

Stat 3202: Statistical Inference for Data Analytics

Summer 2026 (17036)

Course Overview

Instructor Information

Instructor: Thomas Metzger, PhD

Email: metzger.181@osu.edu; **please do not use my Buckeyemail address.** Messages sent through Carmen often go into my spam folder; for fastest communication, use **metzger.181@osu.edu**.

Office hours: by appointment.

Grader/TA: Mr. Alan Gan, gan.171@osu.edu

Course Delivery

Asynchronous lectures: pre-recorded videos will be posted in advance that you must watch on your own time before the required deadline. When watching these videos, it is important that you treat them as you would an in-person course: view them without distractions, and work along by taking notes and coding along with the video.

Asynchronous recitation: recitations will be treated as lab tutorials. These tutorials will be posted Mondays by 12 pm. Students should review the recording on their own time as a supplement to each week's lab activity. Additionally, the TA will host an optional in-person office hour TBD.

Office hours: the purpose of office hours is to provide supplemental time for questions, discussion, or assistance that you may need. Any topics related to the course, or to college life, professional development, or personal issues affecting your academic career at Ohio State are relevant and welcome topics. Office hours will be held by appointment. A Zoom link can be found on Carmen for virtual meetings. Office hour attendance is always optional but you are welcome to attend as frequently as you would like.

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

Materials

Text

- Required text: Stat 3202 Course Notes (electronic, on Carmen)
- Required 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.

Hardware and Software

- Required hardware: a webcam and microphone are required. There will be occasional individual meetings between students and the TA or professor for oral exams and intermittent check-ins.
- 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

Homework (11.3%)

Homework assignments will serve as a good foundation and preparation for the oral and written exams. You may be asked to defend the work you submit. All homework assignments will be counted toward your final grade. See below for the AI policy on homeworks.

Labs (11.3%)

Tentatively, there will be 12 labs (one per week, with half-labs Week 3 (Memorial Day), Week 6 (June-teenth), and Week 8 (Independence Day)). Most weeks a lab assignment will be introduced during recitation, incorporating recent lecture topics with coding. Labs will generally be due Fridays before 11:59 pm. You are encouraged to collaborate on lab assignments, but ultimately the work you submit must be your own. Labs must 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. You may be asked to explain and defend your work. The lowest lab grade will be dropped. See below for the AI policy on labs.

Content Quizzes (11.3%)

The purpose of these Carmen assignments is to ensure you are keeping on schedule with the videos and to assess the content of the videos with a low-stakes assignment. Treat them as additional practice and a gauge

for your own understanding. Feel free to use your notes, rewatch videos, and retake them a second time. These short assignments should be completed by the assigned deadline. The lowest content quiz grade will be dropped. Videos and content quizzes will typically be available a week in advance to give you a chance to work ahead if you have personal obligations. The lowest content quiz grade will be dropped. See below for the AI policy on content quizzes.

Oral Exams (33.3%)

Three oral exams, each comprising 11.1% of your grade, will take place during the semester: oral exam 1, approximately covering video sets 1A-4B, will take place Week 5 by appointment. Oral exam 2, approximately covering video sets 5A-8B, will take place Week 9 by appointment. Oral exam 3, approximately covering video sets 9A-12B, will take place during final exam week (Monday, August 3 - Wednesday, August 5) by appointment. Oral exams will last about 10 minutes. Students are welcome to use their notes during these exams but they cannot communicate with others or use AI tools in any way. For students who contact me well in advance, I will typically have flexibility within a day before or after these dates to accommodate students who are unavailable on these specific dates - please reach out ahead of time for flexibility! All exam grades will count towards your final grade.

Written Exams (33.3%)

Three written exams, each comprising 11.1% of your grade, will take place during the semester: written exam 1, approximately covering video sets 1A-4B, will take place Week 5 TBD. Written exam 2, approximately covering video sets 5A-8B, will take place Week 9 TBD. Written exam 3, approximately covering video sets 9A-12B, will take place during final exam week (Monday, August 3 - Wednesday, August 5) TBD. Lockdown browser and Respondus Monitor will be required. Notes, resources, and AI tools are not permitted in any way.

Late Assignments

It is imperative to stay on schedule for this condensed, 12 week course. Late homeworks, labs, and content quizzes will be accepted for 48 hours after the original due date with a 2% 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 proper document in the proper format.

For an emergency, each student can have one late waiver throughout the semester, no questions asked. **You still have to turn in the assignment within 48 hours, but I'll waive the late penalty for one assignment of your choosing if something unexpected comes up and submit it within 48 hours of the due date.** You can request the waiver any time, but you must contact me in writing to let me know which assignment you'd like your late waiver for no later than Friday, July 31, 2026.

