
Syllabus

Instructor: Ross Whitaker | WEB 3893 | <http://www.cs.utah.edu/~whitaker>

Class Meetings: Tuesdays and Thursdays, 3:40pm – 5:00pm, ASB 220

Course Web Page: <http://www.cs.utah.edu/~whitaker/cs3130>

An introduction to probability theory and statistics, with an emphasis on solving problems in computer science and engineering. Probability and statistics is an important foundation for computer science fields such as data science, machine learning, artificial intelligence, randomized algorithms, image processing, and scientific simulations. Topics in probability include discrete and continuous random variables, probability distributions, sums and functions of random variables, the law of large numbers, and the central limit theorem. Topics in statistics include sample mean and variance, estimating distributions, correlation, regression, and hypothesis testing. Beyond the fundamentals, this course will include modern computational methods such as simulation and the bootstrap. Students will learn statistical computing using the freely available R statistics software: <http://www.r-project.org/>.

The course has the following **expected learning outcomes**.

On completion of the course, students should be able to:

- define sample spaces and events corresponding to real-world probabilistic phenomena, and compute the associated probabilities or conditional probabilities using identities such as Bayes' theorem;
- define appropriate random variables, both continuous and discrete, and reason about the behavior of random processes by computing the distribution and expected values of these random variables;
- reason about the aggregate behavior of random variables using the law of large numbers and concentration inequalities, and apply these ideas to sampling and estimation;
- perform statistical estimation by constructing estimators, analyzing their bias and variance, and developing confidence intervals; and
- formulate null and alternate hypotheses, analyze the statistical significance of an experiment, in the context of scientific discovery and other applications.

Book

A Modern Introduction to Probability and Statistics: Understanding Why and How by Dekking, Kraaikamp, Lopuhaa, and Meester/

An electronic version of this book is freely available through the University! The website is here:

<https://link.springer.com/book/10.1007/1-84628-168-7>

To access the book you must be visiting this website from the campus network. Or if you are off campus, you can access it using VPN: <https://vpn.utah.edu/>. See more information on the VPN here:

https://uofu.service-now.com/it?id=uu_kb_article&sys_id=3cf34fa5d5558900023cf36e22818368

Lecture Availability and Procedure

Lectures will be delivered live and in ASB 220 on the University of Utah campus.

Getting Help

Take advantage of the instructor and TA office hours (posted on course web page). We will work hard to be accessible to students. Please send us email if you need to meet outside of office hours. *Don't be shy if you don't understand something: come to office hours, send email, or ask/post questions in class!*

Students are encouraged to use a discussion group for additional questions outside of class and office hours. The class will rely on the Canvas discussion group. Feel free to post questions regarding any questions related to class: homeworks, schedule, material covered in class. Also feel free to answer questions, the instructors and TAs will also actively be answering questions. But, **do not post potential homework answers**. Such posts will be immediately removed, and not answered.

All important announcements will be made through the discussion group, there is otherwise no class mailing list.

Pre-requisites

Students should have gotten a 'C-' or better in Calc II (Math 1220 / Math 1320 / Math 1321 or AP Calc BC score of 4+). This is a calculus-based course on probability and statistics, and Calculus is required to properly cover continuous random variables. Students should have completed CS 2100 in good standing.

The course will cover some simple computational approaches in the programming language R. No prior knowledge in R is needed, but some familiarity with programming expected, as there will not be separate labs set up to help students navigate a new programming language.

This course is designed for majors in Computer Science, Data Science, Software Development, Electrical Engineering and Computer Engineering. As such full major status (FMS) in one of those degrees is a formal pre-requisite. If there is room after FMS students have registered, students who lack FMS may petition the instructor to enroll in the course.

Grading

There will be a midterm exam worth 15% of the grade and a final exam worth 25% of the grade.

There will be 13 quizzes (one each week, except midterm), in total worth 20% of the grade. These will be given as canvas quizzes in times that overlaps with the end of class every Thursday. They are not meant to be challenging, rather they are meant to keep students on schedule for the course. The lowest 3 quiz grades will be dropped. No other exceptions for missed quizzes will be made.

Homeworks will be worth 40% of the grade. There will be 7 homeworks. The homeworks will usually consist of an analytical problems set, and sometimes light programming exercises in the R programming environment. When R is used, we typically will work through examples in class first. The homeworks will be turned in through GradeScope. Students will be responsible for turning these in on time, and marking with page is associated with each question.

I will plan to map numerical grades to letter grades at the standard scale:

93-100	A	87-89	B+	77-79	C+	67-69	D+	0-59	E
90-92	A-	83-86	B	73-76	C	63-66	D		
		80-82	B-	70-72	C-	60-62	D-		

but the instructor reserves the ability to shift this scale (upwards) in the final assignment of grades to account for the general performance of the class.

