EE 278 Statistical Signal Processing

Instructor: Dr. Himanshu Asnani
Course Assistant: 
Contact: asnani@stanford.edu

Course Information

Prerequisite: EE178 and linear systems; Fourier transforms at the level of EE102A, EE102B or EE261.

Materials: Review of basic probability and random variables. Random vectors and processes; Convergence and limit theorems; IID, independent increment, Markov, and Gaussian random processes; stationary random processes; autocorrelation and power spectral density; mean square error estimation, detection, filtering and linear estimation.

Grading: 30% Homework, 30% Midterm, 40% Final

Exams

Midterm: Venue Gates B1, time TBD.

Final: The final exam will be on 8/12/16 from 12:15pm-3:15pm. Venue TBD.

Lectures

06/20/2016 - 08/11/2016 Mon, Wed 11:30 AM - 1:20 PM at Gates B1
Office Hour: TBD

EE278: Tentative Lecture Schedule

- Introduction and Review of Basic Probability (1 lecture)
  - Probability Spaces
  - Conditional Probability and Independence
  - Random Variables, Functions, Generation
  - Jointly Distributed Random Variables
  - Scalar detection
- Expectation (2 Lectures)
  - Mean and Variance
  - Markov and Chebychev Inequalites
  - Scalar MSE Estimation
  - Scalar Linear Estimation

- Random Vectors (2 Lectures)
  - Specifying a Random Vector
  - Mean and Covariance Matrix
  - Coloring and Whitening

- Vector Detection and Estimation (2 Lectures)
  - Vector Detection and Reconstruction Problem
  - Detection for Vector AGN Channel
  - Vector Linear Estimation
  - Linear Innovation Sequence and Kalman Filtering

- Convergence and Limit Theorems (2 Lectures)
  - Convergence with Probability 1
  - Convergence in Mean Square
  - Convergence in Probability, WLLN
  - Convergence in Distribution, CLT

- Random Processes (2 Lectures)
  - Definition and Simple Examples
  - Important Classes of Random Processes
  - Random Walk Process
  - Markov Processes
  - Independent Increment, Counting and Poisson Process
  - Mean and Autocorrelation Function
  - Gaussian Random and Gauss-Markov Processes

- Stationary Random Processes (2 Lectures)
  - Strict-Sense and Wide-Sense Stationarity
  - Autocorrelation Function of a Stationary Process
  - Power Spectral Density
  - Continuity and Integration of Random Processes
  - Stationary Ergodic Random Processes

- Random Processes in Linear Systems (2 Lectures)
  - Linear System with Random process Input
  - LTI System with WSS Process Input
  - Process Linear Estimation

- Review (1 Lecture)