

Stat 3202: Statistical Inference for Data Analytics Spring 2023 (29399)- Online

Course Overview

Instructor Information

Instructor: Sanjeevani Weerasingha, PhD

Email: weerasingha.1@osu.edu

Virtual Office hours via Carmen Zoom: Wednesday 10:00 am - 11:00 am, or by appointment

Teaching Assistant Information

Teaching Assistant : Alan Gan

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Teaching Assistant : Fangyi Wang

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Course Delivery

The course will use a mix of synchronous and asynchronous content.

- Required **asynchronous content** will be made available each Monday on Carmen. This material will include:
 - Reading assignments from the textbook.
 - Video lectures that provide in-depth discussion of the topics for the week.
 - Homework problems to help assess your understanding of the material.
 - Quizzes to help assess your understanding of the material.
- Required **synchronous content** will be delivered live over Carmen Zoom on Mondays during your corresponding recitation time. Students are expected to attend and participate in these live, online class meetings for Lab tutorials. The synchronous meetings on Mondays will be used to introduce new material and provide context for the asynchronous content using examples, discussion and questions.

I will hold office hours during the week via CarmenZoom. The schedule and Zoom links will be posted on Carmen.

The Teaching Assistants for the course will hold virtual office hours during the week. The schedule and information for how to attend these virtual sessions will be made available on Carmen.

Course Description

Foundational inferential methods for learning about populations from samples, including point and interval estimation, and the formulation and testing of hypotheses. Statistical theory is introduced to justify the approaches. The course emphasizes challenges that arise when applying classical ideas to big data, partially through the use of computational and simulation techniques.

Prereq: C- or better in 3201, or permission of instructor. Not open to students with credit for 4202.

Course learning outcomes

By the end of this course, students should successfully be able to:

- Compare the performance of estimators via bias, mean squared error, consistency, and sufficiency
- Use Monte Carlo simulation to model the performance of estimators and testing procedures
- Propose estimators via the method of moments and maximum likelihood estimation
- Use the Central Limit Theorem to model the sample distribution of a sample mean
- Conduct hypothesis tests on mean and variance parameters, including t-tests, chi-square tests, and F tests
- Determine and interpret the power and type-II error of a test
- Use bootstrapping to conduct inference
- Perform nonparametric hypothesis tests on mean parameters

Carmen

This class will use Carmen. In Carmen, you will find copies of the syllabus, homework assignments, lecture notes and other important documents. Carmen will also be used to keep track of your assignment grades. Additionally, materials for lectures will be uploaded to Carmen.

Materials

Text

- Required text: Stat 3202 Course Notes (electronic, on Carmen)
- Recommended text: Mathematical Statistics with Applications, 7th edition, by Wackerly, Mendenhall, and Scheaffer, Brooks/Cole, Cengage Learning, 2008. eBook PDFs are much cheaper and are highly encouraged.

Software

- Required software: we will extensively use the statistical software package called R (The R Project for Statistical Computing; <http://www.r-project.org/>). This software package is available for free. You can download R for Windows, Mac, and Linux, from the CRAN archive at <https://cran.r-project.org>. An in-depth introduction to R is available at <http://cran.r-project.org/doc/manuals/R-intro.pdf>. Tutorials are available in the Swirl system, which you can learn about at <http://swirlstats.com/>. “R Programming: The basics of programming in R” is an appropriate first tutorial for students who have never used R.
- Required software: we will also use the R interface RStudio. This package is available for Windows, Mac, and Linux and can be downloaded for free from <http://rstudio.org>. Note that RStudio requires R to be installed.
- Required software: Microsoft Office 365 ProPlus. All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft’s Student Advantage program. Each student can install Office on five PCs or Macs, five tablets (Windows, iPad® and Android™) and five phones. Students are able to access Word, Excel, PowerPoint, Outlook and other programs, depending on platform. Users will also receive 1 TB of OneDrive for Business storage. Office 365 is installed within your BuckeyeMail account. Full instructions for downloading and installation can be found <https://ocio.osu.edu/kb04733>.

Grades and Assignments

Quizzes (15%)

In order to help us check your comprehension during the semester, there will be quizzes in Carmen site. The quizzes are open book/open notes but should be completed without any external help or communication. I will drop your lowest quiz score when computing your quiz grade for the semester.

Homework (20%)

Homework assignments will comprise 20% of your grade for the course. Assignments will only be accepted through Carmen as a .pdf file submission, with clear and organized work and relevant code and output provided. **Every assigned problem should be completed**, but only a subset of problems may be graded. You are encouraged to work together on homework; however, each student must produce their own assignment to be handed in. Do not copy any part of another student's homework. All homework assignments will be included in your final grade, so be sure they are all submitted.

