Syllabus - Stats

STATS 7 online - syllabus - spring 2024

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*This is an **online course,** with some asynchronous (weekly video material, Perusall group work, homework) and synchronous components (Wed. discussions). **The final exam (https://canvas.eee.uci.edu/courses/62654/pages/exams) is proctored IN PERSON ON YOUR CAMPUS at the official time** and requires a laptop or tablet for data analysis with CrunchIt and a basic calculator for on-paper calculations.*

Class objectives

Objectives

My objective is to provide both an understanding of, and hands-on experience with basic, data-centric statistics. I will use for illustration examples of actual studies from a wide array of socioeconomic and scientific fields. What you will learn in this class should help you understand broadly the methodology, results, and issues of studies presented in your other classes or in news stories.

By the end of this course, you should be able to analyze and present data, design observational and experimental studies, use probabilities to model and predict random events, and use inference procedures to test hypotheses and estimate population parameters to reach conclusions in context. I also hope that you will come to appreciate statistics as a cool and really interesting subject.

GE requirement

Note that STATS 7 satisfies the **General Education requirement for Category Va, Quantitative Literacy**, with the following learning outcome objectives: Students should be able to
1) Identify appropriate tools for quantitative analysis of processes or events.
2) Have a basic familiarity with fundamental principles underlying quantitative descriptions of natural or social processes.
3) Be able to do one or more of the following: evaluate studies and reports that assess risk and probability in everyday life; use models of natural phenomena to make quantitative predictions of future behavior or events; use models of economic and social structures to make quantitative predictions of future behavior or events.

Topics covered

1. Data collection: random samples, observational designs, experimental designs, confounding
2. Descriptive statistics: data organization, graphs, numerical summaries, interpretation in context
3. Association: correlation, regression, two-way tables, association versus causation
4. Probability concepts: fundamental rules, conditional probabilities, independence
5. Probability distributions: continuous distributions, Normal distributions and computations, sampling distributions
6. Confidence interval for a population mean: one sample and matched-pairs *t* intervals
7. Hypothesis test for a population mean: one sample and matched-pairs *t* tests
8. Inference for several means: two-sample *t* interval, two-sample *t* test, analysis of variance (one-way ANOVA)
9. Inference for categorical data: chi-square test for two-way tables, confidence intervals for proportions (one-sample z intervals and, time permitting, two-sample z intervals)

Class organization

This is an online course with a pedagogical approach based on scientific studies of learning. It emphasizes retrieval, spaced out practice, group work, and active engagement. The course also follows the Guidelines for Assessment and Instruction in Statistics Education (**GAISE** (https://www.amstat.org/education/guidelines-for-assessment-and-instruction-in-statistics-education-(gaise)-reports)) endorsed by the American Statistical Association, which emphasizes statistics as an investigative process leading to comprehensive and nuanced interpretations in context.

Each topic is covered with a consistent weekly format:

1. Self-paced learning: Each topic starts with every student learning asynchronously from a set of short interactive videos hosted on Canvas. The interactive aspect of these videos is really important because humans do not learn well just from watching (or just reading notes, for that matter; see "**How to study for this class** (https://canvas.eee.uci.edu/courses/62654/pages/how-to-study-for-this-class) "). A graded video-lesson quiz on Canvas is designed to help you assimilate and retain this knowledge.

▼ **Video lesson and quiz study tips** *(click to expand)*

The interactive questions embedded in the videos are NOT recorded, so that you do not have to feel self-conscious about your answers. However, you will see many of these same questions in the Canvas video quiz -- where they are definitely part of the quiz grade.

The videos in a given topic set progress in complexity level, so do not skip any, especially not the last ones in the set.

Understanding the statistical concepts in the videos is not enough. You need to be able to use them to solve actual problems. So be sure to work out on your own all the "PRACTICE" problems before watching their detailed solutions.

*If you struggle with a particular concept or application, use the textbook explanations and examples for additional support at this stage, post your questions on **Ed Discussion** (https://canvas.eee.uci.edu/courses/62654/external_tools/7799?display=borderless) , and/or ask for help in **office hours** (https://canvas.eee.uci.edu/courses/62654/pages/contact-info-and-office-hours) . Struggling is an important part of the learning process as long as you do not give up.*

2. Coached group work: You need opportunities to practice your new analytical skills with expert guidance. The class offers both synchronous and asynchronous supervised learning activities: group work on Perusall supervised by Dr. Baldi (asynchronous) and group work on Zoom supervised by your TA (live Wed discussion). Because active participation is vastly preferable for learning, work done for both types of activities receive credit.

