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.

We will use Gradescope for all submissions/grade-related items. If you are not added automatically, please use the code RWKVJ7 to join. 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. We will not be proctoring exams.

In situations that will foreseeably result in a need for accommodation, requests must be made no later than Friday Feb. 12th using this form: **https://forms.gle/zAHqLX2wsjikhDWx9**

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 Gradescope. 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.
- Your homework grades are given by 1.25 x min(your self grade, .8), i.e. the max score is 80%.

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. Students should submit these notebooks as a .pdf 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

your self-grades. If you do not hear from us, your self-grades will be used for your homework grade. Please remember the Academic Dishonesty policy and the Berkeley honor code and try to report your self-grades accurately.

Each problem is worth 20 points:

- 20: fully correct
- 15: minor mistakes or missed small detail
- 10: right direction, about halfway progress, missed some details
- 5: wrong or no clear direction, major details missed
- 0: didn't attempt, very incorrect

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 Dishonesty**. 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 course materials for personal use (in collaborations with other students, in your research, etc.). You are also granted permission to post any notes you create on your own personal website. You are expressly prohibited from publicly uploading course materials 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**.