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 or STAT 134. Linear algebra at the level of EECS 16A or Math 54.

Course Outline

1. Fundamentals of Probability / 4 weeks
    - Review: Discrete and Continuous Probability
    - Bounds, Convergence of Random Variables, Law of Large Numbers
    - Discrete Time Markov Chains
2. Random Processes and Estimation / 6 weeks
    - Transforms, Central Limit Theorem
    - Queueing, Poisson Processes, Continuous Time Markov Chains
    - Communication, Information Theory
    - MLE/MAP, Detection, Hypothesis Testing
3. Applications of Probability / 4 weeks
    - Kalman Filtering, Tracking
    - Markov Decision Problems, Linear Quadratic Gaussian Control
    - Hidden Markov Chains, Optimization

Textbooks

The course will follow the new Walrand textbook (see Piazza for access).

- Jean Walrand, Probability in Electrical Engineering and Computer Science: An Application-Driven Course, Amazon, 2020.

Other References

Some students may find it helpful to reference parts of the B&T textbook, but we will not be using it this semester, and it is not necessary.

- Dimitris P. Bertsekas and John N. Tsitsiklis, Introduction to Probability, 2nd Edition, Athena Scientific, 2008.

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.

The grading breakdown is as follows:

- Homework (15%)
- Lab (10%)
- Midterm 1 (20%)
- Midterm 2 (20%)
- Final (35%)

Exams

We will be using a clobber policy where your final can replace your grade for either MT1 or MT2, but not both.

Exams will be held during lecture times (Pacific Time):

- Midterm 1: Thursday, September 24, 11-12:30 PM
- Midterm 2: Tuesday, November 10, 11-12:30 PM
- Final: Wednesday, December 16, 8-11 AM

See the **exams page** for 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. The assignments will open every Thursday morning and due the following Monday at 11:59 PM.
- Any late self-grades will result in a 0, with no exceptions.
- Your lowest homework score will be dropped automatically.
- You will have the opportunity for a two extra homework drops by answering mid-semester surveys.

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 submit their notebooks as both a PDF and either the .py or .ipynb file and submit to Gradescope.
- Labs will be self-graded through Gradescope. The assignments will open every Saturday morning and are due on the following Wednesday at 11:59 PM.
- Any late self-grades will result in a 0, with no exceptions.
- Your lowest lab score will be dropped automatically.
- You will have the opportunity for a two extra lab drops by answering mid-semester surveys/

Self-Grading Policy

We will periodically be checking self-grades internally to ensure that they are accurate. If we find that your self-grades do not align with our scores (either positively or negatively), we will reach out to you and adjust your self-grades. If you do not hear from us, your self-grades will be used for your homework grade.

Collaboration