Syllabus: STAT 6950

Applied Statistics I
Autumn 2025 (full semester)
4 credit hours

# Course overview

## Instructor

Jennifer Sinnott

Email address: sinnott.12@osu.edu

Lectures: Tuesdays and Thursdays, 9:25am–11:15am
Classroom: EA0285 (Eighteenth Ave, 209 W / formerly East Annex [?])

Office hours: Wednesday 2pm–3pm **by Zoom** (link on Carmen)

## Grader

Yingyu Cheng

Email address: cheng.1753@osu.edu

## Prerequisites

Statistics 6801 (co-requisite), or permission of the instructor. Not open to students who have taken Statistics 6450.

**Format of instruction**

STAT 6950 is a four-credit hour course with two in-person, 110-minute lectures each week. One in-person office hour is offered by the instructor each week. Students are expected to attend both lectures each week; attendance at office hours is optional.

## Course description

One and two-sample problems, exploratory data analysis, simple and multiple linear regression, diagnostics and model selection. Intended primarily for students in the PhD program in Statistics or Biostatistics.

Stat 6950 is an applied statistics course that emphasizes principles of data analysis in the linear model setting. While the focus is applied, the methods of data analysis are presented and motivated in the context of statistical theory at a level appropriate for first year graduate students in Statistics or Biostatistics. The theoretical background assumes facility with multivariable calculus and basic matrix operations from linear algebra. The R language and environment for statistical computing and graphics will be used as the main tool for data analysis.

## Course learning outcomes

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

* identify and implement appropriate methods of data analysis in the one- and two-sample problem settings;
* use an exploratory analysis of data to guide the linear regression modeling process;
* fit, interpret, and perform statistical inference based on linear regression models;
* use appropriate diagnostics for model checking and case-influence analysis to identify deficiencies with a fitted model;
* recognize and employ appropriate modeling strategies for common examples of nonconstant variance functions;
* employ appropriate strategies for regression modeling with many predictors;
* summarize an analysis appropriately.

# Course materials and technologY

## Textbooks

### Required

* S. Weisberg (2014), Applied Linear Regression, 4th Ed., John Wiley & Sons, Inc., NJ.

An electronic version of the book can be accessed for free through The Ohio State University Libraries at:

<http://proxy.lib.ohio-state.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=771773>
Errata and more information about the textbook can be found at <http://users.stat.umn.edu/~sandy/alr4ed/>.

### Recommended/optional

* I will highlight other useful resources as the course progresses.

## Necessary Software and Equipment

* This class requires you to use the statistical software packages called R (The R Project for Statistical Computing; <http://www.r-project.org/>) and RStudio (<https://posit.co/>). These software packages are available as Free Software with versions compatible with current macOS and Windows operating systems. More details will be given in lectures.
* You may choose to use the (free) R Markdown ([https://rmarkdown.rstudio.com](https://rmarkdown.rstudio.com/)) or Quarto ([https://quarto.org](https://quarto.org/)) authoring frameworks to complete assignments.
* Access to a computer capable of running the required software, which typically includes Mac and PC devices running the current macOS or Windows operating system.
* Office hours will be held by CarmenZoom ([go.osu.edu/zoom-meetings](http://go.osu.edu/zoom-meetings))

# Grading

|  |  |
| --- | --- |
| Assignment category | PERCENTAGE |
| **Homework** | **15** |
| **Midterm 1** | **15** |
| **Midterm 2** | **25** |
| **Project** | **15** |
| **Final Exam** | **30** |
| **Total** | **100** |

**Homework** will be assigned approximately weekly, with a few weeks off during the semester. While adjustments may need to be made, I expect that homework assignments will be due on Carmen on Fridays by 11:59pm. Instructions for how to prepare and turn in your homework solutions will be given at the beginning of the semester.

**Project**: A group project will be due in late November. The project will tie together the concepts learned throughout the course. Details will be provided in the beginning of October.

**Exams**: The first midterm is **tentatively** scheduled to be on **Tuesday, October 7** during our regularly scheduled class time. The second midterm is **tentatively** scheduled to be on **Tuesday, November 18** during our regularly scheduled class time. The first midterm will last for one hour, and the second midterm will last for 1 hour and 50 minutes. The final exam has been scheduled by the registrar for **Friday, December 12, 8:00am–9:45am.**

All exams are closed book/closed notes. Further details will be given in advance of each exam. A basic calculator is allowed.

