Estimation Unbiased Estimators, Maximum Likelihood Estimation, Least Squares, MMSE, Bayesian Estimation, Kalman Filtering

Detection Hypothesis Testing, Bayes Risk, Neyman Pearson Theorem

Supervised Learning: Linear Regression, Linear classification, Model Selection and Inference, Support Vector Machines, Principal Component Analysis, High dimensional statistical learning.

Unsupervised Learning: Clustering, Cluster Analysis, Multidimensional Scaling.

Online No-Regret Learning: Bandit problems.

- **Textbooks:**
 - "Fundamentals of Statistical Signal Processing: Estimation Theory", Steven M Kay
 - "Linear Estimation", Thomas Kailath
 - "The Elements of Statistical Learning" Hastie, Tibshirani and Friedman, and Pattern Recognition and Machine Learning by Christopher Bishop.
- **Additional References:** Topics in Matrix Analysis: Horn and Johnson

Grading: There will be 1 mid-term test and a final exam with equal weightage of 30% each. The rest 40% will comprise of homeworks, and class performance.

Auditing Policy: Students planning to audit the course will be required to turn in all the homeworks. Writing exams is, however, optional.