Academic Integrity

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/>.

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute Academic Misconduct.

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: Any activity that tends to compromise the academic integrity of the University or subvert the educational process. Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an excuse for academic misconduct, so please review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

Generative artificial intelligence (GenAI) tools should not be used in the completion of course assignments unless an instructor for a given course specifically authorizes their use, and then only in the ways allowed by the instructor. Students are not to submit their work without acknowledging any word-for-word use and/or paraphrasing of writing, ideas, or other work that is not their own. These requirements apply to all students, whether undergraduate, graduate, and professional.

If an instructor suspects that a student has committed academic misconduct in this course, the instructor is obligated by University Rules to report those suspicions to the Committee on Academic Misconduct. If COAM determines that a student violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University.

If students have questions about the above policy or what constitutes academic misconduct in this course, they should contact the instructor.

- 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.
- Content quizzes, homeworks, and labs: 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. Generative AI tools such as ChatGPT or Microsoft Copilot policies are outlined below.
- Oral exams: you may use your own personal notes during oral exams, but be careful to not be too reliant on these resources, as it may cost you valuable time. You may not be in communication with others during oral exams in any way. Generative AI tools such as ChatGPT or Microsoft Copilot are not permitted in any way.
- Written exams: no outside help, including notes, AI tools, external resources, other people, or any other tools may be used. Exams should be completed using Lockdown Browser and Respondus Monitor. Students must show a photo ID, show a room scan, and adhere to all proctoring guidelines outlined by the Carmen proctoring tools.

AI Usage

Given that the learning goals of this class include developing and refining your coding abilities, articulating statistical concepts orally and in writing, and connecting complex statistical concepts with mathematical and computer science tools, the use of generative artificial intelligence tools such as ChatGPT or Copilot is not permitted in this course for purposes including, but not limited to, generating code, finding solutions, or solving problems. Ultimately, any use of GenAI tools for work in this class for labs, content checks, and homeworks may be scrutinized to ensure it is in adherence with Ohio State's Academic Integrity policy and Code of Student Conduct. If I suspect that you have used GenAI inappropriately on an assignment for this course, I will ask you to explain your process for completing the assignment in question. The unauthorized or inappropriate use of GenAI tools will result in referral to the Committee on Academic Misconduct.

May be Permitted/Appropriate:

- Pasting in error messages generated by code you have written yourself
- Asking to be pointed in the right direction for resources
- Paraphrasing a topic you have phrased yourself
- Correcting grammar
- Translating unknown words and phrases
- Organizing or paraphrasing thoughts or ideas you have already created

Not permitted/Inappropriate:

- Pasting in problems that are verbatim or minimally/superficially adjusted
- Asking to have a problem started for you
- Using AI to solve proofs and problems
- Copying or minimally/superficially altering code written by AI
- AI does the thinking for you

The bottom line: if the work you submit represents your own uniquely generated thoughts, it is appropriate. If it represents someone (or something) else's thoughts or work, it is not appropriate. In general, do not submit work you can't defend, because if I have suspicions, I will ask you to defend it.

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.

Disability Statement (with Accommodations for Illness)

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If students anticipate or experience academic barriers based on a disability (including mental health and medical conditions, whether chronic or temporary), they should let their instructor know immediately so that they can privately discuss options. Students do not need to disclose specific information about a disability to faculty. To establish reasonable accommodations, students may be asked to register with Student Life Disability Services (see below for campus-specific contact information). After registration, students should make arrangements with their instructors as soon as possible to discuss your accommodations so that accommodations may be implemented in a timely fashion.

If students are ill and need to miss class, including if they are staying home and away from others while experiencing symptoms of viral infection or fever, they should let their instructor know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations.

Religious Accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Civil Rights Compliance Office.

Policy: Religious Holidays, Holy Days and Observances

Counseling and Consultation Services / Mental Health Statement

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 by dialing 988 to reach the Suicide and Crisis Lifeline.

Military-Connected Students

The Military and Veterans Services (MVS) Office offers a wide range of resources for military-connected students. Whether using educational benefits or not, all military-connected students are encouraged to learn more about how the university supports military-connected students (i.e., information about tutoring, transition services, access to the veteran's lounge, etc.). For service members, should you receive military

orders during the semester or know of classes that will be missed due to service commitments, please speak with your instructor as soon as possible on possible accommodations. MVS contact information: milvets@osu.edu; 614-247-VETS; veterans.osu.edu/; 185 Student Academic Services Building, 281 W. Lane Avenue.

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 I reserve the right to change policies, due dates, or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.