THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 3202 SP 2026
Statistical Inference for Data Analytics

Course overview

Instructor

Instructor: Dr. Andrew Richards
BS, Physics, U.S. Naval Academy
MBA, Yale School of Management
PhD, Statistics, The Ohio State University
Email address: richards.1227@osu.edu **not buckeyemail**
Office: Cockins 325
Office hours: MWF 1:15pm -2:15pm, or by appointment

Graders

TA: Alan Gan
Email address: gan.171@buckeyemail.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.

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

Course delivery

Course Lectures:

This course's lectures will be delivered fully online. Three lecture videos (each approximately 40 min in length) will be posted on Carmen on a weekly basis. Students are expected to watch the lectures prior to the synchronous lecture. There will also be 1 synchronous lecture R 4:10-4:50. Attendance **and participation** at the synchronous lecture is **mandatory.** The purpose of the synchronous lecture is to work through problems together for practice for homework/exams.

Labs:

Lab meetings will be delivered online through Zoom on Mondays at the specified time. Lab tutorials and supplemental problems will be provided via Carmen. Lab attendance is **mandatory** (with the exception of Lab 0 on 1/12).

Exams:

There will be 3 midterm exams and 1 final exam that will be conducted **in person**.

Carmen

This class will use Carmen. In Carmen, you will find copies of the syllabus, lab and homework assignments, lecture notes and other important documents. Carmen will also be used to keep track of your assignment grades. Additionally, materials for lectures will be uploaded to Carmen.

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 materials

Required

- 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.

Course technology

Necessary 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 AndroidTM) 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 .

This class requires the use of the (free) R Markdown authoring framework to complete assignments. Information about R Markdown will be provided in class; an online guide with overview information can be found at https://rmarkdown.rstudio.com.

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at https://ocio.osu.edu/help/hours, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** http://ocio.osu.edu/selfservice
- **Phone:** 614-688-HELP (4357)

- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Technology skills necessary for this specific course

- Basic computer and web-browsing skills
- Navigating Carmen
- Collaborating in CarmenWiki

Necessary equipment

- Computer: current Mac (OS X) or PC (Windows 10+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed (if virtual office hours)
- Microphone: built-in laptop or tablet mic or external microphone

Grading and faculty response

Grades

Assignment or category	Percentage
Participation	**5**
Homework	**15**
Labs	**15**
Midterm 1	**15**
Midterm 2	**15**
Midterm 3	**15**
Final Exam	**20**
Total	**100**

Description of major course assignments

Homework

- Description

  There will be eight homework assignments throughout the semester. They will consist of mostly textbook-style problems, problems motivated by real-world applications, and analyses requiring the use of statistical software. Homework must be uploaded to Carmen by the due date. The solutions may be handwritten and scanned, entered directly into a tablet, or typed. Any software output must appended to the homework file prior to submission. **All work and software output must be uploaded as a single pdf file.** Please be sure that the questions are clearly labeled, all supporting work (including software output) can be easily identified, and that all figures/tables are referenced and interpreted in the text.

- Academic integrity and collaboration guidelines

  You may work together on assignment problems, but each student must hand in their own work, written in their own words. Do not directly copy any part of another student's homework or AI output. If you have any questions about what is allowed, **please ask**.

Labs

- Description

  Weekly lab activities will be completed in recitation. **Attendance in lab is mandatory to receive credit for the lab.** These are designed so you can work on difficult problems together and under the guidance of your TA. These problems will be designed to run the range from simpler coding problems for gaining experience to challenging problems that may exceed the difficulty of exam questions.

- Academic integrity and collaboration guidelines

  You are encouraged to work together with your fellow students and seek help from your TA.

Exams

- Description

  There will be three midterm exams and one final exam. All exams will be **in person.**

- Academic integrity and collaboration guidelines

  You must complete the midterm exams yourself, **without any external help or communication**. On some exams, a formula sheet and/or calculator will be allowed. If so, use of a calculator or any other electronic device that is internet-capable is **strictly prohibited**.

