STATS 116 Syllabus

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Introduction and logistics

Welcome to Stats 116! This is a rigorous first course in probability. Lectures will closely follow the book *Introduction to Probability* by Joe Blitzstein and Jessica Hwang. Since we only have 8 weeks we cannot cover all of it. A draft course schedule is provided below, alongside the relevant chapters in the book, which is freely available to read at `http://probabilitybook.net`.

- Teaching team:
  - Harrison Li (Instructor) `hli90722@stanford.edu`.
  - Dileka Gundawardana (TA) `dilekag@stanford.edu`.
  - Michael Salerno (TA) `mdsalerno@stanford.edu`.

  Please use the Ed discussion forum, not email, for all non-private course-related questions, for the benefit of your fellow students.

  Office hours for each instructor will be posted on the course Canvas homepage. They are a great way to get help understanding concepts or problems in a more intimate environment than lecture or section, or just to discuss the course, including any concerns you have, with the teaching staff. Everyone is highly encouraged to attend.
- Lectures: Monday-Thursday, 10:30 am - 11:20 am, Gates B3
- Sections: Friday 10:30 am - 11:20 am, see location in ExploreCourses

Grading

- 45% homework (4 units) or 40% homework + 5% section attendance (5 units), 15% midterm exam, 40% final exam.
- No late homework will be accepted, but the lowest homework score will be dropped
- Homeworks will be due on Gradescope every Thursday at 10:00 pm PT starting June 29 and will cover the material from the preceding week's lectures
- All homeworks must be completed individually, but you may consult TAs and other students for guidance. See Honor Code section below
- The midterm will be 50 minutes, in class, on Monday, July 24.
- The final exam will be 3 hours on Saturday, August 19 from 8:30 am - 11:30 am.

Regrade requests for homeworks and exams must be submitted on Gradescope within one week of when the grade is posted. The whole problem will be graded and your score can go up or down. This is a challenging and fast-paced course (especially in the summer), so exam scores may be lower than you're used to. Do not stress - grading will heavily take this into consideration.

Course outline

The main prerequisites are: Strong comfort with single variable calculus, some comfort with rigorous mathematical argument, a working understanding of partial derivatives and multiple integration, some working familiarity with matrices, and knowledge of the contents of a standard deck of 52 cards. No statistics or probability background is assumed.

The two main learning objectives of the course are as follows:

1. Be able to translate uncertainty in a variety of realistic settings to the language and tools of probability
2. Develop a deep, foundational understanding of the mathematical underpinnings of probability theory as a technical foundation for study in statistics, machine learning, and related fields

A tentative calendar of lecture topics is provided below and subject to change.

Topic	Dates	Textbook chapters
Basic definitions, counting, and the naive definition of probability	6/26, 6/27	1.3, 1.4
General definition of probability	6/28	1.6
Definition of conditional probability, Bayes' rule, and LOTP	6/28, 6/29	2.1-2.4
Independence and conditional independence	7/3	2.5
Examples and paradoxes in conditional probability	7/5	2.6, 2.7
Discrete random variables: Definitions, distributions, and PMFs	7/6	3.1, 3.2
Important discrete distribution families	7/10, 7/11	3.3-3.5, 4.3, 4.7
CDFs and independence of random variables	7/12	3.6, 3.8
Expectation: Definition, linearity and LOTUS	7/13	4.1, 4.2, 4.5
Indicator random variables	7/17	4.4
Variance	7/18	4.6
Midterm	7/24	All topics above
Continuous random variables: PDFs and the Uniform	7/19	3.6, 5.1-5.3
Normal and Exponential distributions	7/20, 7/25	5.4-5.5
Joint, marginal, and conditional distributions	7/26, 7/27	7.1-7.2
Covariance and correlation	7/31	7.3
The multinomial distribution	8/1	7.4
Convolution and change of variables	8/2	8.1
Conditional expectation: Definitions and properties	8/3, 8/7	9.1-9.3
Laws of total expectation and variance	8/8, 8/9	9.5, 9.6
Inequalities	8/10	10.1
Law of large numbers, central limit theorem	8/14, 8/15	10.2, 10.3
Review/extra time/special topics (not tested)	8/16-8/17	

Honor code

You are free to form study groups for homework. However, you must write up homework solutions from scratch independently, and you must acknowledge in your submission all the students or others you discussed the problems with. You may occasionally use the Internet or other public resources to clarify concepts with citation when this information is used as part of your own solution to a homework problem. However, you may not search for direct solutions to any problems assigned for homework or exams. For example, you can ask ChatGPT to clarify a particular concept from lecture that may be related to a problem, but you cannot feed it any part of a course assignment or a substantively similar version.

Accessibility

Stanford is committed to providing equal educational opportunities for disabled students. If you experience disability, please register with the Office of Accessible Education (OAE). Professional staff will evaluate your needs, support appropriate and reasonable accommodations, and prepare an Academic Accommodation Letter for faculty. For more information, please visit `oae.stanford.edu`. If you already have an Academic Accommodation Letter, we invite you to share your letter with us at the earliest possible opportunity so we can mitigate any barriers to access to inclusion that you might encounter in this course.

Video recording

Video cameras located in the back of the room will capture the instructor presentations in this course. For your convenience, you can access these recordings by logging into the course Canvas site. These recordings might be reused in other Stanford courses, viewed by other Stanford students, faculty, or staff, or used for other education and research purposes. Note that while the cameras are positioned with the intention of recording only the instructor, occasionally a part of your image or voice might be incidentally captured. If you have questions, please contact Harrison.