STAT 150 - STOCHASTIC PROCESSES

SPRING 2024

Course webpage: <https://www.stat.berkeley.edu/~bensonau/s24.150/index.html>
We will also use bCourses to make announcements and host course material.

Textbooks:

- *An Introduction to Stochastic Modeling, Fourth Edition* by Pinsky and Karlin (freely available through the university library here)
- *Essentials of Stochastic Processes, Third Edition* by Durrett (freely available through the university library here)

To reiterate, the textbooks are **freely available** through the university library. Note that you must be connected to the university Wi-Fi or VPN to access the ebooks from the library links. Furthermore, the library links take some time to populate, so do not be alarmed if the webpage looks bare for a few seconds.

Course description: Time permitting, we will cover the material in the course catalogue description:

Random walks, discrete time Markov chains, Poisson processes. Further topics such as: continuous time Markov chains, queueing theory, point processes, branching processes, renewal theory, stationary processes, Gaussian processes.

In practice, we typically cover the following topics:

- Discrete-time Markov chains
- Poisson processes
- Renewal processes
- Continuous-time Markov chains
- Discrete-time martingales

Prerequisites: STAT 134 or an equivalent first course in probability theory. This is a second course in probability theory intended for majors in statistics and related quantitative fields. If you did not get at least an A- in STAT 134, then you may find this course particularly challenging.

Grading: Raw scores (R) will initially be computed according to the formula

- 20% Homework (H);
- 20% Midterm exam #1 (M_1);
- 20% Midterm exam #2 (M_2);
- 40% Final exam (F),

where $H, M_1, M_2, F \in [0, 1]$. However, your lowest scoring homework assignment will be omitted from the calculation. Furthermore, the final exam can take the place of your lowest scoring midterm exam. To discourage cheating on the homework, your homework score will be capped by your exam scores. To make this precise, we introduce your exam score

$$E = \frac{.2\max(M_1, M_2) + .2\max(\min(M_1, M_2), F) + .4F}{.8} \in [0, 1].$$

Your final raw score will be computed as

$$R = .8E + .2\min\left\{\begin{array}{l}\log(2(e-1)\sqrt{E}+1), \\ H\end{array}\right\}.$$

For example, if your exam score is $E = .25$, then the minimum simply becomes H. On the other hand, if your exam score is $E = 0$, then this minimum is 0. As another example, if $E = .1$, then this minimum is approximately $\min\{.735, H\}$. The class will then be curved with historical departmental practice in mind.

Final exam: The final exam will take place in-person on May 7th from 8:00a-11:00a. If you cannot take the final exam at its scheduled time, then you should not enroll in the class.

Lectures: The lectures will take place in Stanley 106 on Mondays, Wednesdays, and Fridays from 1:10p - 2:00p. Attendance is not mandatory; however, it is a fundamental part of the course. In particular, you are responsible for material presented in lecture whether or not it is discussed in the textbook. You should expect questions on the exams that will test your understanding of concepts discussed in lecture.

Reading: Reading the sections of the textbook corresponding to the assigned homework exercises is considered part of the homework assignment. In particular, you are responsible for material in the assigned reading whether or not it is discussed in the lecture.

Makeup policy: Makeup exams are not offered. Similarly, late homework assignments are not accepted. Exceptions can be granted pursuant to university guidelines regarding activities such as athletic events or medical quarantine.

Gradescope: Homework assignments must be submitted to Gradescope. One should be able to register for the class Gradescope page by clicking on the Gradescope tab on the class bCourses page. Alternatively, one can register for our class Gradescope page using the course entry code **5JWZ6K**. A random selection of problems from each homework will be graded. No late homework is accepted, but the lowest homework score will be dropped from the calculation.

Collaboration: You are welcome to work with other students on homework assignments, but you must write up your own solutions and acknowledge the names of all collaborators on the first page of your assignment. Keep in mind that you will *not* be able to collaborate on the exams.

Academic Integrity: The campus academic integrity page outlines the expectations for all students and faculty and details the consequences for academic dishonesty (see here). The main issues are cheating and plagiarism, for which we have a zero-tolerance policy. Penalties for these offenses include assignment of a failing grade in the course and usually involve an administrative penalty, such as suspension or expulsion. At the same time, academic integrity also includes things like giving credit where credit is due and treating your peers respectfully in class. In particular, here are a few of the expectations for etiquette in and out of class.

- *Entering/exiting class:* Please arrive on time and stay for the entire class/section period. If, despite your best efforts, you arrive late, please enter quietly through the rear door and take a seat near where you entered. Similarly, in the rare event that you must leave early (e.g., for a medical appointment), please sit close to the rear exit and leave as unobtrusively as possible.
- *Noise and common courtesy:* When class/section begins, please stop your conversations. Wait until class/section is over before putting your materials away in your backpack, standing up, or talking to friends. Do not disturb others by engaging in disruptive behavior. Disruption interferes with the learning environment and impairs the ability of others to focus, participate, and engage.
- *Electronic devices:* Please do not use devices (such as cell phones, laptops, tablets) for non-class-related matters while in class/section. No visual or audio recording is allowed in class/section without prior permission of the instructor (whether by camera, cell phone, or other means).
- *E-mail etiquette:* You are expected to write as you would in any professional correspondence. E-mail communication should be courteous and respectful in manner and tone. Please do not send e-mails that are curt or demanding.

Accommodations: Students with disabilities requesting accommodations should notify the instructor as soon as possible so that arrangements can be made. Please consult the Disabled Students' Program webpage for more information.

Important dates

- Midterm exam #1 on TBD in class during lecture
- Midterm exam #2 on TBD in class during lecture
- Final exam on May 7th, 8:00a-11:00a, location TBA

Contact information

Instructor: Benson Au
E-mail: bensonau@berkeley.edu (Note that email should only be used for confidential matters. Questions about homework and course material should be asked during office hours. Please put "Stat 150" somewhere in the title of your email.)
Office hours: TBD (information will be posted on bCourses). Note that office hours are subject to change. Any such change will be announced on bCourses. Make sure that you have not disabled email notifications for announcements on bCourses.