Late assignments

Assignment solutions will be posted shortly after the submission deadline. **No** late assignments will be accepted without **prior permission** and/or **formal documentation**. Please refer to Carmen for due dates. Accommodations can be made in case of severe illness, so please notify me as soon as possible if this situation arises. Deadlines are crucial in order, among other things, to:

- Get grading done and provide feedback in a timely manner.
- Grade all assignments at the same time to maintain consistency and fairness
- Provide a mechanism to help ensure students keep up with the material and are prepared for follow-on lectures.
- Protect students from their inability to predict their own future behavior – "I'll somehow manage to catch up at the end of the semester."

Faculty feedback and response time

I am providing the following to give you an idea of my intended availability throughout the course. (Remember that you can call **614-688-HELP** if you have a technical problem.)

Grading and feedback

For large weekly assignments, you can generally expect feedback within **7 days**.

E-mail

I will reply to e-mails within **one working day**. Specific technical questions about the course material that require significant back-and-forth communication are not well suited for e-mail; while I will do my best to answer such questions, I may ask that you attend office hours if your question isn't easily answerable over email. In order to protect your privacy, all course email correspondence must be done through a valid OSU name.nn account. Please use the correct email address. (Richards.1227@osu.edu **not** @buckeyemail.osu.edu). Please write "STAT 3202" somewhere in the subject line, as this will help me to quickly identify and reply to class emails.

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

Attendance, participation, and discussions

Student participation requirements

The following is a summary of everyone's expected participation:

- **Attending in-person class meetings**: **TWO TIMES PER WEEK**
  Students are expected to attend **and participate** in the in-person class meetings.
- **Logging in**: **AT LEAST THREE TIMES PER WEEK**
  Be sure you are logging in to the course in Carmen each week, including weeks with holidays. You will need to log in to Carmen to view lecture content and upload homework assignments. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me as soon as possible.
- **Office hours**:
  Yor are encouraged to attend office hours for assistance. If you need to speak with me privately about a topic that cannot be easily discussed during office hours, please contact me to schedule a time to meet.

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style**: While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. Informality (including an occasional emoticon) is fine for non-academic topics.
- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)
- **Backing up your work**: Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Other course policies

Standard university policies regarding academic misconduct, disability accommodations, and religious accommodations, among other topics, can be found here: https://ugeducation.osu.edu/academics/syllabus-policies-statements

Academic integrity policy

Policies for this course

- **Exams**: You must complete the midterm and final exams yourself, without any external help or communication.
- **Written assignments**: Your written assignments, should be your own original work. In formal assignments, you should cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in, but no one else should revise or rewrite your work.
- **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.
- **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 a quiz or assignment is not permitted. If you're unsure about a particular situation, please feel free to ask the instructor.

Copyright statement

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, quizzes, exams, etc.) may be distributed publicly or privately to anyone outside of the class.**

Accessibility of course technology

This course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- Carmen (Canvas) accessibility
- Streaming audio and video
- Synchronous course tools

Disclaimer

The planned instruction for this course may be disrupted for a number of reasons. Such disruptions may affect individual students for a brief period, the entire class, the instructor, or the entire university. If the class is disrupted, we will adjust as needed. The adjustments may include changes to course delivery, assignments, grading of assignments, and determination of final course grade. Please pay special attention to announcements in class and over Carmen. **Failure to address every possible scenario in this syllabus does not override your responsibility to exercise basic common sense. If in doubt about any course policy, ask in advance!**

Course Schedule (tentative)

Refer to the Carmen course for any changes in due dates.

Week	Dates	Topics; Holiday, Homework and Exam Dates
1	1/12-1/16	Intro, R, expected value HW0 1/16
2	1/19-1/23	Distributions
3	1/26-1/30	Estimators, bias, MSE HW1 1/27
4	2/2-2/6	Point estimation, consistency, sufficiency HW2 2/3
5	2/9-2/13	Likelihood MT1 2/10
6	2/16-2/20	MLEs HW3 2/17
7	2/23-2/27	1-sample CIs HW4 2/24
8	3/2-3/6	2-sample CIs HW5 3/3
9	3/9-3/13	HT intro MT2 3/10
10	3/16-3/20	SPRING BREAK
11	3/23-3/27	Rejection regions and power
12	3/30-4/3	Z and T tests HW6 3/31
13	4/6-4/10	More 1-sample tests MT3 4/7
14	4/13-4/17	2-sample tests HW7 4/14
15	4/20-4/26	Other tests, bootstrapping, advance topics HW8 4/21
16	4/27	Review

Final exam: Monday, May 4 6:00-7:45