



# SYLLABUS: STAT 6950

Applied Statistics I

Autumn 2024 (full semester)

4 credit hours

## COURSE OVERVIEW

### Instructor

Christopher Hans

Email address: [hans.11@osu.edu](mailto:hans.11@osu.edu)

Lectures: Tuesdays and Thursdays, 9:25am–11:15am

Classroom: EC 354 (Enarson Classroom Building)

Office hours: Tuesdays 11:30am–12:30pm in CH428D

Wednesdays 12:30pm–1:30pm in CH428D

### Grader

Ye Jin Choi

Email address: [choi.1577@osu.edu](mailto:choi.1577@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.

Two in-person office hours are 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 <https://library.ohio-state.edu/record=b7651844~S7>. You will need to click on “Connect to resource EBSCOhost”; you may also need to supply your OSU credentials. The online resource is best suited for screen reading; each individual is allowed to print/e-mail/save/download a limited number of pages.

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>) or Quarto (<https://quarto.org>) authoring frameworks to complete assignments. Examples will be provided in class.
- 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.

## GRADING

ASSIGNMENT CATEGORY	PERCENTAGE
Homework	15
Midterm 1	15
Midterm 2	25
Project	15
Final Exam	30
<b>Total</b>	<b>100</b>

**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 **Thursday, October 3** during our regularly scheduled class time. The second midterm is **tentatively** scheduled to be on **Tuesday, November 12** 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 6, 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 20 Aug 22	One and two-sample problems
2	Aug 27 Aug 29	One and two-sample proportions
3	Sep 3 Sep 5	EDA, statistical models, simple linear regression intro
4	Sep 10 Sep 12	Simple linear regression
5	Sep 17 Sep 19	Testing, techniques for model validation
6	Sep 24 Sep 26	Regression diagnostics
7	Oct 1 Oct 3	Transformations, Midterm 1 (1hr)
8	Oct 8	Multiple linear regression (MLR)

Week	Dates	Topics
9	Oct 15 Oct 17	MLR inference, added variable plots, multicollinearity
10	Oct 22 Oct 24	Nested models, general linear F test
11	Oct 29 Oct 31	Regression with categorical predictors
12	Nov 5 Nov 7	Weighted least squares, generalized least squares
13	Nov 12 Nov 14	Midterm 2 (2hrs), Residuals and diagnostics
14	Nov 19 Nov 21	Polynomial regression, interaction effects
15	Nov 26	Model comparison and selection
16	Dec 3	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.

## Ohio State University's academic integrity policies

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 3335-5-48.7 (B)). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

**If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct.** If COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me. Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page ([go.osu.edu/coam](http://go.osu.edu/coam))
- Ten Suggestions for Preserving Academic Integrity ([go.osu.edu/ten-suggestions](http://go.osu.edu/ten-suggestions))

## Copyright for instructional materials

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. No course materials provided by the instructor (notes, videos, recordings, computer code, homework assignments, homework solutions, exams, etc.) may be distributed publicly or privately to anyone outside of the class.

## 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 [Office of Institutional Equity](#). (Policy: [Religious Holidays, Holy Days and Observances](#))

## 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](mailto:titleix@osu.edu).

## Commitment to a diverse and inclusive learning environment

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.

## Your 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](https://ccs.osu.edu) or calling [614-292-5766](tel: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](tel:614-292-5766) and 24-hour emergency help is also available 24/7 by dialing **988 to reach the Suicide and Crisis Lifeline**.

## Disability Services

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. 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.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; or [slds.osu.edu](https://slds.osu.edu).

## 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]