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.

Course Outline

1. Fundamentals of Probability (5 weeks)
    - Review: Discrete and Continuous Probability
    - Bounds, Convergence of Random Variables, Law of Large Numbers
    - Discrete Time Markov Chains
2. Random Processes and Estimation (7 weeks)
    - Transforms, Central Limit Theorem
    - Queueing, Poisson Processes, Continuous Time Markov Chains
    - Communication, Information Theory
    - MLE/MAP, Detection, Hypothesis Testing
3. Applications of Probability (3 weeks)
    - LLSE, MMSE
    - Kalman Filtering, Tracking

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, 2020. **Available free online**

Ed

and professor.

Gradescope

We will use Gradescope for all submissions/grade-related items. Note that our policy for accepting assignments (not exams) is that if Gradescope accepts the assignment, it is accepted, even if it says late or assigns a late timestamp.

Grading

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 proctored and in-person.

In situations that will foreseeably result in a need for accommodation, email course staff.

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

Homework

- Homeworks will be posted on the course website every Thursday (no particular time of day) and are due on the following Thursday at 10:59 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 Gradescope. The assignments will open every Thursday morning and due the next Thursday at 10:59 PM.
- You will have a 1 hour grace period to submit the homework and self-grade. No late self-grades or homework submissions will be accepted after that.
- You will only recieve nonzero credit for your homework if you turn in BOTH your homework and your self-grade on time.
- Your lowest homework score will be dropped automatically.
- You will have the opportunity for two extra homework drops by answering mid-semester surveys.

Labs

- Labs will be posted on the course website every Wednesday morning and are due on the following Wednesday at 10:59 PM.
- Labs will be in the form of Jupyter notebooks. Students should submit these notebooks as a .pdf to Gradescope.
- You will have a 1 hour grace period to submit the lab after the due date. No late lab submissions will be accepted after that.
- Most labs will be autograded, and will not require self-grades.
- Your lowest lab score will be dropped automatically.
- You will have the opportunity for two extra lab drops by answering mid-semester surveys.

Self-Grades

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. Please remember the Academic Misconduct policy and the Berkeley honor code and try to report your self-grades accurately.

Each problem is worth 10 points, and is graded on the following scale:

- 10: Fully correct
- 8: You completed at least 80% of the sub-parts (if applicable), and each was fully correct, or had minor arithmetic errors that did not impact the form of the final solution.
- 5: Your work was in the right direction, but missing one or a few critical steps
- 2: You made initial progress but proceeded in the wrong direction.
- 0: Not attempted

For problems with subparts, we will specify the breakdown; apply to rubric similarly to each subpart.

Collaboration

You are encouraged to discuss homework and lab assignments with your classmates. However, you must always write up the solutions on your own, and you must never copy the solutions of other students. Similarly, you may use books or online resources to help solve homework problems, but you must credit all such sources in your writeup and you must never copy material verbatim. You are reminded of the Department's **Policy on Academic Misconduct**. In particular, you should be aware that copying solutions, in whole or in part, from other students in the class or any other source without acknowledgment constitutes a violation of this policy and risks serious consequences.

Policy on Course Content

The University's Policy on **Classroom Note-Taking and Recording** applies to this course. You are free and encouraged to use

created by teaching staff (exams, HW, solutions, labs). In particular, any upload of course content to websites such as CourseHero.com or Chegg.com, which distribute and monetize content without permission from the instructor or University will be considered a violation of University Policy, and referred to the **Center for Student Conduct**.