Course Syllabus

Welcome to MATH/STAT 395.

Course description: Jointly distributed random variables; conditional distributions and densities; conditional expectations and variance; covariance, correlation, and Cauchy-Schwarz inequality; bivariate normal distribution; multivariate transformations; moment generating functions; sums of independent random variables; Central Limit Theorem; Chernoff's inequality; Jensen's inequality. Prerequisite: either a minimum grade of 2.0 in MATH 394/STAT 394, or a minimum grade of 2.0 in STAT 340. Offered: jointly with MATH 395; WSpS.

Logistics

Instructor: Harshil Desai

Classroom: THO 119

Class times: MWF 8:30-10:40 am Pacific time. Lectures will be recorded and posted to Canvas under "Zoom." I will take a 10 minute break around 9:30 and resume class around 9:40. I will not take attendance but I highly encourage you to attend. Summer quarter can be fast paced, and thus it can be very easy to fall behind.

Office hours: MWF, 11:00AM-12:00PM (THO 134). Tuesday, Thursday TBA (Zoom). If these times do not work please feel free to reach out to schedule additional OH.

Email: hhdesai@uw.edu . When you send me an email, please include "[STAT 395]" or "[MATH 395]" in the beginning of the subject line. This will ensure I see your emails and respond in a timely manner.

Ed: The primary place to ask questions about course content will be Ed (link in the sidebar). I highly encourage participation in both answering and asking questions. Extra credit may be given out depending on Ed participation. Don’t send emails to the teaching team, except for personal matters. Use Ed to ask any general questions, everyone will benefit from the question and the answer.

Textbook: The textbook for the course is Introduction to Probability (Cambridge Mathematical Textbooks) 1st Edition by David F. Anderson, Benedek Valkó, and Timo O. Seppäläinen. This textbook will be available at the UW library as well. I will refer to this as the main textbook for this course in the syllabus. Here are some good free references recommended by previous instructors: Jeff Rosenthal’s notes (Links to an external site.) and Sheldon Ross' book (Links to an external site.). Casella and Berger (Links to an external site.) is a good textbook too with plenty of exercises for you to practice.

Anonymous Feedback: Please feel free to submit anonymous feedback here during the quarter via this form. This form will be confidential so only I will see it. You will have to
option to put your name down or not if you wish to keep your comments completely anonymous.

Class pace: This is an accelerated course, so we will move quickly to cover all of the material.

Learning goals: Some of the goals of this class include: giving you the statistical maturity to think in future classes, jobs, or research; problem solving skills; and the ability to communicate your work.

Class schedule (subject to change)

Friday July 22nd: Class logistics. Lectures 1 and 2: Joint distributions for collections of discrete random variables. Multinomial random variable. Homework 1 assigned and is due Friday July 29th at 11:59 pm Pacific time. Textbook: 6.1, 6.2


Friday July 29th: Lectures 7-8: minimum and maximum of random vectors. Sums of random variables. Homework 2 is assigned and is due August 5th at 11:59 pm. Textbook: 6.3, 7.1

Monday August 1st: Lecture 9-10: properties of expectation and variance. Textbook: 8.2

Wednesday August 3rd: Lecture 11-12: properties of covariance and correlation. Textbook: 8.4

Friday August 5th: Midterm (8:30-9:30AM) IN PERSON, Lecture 13: multivariate normal distribution. Homework 3 is assigned and is due August 12th at 11:59 pm. Textbook: 8.5

Monday August 8th: Lecture 14-15: moment generating functions and concentration inequalities. Textbook: 5.1, 8.3, 9.1

Wednesday August 10th: Lecture 16-17: law of large numbers and central limit theorem. Textbook: 9.2, 9.3

Friday August 12th: Lecture 18-19: central limit theorem (continued) and confidence intervals. Homework 4 is assigned and is due August 20th at 11:59 pm. Textbook: 9.3, 9.4

Monday August 15th: Lecture 20-21: Monte Carlo methods and conditional distributions. Textbook: 9.4, 10.1, 10.2

Wednesday August 17th: Lecture 22-23: Conditional mean and random sums. Textbook: 10.3, 10.4
Friday August 19th: (last day): Final Exam IN PERSON

Grading
There will be four homework sets (worth 40% of the final grade), a one hour midterm (20%), and a final exam (40%). For the homework, due to the accelerated nature of the course, no late submission will be accepted. Submit homework to Gradescope. I encourage you to work with each other, but write up your own solutions, and if you worked with someone, please write their names on your solutions.

Exam Logistics
The midterm will (tentatively) be given in person on August 5th. The final exam will be given in person on the last day of instruction, August 19th. Aside from extreme circumstances, no exceptions will be made for taking this exam in person.

Preparing for exams
Doing a lot of practice problems from the books is a great way to learn the material and prepare for the exams. If you have questions about problems you are working on, whether they were assigned or not, please come see me in office hours. Some interesting non-hw textbook problems may show up on the exams.

Expectations and Accommodations

Diversity
Diverse backgrounds, embodiments, and experiences are essential to the critical thinking endeavor at the heart of university education. Therefore, I expect you to follow the UW Student Conduct Code in your interactions with your colleagues and me in this course by respecting the many social and cultural differences among us, which may include, but are not limited to: age, cultural background, disability, ethnicity, family status, gender identity and presentation, citizenship and immigration status, national origin, race, religious and political beliefs, sex, sexual orientation, socioeconomic status, and veteran status.

Academic Integrity
We take academic integrity with the utmost seriousness, and will not hesitate to report academic dishonesty to UW and/or penalize you via your grade on the test/homework in question. If you are found to have cheated on a homework/test, you will have invalidated your submission and will receive a zero for the entire homework/test in question.
- **Tests:** this should be obvious, but you may not look at other students’ tests, or obtain help from others during a test.

- **Homework:** some answers to homework will be available (back of the book, previous solutions, online, etc). I highly highly encourage you do not go looking for these resources. Probability is a very foundational concept for statistics, and building a natural intuition is key. Thus it is incredibly important that you attempt the problems **without** trying to find online answer keys and work to build that intuition. You are also encouraged to work with your friends/classmates on the homework. The key to not cheating on homework is simple: don’t plagiarize. Your submitted solutions must be your own, even if the answer was found elsewhere. The purpose of the homework is to encourage your personal growth as a student and statistician and, as such, your submitted solutions must demonstrate your personal understanding. If you have questions about this, please reach out to me.

**DRS**

Your experience in this class is important to me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at [disability.uw.edu](mailto:disability.uw.edu).

**Religious Accommodations:**

Washington state law requires that UW develop a policy for the accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy [here](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form [here](https://registrar.washington.edu/students/religious-accommodations-request/).