Course Information

Description

Probability is a mathematical discipline for reasoning about randomness: it helps us make decisions in the face of uncertainty and build better systems. In this course, we will teach you the fundamental ideas of probability and random processes. The various assignments are carefully designed to strengthen your mathematical understanding of probability and to demonstrate how these concepts can be applied to the real world, be it in communication networks, control systems, or machine learning.

Prerequisites

Knowledge of probability at the level of CS 70. Linear algebra at the level of EE 16A or Math 54.

Textbooks

- (BT) Dimitris P. Bertsekas and John N. Tsitsiklis, Introduction to Probability, 2nd Edition, Athena Scientific, 2008.
- (W) Jean Walrand, Probability in Electrical Engineering and Computer Science: An Application-Driven Course, Amazon, 2014.

Course Outline

1. Fundamentals of Probability
    - Discrete and Continuous Probability
    - Order Statistics, Convolution, and Moment Generating Functions
    - Bounds, Convergence, and Information Theory
2. Random Processes
    - Discrete and Continous Time Markov Chains
    - Poisson Processes
    - Erdos-Renyi Random Graphs
3. Inference and Estimation
    - MLE/MAP and Hypothesis Testing
    - LLSE/MMSE, Kalman Filter, and Jointly Gaussian Random Variables
    - Fisher Information and Cramer-Rao Bound

Piazza

We will be using Piazza for class discussion. Rather than emailing questions to the GSIs, we encourage you to post your questions on Piazza. Find our class page **here**.

Grading

The grading breakdown is as follows:

- Homework (15%)
- Lab (10%)
- Exams (75%)

For the exam grade, MT1 and MT2 will make up 25% each and the final will make up 50%. This semester, we will be using a clobber policy where your final can replace your grade for either MT1 or MT2 but not both.

For example, if a student gets full credit on Homework and Labs, then receives a 73 on MT1, 34 on MT2, and a 80 on the Final, their grade would be computed as follows: Final Grade = .15 + .10 + .75 x (.73 x .25 + .80 x .25 + .80 x .50).

The exams will be at the following times, it is your responsibility to notify us ASAP if you cannot make them.

- Midterm 1: February 21, 2020 7-9 PM
- Midterm 2: April 3, 2020 7-9 PM
- Final: May 14, 2020 3-6 PM

See the **exams page** for more details.

Homework

- Homeworks will be posted on the course website every Thursday morning and are due on the following Wednesday at 11:59 PM.
- Homeworks should be submitted as a PDF to Gradescope.
- Any homework that is illegible or too difficult to read will get a 0.
- Homeworks will be self-graded through Google Forms. Forms will be posted on the course website every Thursday morning and due the following Wednesday at 11:59 PM.
- Any late self-grades will result in a 0, with no exceptions.
- You will have the opportunity for a homework drop by answering a mid-semester survey.

Labs

- Labs will be posted on the course website every Saturday morning and are due on the following Friday at 11:59 PM.
- Labs will be in the form of Jupyter notebooks. However, students should convert their notebooks to both a .py file and a PDF to submit to Gradescope.
- Labs will be self-graded through Google Forms. Forms will be posted on the course website every Saturday morning and are due on the following Friday at 11:59 PM.
- Any late self-grades will result in a 0, with no exceptions.
- You will have the opportunity for a lab drop by answering a mid-semester survey.

Collaboration

Discussions about assignments are allowed and encouraged, but each student is expected to write his/her own solutions.

Self Grades

- Each Homework and Lab question is self-graded out of 3.
    - 3: Matches solution with minor to no errors. Or finds the solution through an alternate method.
    - 2: Off the solution by a major term, or matches most steps except a few crucial ones.
    - 1: A little work in the right direction, but a significantly different or no complete solution.
    - Did not attempt, entirely off track.
- Self-grades do determine assignment scores, but we will be checking student self-grades throughout the semester. If a student is caught significantly inflating their self-grade for an