▼ **Lecture and discussion study tips** *(click to expand)*

This part of the course involves group work. This is an opportunity for you to discuss your approach and reasoning with your peers, before getting feedback from your instructors. Your emphasis should be on the statistical process rather than any specific answer.

Lecture is conducted asynchronously with students working out problems in groups on Perusall over a 48-hour period, followed by Dr. Baldi's feedback in a video. This is designed to support active learning more effectively than large-audience live Zoom lectures (which often lack in engagement).

Discussion problems are solved in student groups (live on Zoom) before receiving the TA's explanations. While you could do that work on your own, the discussions benefit you by providing small-group tutoring and hands-on help.

You only acquire new skills by practicing those skills. Be sure to make an honest effort to methodically solve every problem in the asynchronous lecture and the synchronous discussion. Expect to struggle at times and not get everything right: you are still learning! Perseverance is key. Re-reading notes before an exam is a mostly ineffective learning strategy--despite being a huge time pit. Instead, revisit the problems from discussion and lecture without looking at your notes, and make sure you can solve them by explaining why a particular solution or interpretation is correct (this is "deep learning").

3. Self-paced practice: Each topic has a homework assignment on **Achieve** (https://canvas.eee.uci.edu/courses/62654/external_tools/1688) to help you solidify your skills with practice. This is also a good time to (1) complement your learning with the textbook explanations and examples, and (2) seek help during **the instructor's or the TAs' office hours** (https://canvas.eee.uci.edu/courses/62654/pages/contact-info-and-office-hours) or asynchronously by posting/answering questions on our dedicated **Ed Discussion forum** (https://canvas.eee.uci.edu/courses/62654/external_tools/7799?display=borderless) .

▼ **Homework study tips** *(click to expand)*

Pedagogically, the homework is designed to be a learning tool, which is why it contains a mix of conceptual questions, basic practice questions, and more comprehensive applications. Ideally, you should find at least some of the problems to be challenging enough to indicate that you are learning.

*The homework is where you consolidate your skills **if** you try solving the problems the "slow way:" yourself, methodically and thoroughly--not by guessing or searching for answers online. Building skills requires actually using those skills (like driving, playing an instrument, ...).*

*AFTER you try solving a problem on your own, use the textbook explanations and examples if clarification is needed. If you are still puzzled by even little things, post a question on **Ed Discussion** (https://canvas.eee.uci.edu/courses/62654/external_tools/7799?*

display=borderless) *or ask for help in* ***office hours*** *(https://canvas.eee.uci.edu/courses/62654/pages/contact-info-and-office-hours)* *. The course builds on previous content every week, so it is important that you clarify any puzzling concept as soon as possible.*

Grading

Letter grades

Your letter grade in this class scales up with the number of **credits accumulated**, with a **maximum of 20 credits available** (https://canvas.eee.uci.edu/courses/62654/pages/grading) . This approach lets you know what you need to accomplish to earn a particular letter grade because you can only build up more credit as the quarter goes on (credits earned cannot be lost).

Elements contributing toward your overall letter grade

LEARNING ACTIVITIES:

Video quizzes (Canvas): contributing **4** credits toward your letter grade
Asynchronous lecture participation (Perusall+Yuja video): contributing **4** credits
Discussion work (Gradescope): contributing **4** credits
Homework assignments (Achieve): contributing **4** credits

ASSESSMENT:

Final exam (in-person): contributing **4** credits

Click the following links for details on the **final exam** (https://canvas.eee.uci.edu/courses/62654/pages/exams) , how to **catch-up/improve weekly assignment scores** (https://canvas.eee.uci.edu/courses/62654/pages/catching-up) , and how to **understand and compute your credits and letter grade** (https://canvas.eee.uci.edu/courses/62654/pages/grading) .

Additional considerations

▼ Exam times

There are no options for make-up exams or alternate times, but Incomplete grades are possible for emergency situations (within UCI's specifications and requiring documentation).

▼ Grade issues

Except for the final exam, all grade issues must be raised BEFORE finals week. This class is NOT CURVED. Only DOCUMENTED GRADING MISTAKES are considered (no random regrades or point fishing requests). Letter grade pleading at the end of the quarter is unethical and will get no response.

