STAT 3202: Statistical Inference for Data Analytics

Fall 2023

Instructor:	Nasser Sadeghkhani	**Time:**	W F 9:35-10:55am (pre-recorded videos)
Email:	sadeghkhani.1@osu.edu	**Place:**	Online

Online Office Hours W 11:30 am- 12:30 pm or by appointment via Zoom. Zoom links will be posted on Carmen.

My Office is located at 205B Cockins Hall.

TA: Torey Hilbert (hilbert.54) (hilbert.54@osu.edu)

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.

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

Course delivery:

- This is an **asynchronous online** course with **pre-recorded video lectures**. So you have access to them during the semester, and there is no online classes on W and F 9:35-10:55.

- On occasion partial lecture notes will be posted on Carmen one week in advance of every session (depending on the topic). Students are expected to fill in the blanks during the lectures.

- The videos will elaborately explain all the topics, and each is about 75 min. Students are expected to watch watch videos in chronological order, and ask their potential questions in the **"Discussions'** section on Carmen. Our TA and I will answer your questions as soon as we can. Other students are welcome to respond to your colleagues' questions. Alternatively you can ask your questions during office ours or just by emailing them to me.

Main References:

- 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.

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

Necessary software

- This class requires you to use the statistical software package called R (The R Project for Statistical Computing; http://www.r-project.org/) to illustrate certain aspects. Here is the information for obtaining R.

  - 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

- An easier to use interface to R is available in the software package 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.

Course Requirements:

Evaluation: The evaluation will be determined based on **four** assignments, **four** quizzes (approximately), **two** midterm exams, and **one** final exam.

quizzes 15%, Assignments 20%, First Midterm 15%, Second Midterm 20%, Final 30%.

Grades will be recorded on Carmen

Important Dates:

Assignments and quizzes	Almost biweekly (on Carmen)
Midterm #1	F–Sep 29 (online 9:35-10:50 am)
Midterm #2	F–Nov 03 (online 9:35-10:50 am)
Final Exam	Thur–Dec 14 (online 8:00am-9:45 am)

Grading Scale:

93–100 .... A
90–92.9 .... A-
87–89.9 .... B+
83–86.9 .... B
80–82.9 .... B-
77–79.9 .... C+
73–76.9 C
70 –72.9 .... C-
67 –69.9 .... D+
60 –66.9 .... D
Below 60 .... E

Course Policy:

Assignment Policy:

- The assignments will be posted on Carmen.

- You answers must be uploaded electronically through Carmen in a single PDF file.

- Pay attention to the due date, it is usually one week after the assignment is posted. No late assignment will be accepted. If you are unable to complete an assignment on time, please get in touch with me asap, so we can discuss your situation.

- You are encouraged to work together on the homework, but **do not** copy any part of a assignment.

- For the Homework assignments that require R, Make sure that the computer output and discussion are placed together (do not put the computer output at the end of homework). Raw computer output is not acceptable. Make it clear what parts of the output are relevant and show how they answer the questions posed in the homework.

- Homework assignments that do not require R may be handwritten (electronically, or on paper and scanned) and uploaded.

- Quizzes will be given (may be unannounced) during recitation, incorporating recent lecture topics. The TA is responsible for grading and any issues regarding the recitation session and quizzes must be directly communicated to him. He will be in contact with you for more information.

Exam Policy:

- On the exams, you are allowed to use all the materials in Carmen (lecture notes, videos, assignments). You are NOT allowed to use other sources. Cheating/copying will lead to strict punishment.

- Each exam coverage will be notified prior to the exam.

- The exams will be cumulative, but will emphasize the more recent material. There will be **no make-up** exams. If exceptional circumstances (sudden onset of illness, unexpected family situations, etc.) arise, contact me asap, so we can discuss your situation.

Health and safety:

The Ohio State University Wexner Medical Center's Cornavirus Outbreak site (`https://wexnermedical.osu.edu/features/coronavirus`) includes the latest information about COVID-19 as well as guidance for students, faculty and staff.

Student academic services:

Student academic services offered on the OSU main campus http://advising.osu.edu/welcome.shtml.

Student support services:

Student support services offered on the OSU main campus http://ssc.osu.edu.

Ohio State's academic integrity policy:

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/.

Copyright 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.

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; https://slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Statement on title IX:

- 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.