

AI1110 Probability and Random Variables

Course information

Jan 5, 2024

Course structure

The repeating course content roughly consists of the following portions

- *Classes:* Monday 12:15pm-1:15pm, Tuesday 8:50pm-9:50pm, Friday 11am-12noon
- *Recorded lectures:* (roughly 1-2hrs in length on average) There may be recorded lectures some weeks to compensate for the time lost in regular lectures.
- *Fortnightly assignments*
- *Fortnightly quizzes:* Tuesday 8:50am-9:50am

The lectures need to be watched before the class on Monday

These do not need to be submitted

Course platform

The assignment problems, announcements, discussions and lecture notes will be posted on google classroom. Students can self-enrol with the join code 2jbvw22.

You can sign up here or use the given join code

Textbooks

The course material will mostly be self-contained. The students are however encouraged to read the following textbooks, in addition to the plethora of content available on the net.

Additional references specific to certain topics may be given during lectures.

- Bertsekas, Dimitri, and John N. Tsitsiklis. *Introduction to probability*. Vol. 1. Athena Scientific, 2008.
- Ross, Sheldon. *A first course in probability*. Pearson, 2010.
- Hajek, Bruce. *An exploration of random processes for engineers*. Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign, Urbana, Illinois (2009): 4091-4102.
- Kay, Steven. *Intuitive probability and random processes using MATLAB*. Springer Science & Business Media, 2006.
- Gallager, Robert G. *Stochastic processes: theory for applications*. Cambridge University Press, 2013.

This textbook has a focus on simulations. Though the examples from the book are in MATLAB (and most of the programming assignments in this course will use python or Julia), it is a very useful resource.

Course content

The course will roughly be in three parts, each corresponding to one segment.

1. Part I: Basics
2. Part II: Concentration and Limit theorems
3. part III: Intro to inference and Stochastic processes

random variables, conditioning, moments
 Markov and Chebyshev inequalities, law of large numbers, central limit theorem, Poisson approximation
 Min-mean square estimation, Gaussian random variables, Poisson processes, Markov chains

Expectations from the student

1. Attend and participate in all the lectures, quizzes and exams
2. Solve all the assignment problems on your own
3. Watch any lectures recorded and uploaded by the instructor before the Monday class
4. Do not engage in any unfair academic practices.

These involve students copying assignments and exam solutions from each other or from internet sources. Please ensure that any work you submit is genuinely your own.

Evaluation criteria

1. Weekly quizzes (50%) ¹
2. Exams (50 %) ²
3. *Scribing*³ If the scribe notes are satisfactory, a grade bump may be given at the end of the course. ⁴.

¹ Your worst two quizzes will be ignored for grade calculation

² There will be two exams

³ This is an optional activity that involves making notes and solutions for some of the assignments, quizzes, lectures or exams. A student who volunteers for scribing will be responsible for scribing only one particular assignment/quiz/exam.

⁴ Think of this as insurance to cover for bad luck, or another way to increase your grade

Teaching team

INSTRUCTOR: Aditya Siripuram

TEACHING ASSISTANTS: Will be updated soon