▼ Unexpected circumstances impacting the class

Note that the course grading scheme may be modified during the quarter (including the need for additional or substitute assessments) if an issue with overall lack of participation, widespread academic dishonesty, or disruptive extraneous circumstances were to emerge.

For complex, long-term issues (such as regular military training, hospitalization or recurring medical treatment, extreme family issues), contact Dr. Baldi on Ed Discussion (https://canvas.eee.uci.edu/courses/62654/external_tools/7799?display=borderless) **or via email so that we can make appropriate alternate arrangements that work for your specific situation.**

***** Academic Integrity *****

The UCI policy on academic integrity can be found at **aisc.uci.edu** (https://aisc.uci.edu/) .

Grades are an assessment of a student's accomplished learning. Therefore, ALL student work in this class must be the work of the individual receiving credit. Academic dishonesty includes having someone else do graded work for you (an entire assignment or parts of it) or any activity in which you represent someone else's work as your own (such as a tutoring site). It also includes you doing this for someone else. *Study groups and group work for group submissions do not fall under the category of academic dishonesty and provide instead an excellent learning opportunity.*

All acts of academic dishonesty will be officially reported to the **UCI Office of Academic Integrity and Student Conduct** (https://aisc.uci.edu/) for possible academic sanctions AND will result in an F in the course without option to drop.

Learning, research, and scholarship depend upon an environment of academic integrity and honesty. This environment can be maintained only when all participants recognize the importance of upholding the highest ethical standards. We live in the world we collectively create, and we need to recognize the impact our actions have beyond ourselves.

NOTE: All materials provided by your instructor are the sole copyright property of that instructor. This content is protected and may not be shared, uploaded, or distributed (including on tutoring sites) without express written consent from the instructor. Passing any original course material as your "own notes" is an act of plagiarism and intellectual property theft.

Course requirements

Achieve: an online textbook and homework system

We use an online textbook-homework system called "Achieve for The Practice of Statistics in the Life Sciences, 4th edition" (PSLS4e) that contains the e-textbook, statistical software, graded assignments, and many useful resources. ***Detailed information about Achieve here*** (https://canvas.eee.uci.edu/courses/62654/pages/achieve-info) .

Software

For the statistical computations needed in this class, you may use any software of your choice. We routinely use the free, web-browser-based statistical software **CrunchIt** (https://crunchit3.bfwpub.com/psls4e) (no installation needed). It is also needed for analytical work on the progress assessments and the final.

Equipment

You need a computing device (such as a desktop, laptop, or tablet) and stable internet access to watch the course videos and complete online assignments. Check out the UCI TechPrep website (**https://techprep.oit.uci.edu/learning/** (https://techprep.oit.uci.edu/learning/)) for help figuring out your technology setup. **You need to bring a laptop or tablet capable of running CrunchIt for the final exam**.

Wellbeing

We should always take care of our physical and mental wellbeing first and foremost, and be kind to others.

Class (n)etiquette

In all class interactions, in-person or online, we expect a positive attitude and respectful behavior. Be kind, understanding, and helpful with everyone. Thank you :-)

UCI resources

- UCI Disability Services Center (DSC): **dsc.uci.edu** (https://dsc.uci.edu/) (949) 824-7974 (request accommodations early, because of processing times)
- UCI Learn Anywhere UCI Be Well portal: **bewell.uci.edu** (https://bewell.uci.edu/)
- UCI Basic Needs: **basicneeds.uci.edu** (https://basicneeds.uci.edu/) (Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the FRESH Basic Needs Hub at **fresh@uci.edu** (mailto:fresh@uci.edu))
- UCI Counseling Center: **counseling.uci.edu** (https://counseling.uci.edu/) (949) 824-6457
- UCI Division of Undergraduate Education (DUE): **due.uci.edu** (https://due.uci.edu/)
- UCI Office of Inclusive Excellence **resources** (https://inclusion.uci.edu/responsive-research/resources/ally-awareness-resources/)

General wellbeing

- 988 Suicide & Crisis Lifeline: **988lifeline.org** (https://988lifeline.org/) (or dial 988)
- How to Apply to Supplemental Nutrition Assistance Program (SNAP): **Youtube video** (https://www.youtube.com/watch?v=e0X2oeP9PIA)
- *Habits of a Happy Brain: Retrain Your Brain to Boost Your Serotonin, Dopamine, Oxytocin, & Endorphin Levels*, by Loretta Graziano Breuning