Labs (20%)

Lab assignments will comprise 20% of your grade for the course. Most weeks a lab assignment will be introduced during recitation, incorporating recent lecture topics with coding. You are encouraged to collaborate on lab assignments, but ultimately the work you submit must be your own. Labs will be completed in R Markdown and must be compiled into organized, professional PDF documents. Relevant plots should be included and labeled, code should be organized and clear, and supporting answers and text should be properly formatted and professionally written. The lowest lab grade will be dropped.

Exams (45%)

There will be two midterms and one final exam to assess your understanding of the course material as the semester progresses. The first midterm will be on Thursday, February 09th and the second will be on Thursday, March 09th. The final exam will be held during exam week.

All exams will be taken remotely as “take-home” (un-proctored) exams. You will have a 24-hour window during which you can start the exam; once started, you must complete the exam and upload your solutions in a specified amount of time. You will be able to use all of your course materials as a reference during the exams. You must complete all exams on your own without assistance from anyone other than a course instructor. You may not assist anyone on the exam. You may not communicate about the exam with anyone until the exam window for all students has closed. Each exam will be worth 15%.

Late Assignments

Late homeworks and labs will be accepted for 24 hours after the original due date with a 1% deduction per hour. **After this, no late assignments will be accepted.** Do not wait until the last moment to begin working on assignments. Unexpected obstacles will occur in life - it is your responsibility to be prepared for them. If something unexpected comes up 2 hours before an assignment is due that impedes your ability to submit on time, then you should have started the assignment earlier. Submitting the wrong document - such as the blank assignment template, an incomplete version, or a corrupted version of the file - is not a valid excuse. It is your responsibility to ensure you have submitted the correct document in the correct format to the correct Carmen submission location.

“Can I please have an extension on my assignment?”

Yes! You may have up to 24 extra hours, with a 1% deduction per hour. Beyond that, no late assignments will be accepted.

Late exams are not accepted under any circumstances.

Late lecture assignments can only be submitted if your absence is excused, and, if the student reviews the material on their own time and demonstrates that they have put in the effort. Part of the purpose of these assignments is to ensure students attend every lecture, so if you do not attend lecture, you cannot attempt, submit, or receive credit for these assignments. These must be made up within two business days of the recording being posted.

Academic Integrity

I take academic integrity very seriously. There is no place at The Ohio State University for academic misconduct.

- Lecture assignments: during class, you are encouraged to collaborate with other students in small groups if you are comfortable doing so, but ultimately the work you submit must be your own. Directly copying another student's work is not permitted.
- Labs: You are encouraged to collaborate on lab assignments, but ultimately the work you submit must be your own. Directly copying another student's code, work, or file is not permitted.
- Reusing past work: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- Falsifying research or results: All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
- Collaboration and informal peer-review: The course includes many opportunities for formal collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on an exam is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Health, Safety, and Accommodations

COVID Information

The Ohio State University Wexner Medical Center's Coronavirus Outbreak site (<https://wexnermedical.osu.edu/features/coronavirus>) includes the latest information about COVID-19 as well as guidance for students, faculty and staff. Be sure to review policies for students that can be found here: <https://safeandhealthy.osu.edu/current-students>.

As of August 2, 2021, all students, faculty and staff are required to wear masks in classrooms and other shared indoor spaces. These include common areas, conference rooms, shared office spaces, hallways, buses and shared vehicles on all Ohio State campuses. Physical distancing is no longer required in classrooms. The university has limited the capacity of some of the largest classes, but there are no longer requirements for a certain physical distance between individuals. Individuals should not eat in classrooms. Individuals can take an occasional drink, but should take masks off only as necessary.

You have voluntarily elected to take the in-person section of this course, so your physical attendance and participation in class is expected every day that it is safe for you to do so. In the event you are unable to attend class for an extended period of time, please reach out to me as soon as possible. If it is reasonable for you to continue participating remotely, all materials will remain accessible for you. In the event I am unable to participate for an extended period of time, I will let students know as soon as possible. A replacement instructor will be available through the Department of Statistics.

Title IX Policy

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected

categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Student Services and Accessibility Accommodations for Students with Disabilities

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

If you have accommodations, it is your responsibility to communicate these with me in a timely and efficient manner.

Student academic services: <http://advising.osu.edu/welcome.shtml>

Student support services: <http://ssc.osu.edu>

Diversity and Inclusion

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at suicidepreventionlifeline.org.

Disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and in particular we reserve the right to change due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.