

# Stat 3202: Statistical Inference for Data Analytics

## Autumn 2025 (25290)

### Course Overview

#### Instructor Information

Instructor: Thomas Metzger, PhD

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

Office hours: Tuesdays, 11 am - 12 pm, Pomerene 161; Wednesdays, 9:30 am - 10:30 am, Cockins 340E.

Grader/TA: Mr. Alex Nguyen, nguyen.2119@osu.edu

#### Course Delivery

This course meets Tuesdays and Thursdays in Pomerene 250 from 9:35 am - 10:55 am. If it is safe and healthy for you to do so, lecture attendance is mandatory. Attendance will be taken daily. Each lecture will be labeled with a week number and a letter, “A” (Tuesday lecture) or “B” (Thursday lecture). For example, the Thursday lecture of week 3 will be Lecture 3B. Students should be respectful to all others at all times with their undivided attention and consideration. Please keep phones and unrelated work away.

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)
- 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

### Homework (10%)

Homework assignments will comprise 10% 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 collaborate remotely on homework assignments, but ultimately the work you submit must be your own. You may be asked to explain and defend your work. **All homework assignments will be included in your final grade.** See below for permissible AI guidelines.

### Labs (10%)

Lab assignments will comprise 10% of your grade for the course. 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 permissible AI guidelines.

## Quizzes (10%)

These short assignments will frequently be given during lectures, and may be unannounced. If you do not attend lecture, you cannot attempt, submit, or receive credit for these assignments. The lowest quiz grade will be dropped. No external resources may be used on quizzes.

## Attendance (10%)

Attendance will be taken daily. Two unexcused tardies will be counted as an unexcused absence. All students will receive one free tardy, for emergencies. All students will also receive one free absence, for emergencies. Absences will be excused on a case-by-case basis.

## Exams (60%)

Three exams, each comprising 20% of your grade, will take place during the semester. Exams will take place during class and are closed-note. All exam grades will count towards your final grade. No external resources may be used on exams.

- (20%) Exam 1, covering Lectures 1A-4A, will take place during scheduled class time on Tuesday, September 23 from 9:35 am - 10:55 am. The corresponding lectures and date are tentative.
- (20%) Exam 2, covering Lectures 4B-10A, will take place during scheduled class time on Tuesday, November 4 from 9:35 am - 10:55 am. The corresponding lectures and date are tentative.
- (20%) Exam 3, covering Lectures 10B-16A, will take place during the scheduled final exam time on Friday, December 12 from 8:00 am - 9:45 am. The corresponding lectures covered are tentative, but the time and date are confirmed.

## Late Assignments

Late homeworks, labs, and Carmen 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, December 12, 2025.

## Academic Integrity

I take academic integrity very seriously. There is no place at The Ohio State University for academic misconduct, and I have submitted many students in the past for violations including copying other students' work and receiving unauthorized assistance on exams.

- Quizzes and Exams: No external resources may be used on quizzes, including notes, AI, or other students.
- Homeworks and Labs: AI *may* be permissible; see below.
- 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.

## AI Usage

*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.

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 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.

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/>.

## Required Statement on 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. Contact [slds@osu.edu](mailto:slds@osu.edu); <https://slds.osu.edu/>; 098 Baker Hall, 113 W. 12th Ave; 614-292-3307.

### **Required Statement on 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)

### **Required Statement on Intellectual Diversity**

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

## **Required Statement on Grievances and Solving Problems**

According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, take your case to the department chairperson, college dean or associate dean, and to the provost, in that order. Specific procedures are outlined in Faculty Rule 3335-8-23. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

## **Required Statement on Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct**

The Ohio State University is committed to building and maintaining a welcoming community. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office (CRCO). Online reporting form: <http://civilrights.osu.edu/>; call 614-247-5838 or TTY 614-688-8605; [civilrights@osu.edu](mailto:civilrights@osu.edu).

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Civil Rights Compliance Office to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

## **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 due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.