# Course schedule

Refer to the Carmen course for up-to-date reading and assignment due dates.

| Week | Dates | Topics |
| --- | --- | --- |
| 1 | Aug 26Aug 28 | One and two-sample problems  |
| 2 | Sep 2Sep 4 | One and two-sample proportions  |
| 3 | Sep 9Sep 11 | EDA, statistical models, simple linear regression intro  |
| 4 | Sep 16Sep 18 | Simple linear regression  |
| 5 | Sep 23Sep 25 | Testing, techniques for model validation  |
| 6 | Sep 30Oct 2 | Regression diagnostics  |
| 7 | Oct 7Oct 9 | Midterm 1 (1hr), Transformations |
| 8 | Oct 14 | Multiple linear regression (MLR) |
| 9 | Oct 21Oct 23 | MLR inference, added variable plots, multicollinearity |
| 10 | Oct 28Oct 30 | Nested models, general linear F test |
| 11 | Nov 4Nov 6 | Regression with categorical predictors |
| 12 | Nov 13 | Weighted least squares, generalized least squares |
| 13 | Nov 18Nov 20 | Midterm 2 (2hrs), Residuals and diagnostics |
| 14 | Nov 25 | Polynomial regression, interaction effects |
| 15 | Dec 2Dec 4 | Model comparison and selection |
| 16 | Dec 9 | Variable selection |

# Other course policies

## Academic integrity policy

**Policies for this course**

* **Exams**: You must complete the midterm and final exams on your own without assistance from anyone other than a course instructor.
* **Homework**: You may work together on the homework, but do not copy any part of your solutions from another person or another source. While study groups are allowed, remember that you must produce your own, original work. If you're unsure about a particular situation, please feel free to ask ahead of time.
* **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.
* **Generative Artificial Intelligence (GenAI)**
	+ Acceptable use of GenAI in this course is strictly limited to:
		- use as a tool to complement the lectures and assigned readings to help you learn the course material. You are allowed to query GenAI about general questions you have as you learn the material in the same way that you might look up information using a search engine like Google. As with any online resource, please treat the information you receive with appropriate skepticism.
		- use as an extended “help manual” for R functions you might use during this class. In the same way that you might use Google to find out what a specific R function can do (or what R function to use for a specific task), you can pass the same queries to GenAI.
	+ All of the work that you turn in for credit in the course (solutions to homework assignments and the class project) must be your own original work. The use of GenAI to produce work that you will turn in for credit is prohibited. This includes, but is not limited to:
		- use of GenAI or other tools such as Google Translate as a translation tool is prohibited. The ability to “summarize an analysis appropriately” is one of the course learning outcomes and so the writing you produce must be entirely your own.
		- use of GenAI to produce written work. All written work you turn in must be your own original work, including all elements of the course project.
		- use of GenAI to answer homework questions. Your solutions to homework questions must be your own work and cannot be generated either in whole or part by GenAI. You may not input a homework question into GenAI either in whole or part.
		- use of GenAI to write R code. While querying GenAI about specific features of R functions is acceptable, asking GenAI to write code for you to complete a task for an assignment is not.
	+ You may not copy/paste or otherwise input any course materials provided by the instructor (including homework questions) into a GenAI platform. Similarly, you may not copy/paste or use any output from GenAI platforms as part of your written work in the course.
	+ A good rule of thumb is to think about GenAI as another person. Asking another person for general information or for clarification about ideas is acceptable; asking another person to provide answers to homework questions, to write code for you, or to write your solutions to an assignment is not.

## Copyright

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.

**Disclaimer**

This syllabus should be taken as a reliable guide for the course content. However, you cannot claim any rights from it, and 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.

**Syllabus version:** v0 [original]

**Other syllabus statements (see below in online version, or visit website here):** <https://ugeducation.osu.edu/academics/syllabus-policies-statements/standard-syllabus-statements>

**Academic Misconduct**

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](https://oaa.osu.edu/resources/policies-and-procedures/committee-academic-misconduct) (COAM) expect that all students have read and understand the University's [Code of Student Conduct](https://trustees.osu.edu/bylaws-and-rules/code), 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.

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.

**Artificial Intelligence and Academic Integrity**

There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite, and others. These tools will help shape the future of work, research and technology, but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes. Specifically, students are not to use unauthorized assistance in the laboratory, on field work, in scholarship, or on a course assignment unless such assistance has been authorized specifically by the course instructor. In addition, 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 your own. These requirements apply to all students undergraduate, graduate, and professional.

To maintain a culture of integrity and respect, these generative AI tools should not be used in the completion of course assignments unless an instructor for a given course specifically authorizes their use. Some instructors may approve of using generative AI tools in the academic setting for specific goals. However, these tools should be used only with the explicit and clear permission of each individual instructor, and then only in the ways allowed by the instructor.

**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](https://oaa.osu.edu/religious-holidays-holy-days-and-observances)

**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.

**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.

**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.

**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

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.