Late Policy

To get full credit for an assignment, it must be turned in through GradeScope by the 10 minutes before the end of the day it is due, specifically 11:50pm. Once the 11:50pm deadline is missed, those turned in late

will lose 10%. Every subsequent 24 hours until it is turned another 10% is deducted. Assignments will not be accepted more than 48 hours late, and will be given a 0. For instance, if a student earns 82 out of 100 points on an assignment turned in 18 hours late, they lose 10% and will be assigned 72 out of 100 points.

This will consistently be enforced by if GradeScope marks the assignment late (GradeScope has a small buffer on the timing).

If you believe there is an error in grading (homeworks or quizzes), you may request a regrading within **one week** of receiving your grade. Regrade requests for homeworks must be made via GradeScope, and for Quizzes via email to instructor and TA Meysam. The request must explain clearly why you think your solution is correct. You may consult with the instructor/TA first, but the formal request must always be made by GradeScope/email. Regrade requests should be polite and professional; impolite requests will not be addressed.

Collaboration Policy

For assignments, you may *discuss* solutions in general with anyone, including problem approach, proofs, and code. Students should not share specific numeric value of solutions with any other students or any other detail which may allow that other student to directly copy the answers. All students *must write their own* code, proofs, and write-ups. These write-ups should be done *without* consulting write-ups of others. We will be using state-of-the-art AI to monitor for work that has been turned in and appears to be done by copying the assignments of other people in this class, in previous versions of this class, or anywhere on the internet. By turning in an assignment and associated code you are confirming that the code was written by you. Any on-line resources that were referred to or studied should be mentioned as an acknowledgement in the code and assignment.

For quizzes and the exams, you must work by yourself. Students discovered discussing with other students the contents of a quiz or test before they have both turned in their quiz will constitute cheating for both students.

Discussion threads, chat areas, and emails are all considered to be equivalent to the classroom, and your behavior in all these venues should conform to the university's student code.

School of Computing Cheating Policy

The School of Computing has instituted a "two strikes and you're out" cheating policy. A strike occurs when you are reported for a major cheating (leading to failing a course), or two comparatively minor cheating instances. If you accumulate two strikes in any SoC courses, you will be unable to register for any future SoC courses.

https://www.cs.utah.edu/docs/misc/cheating_policy.pdf

If a student is caught cheating on a homework or quiz, they will at the least fail that homework or quiz and receive a minor sanction. For repeated, systematic, or ostentatious cheating the student will receive a failing grade and a major sanction. *Please do not cheat, it is not worth it*; the consequences are harsh and it is unfair to your peers. If feel you are falling behind on the material, reach out to the instructor, and he will work with you towards a solution.

For a detailed description of the university policy on cheating, please see the University of Utah Student Code: <http://www.regulations.utah.edu/academics/6-400.html>.

Students Support and Inclusion

Students with Disabilities or with English as a non-First Language

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you need accommodations in this class, reasonable prior notice needs to be given to

the Center for Disability Services, 162 Olpin Union Building, 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

Extra support is also available for those for whom English is not their first language. Several resources on campus will support you with your language and writing development. These resources include: the Writing Center (<http://writingcenter.utah.edu/>); the Writing Program (<http://writing-program.utah.edu/>); the English Language Institute (<http://continue.utah.edu/eli/>). Contact the instructor if there is any additional support that would aid in this course.

Safety and Addressing Sexual Misconduct

The University of Utah values the safety of all campus community members.

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to come speak to the School of Computing Advisors and/or to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776.

To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit <https://safeu.utah.edu>.

Student Names and Personal Pronouns

Class rosters are provided to the instructor with the student's legal name as well as "Preferred first name" (if previously entered by you in the Student Profile section of your CIS account, which managed can be managed at any time). While CIS refers to this as merely a preference, I will try to refer to you with the name and pronoun that feels best for you in class or on assignments. Please advise me of any name or pronoun changes so I can help create a learning environment in which you and your choice of name and pronoun are respected. If you need any assistance or support, please reach out to the LGBT Resource Center. https://lgbt.utah.edu/campus/faculty_resources.php

Diversity and Inclusivity

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

Wellness and Health

Personal concerns such as stress, anxiety, relationship difficulties, depression, cultural differences, etc., can interfere with a student's ability to succeed cross and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

In the case where a medical emergency of you or an immediate family member prevents you from completing an assignment on time, you must seek a medical exception to an assignment. This should be done before the assignment is due and will require written documentation of the medical emergency.

If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: <http://veteranscenter.utah.edu/>.

Contact the instructor if there is any additional support that would aid in this course.