# Statistics 98: Junior Tutorial
# Spring 2024 Syllabus

Last updated 10-24-2024


**Instructors:** Kevin Rader, krader@fas.harvard.edu
Office Hours: Wed 10-11am (SC-300D)
Bookable (Calendly): in-person and/or via Zoom at
`https://harvard.zoom.us/my/kevinrader`

**Teaching Fellow:** Hans Gaebler, jgaebler@fas.harvard.edu
Office Hours: Mon 1:30-2:30pm (outside SC-610)


**Class Meetings:** Thursdays, 3-5 pm, in SC-706. Additional meetings with teaching staff and other students to be scheduled throughout term.

**Prerequisites:** Stat 110 and 111 (111 can be taken concurrently). Open only to junior concentrators in Statistics.

**Credit:** This course counts as a statistics course for concentration credit. It must be taken for a letter grade.

**Description:** Introduction to reading, writing, listening to, presenting, and researching statistics. Students will learn to formulate and approach a research question, to critically review papers that make use of statistics, and to clearly communicate statistical ideas and arguments both orally and in writing.

This course helps student develop into scholars of statistics through engagement in the statistical practice. The emphasis on framing questions, assessing assumptions, and communicating science is intended to equip you to undertake future data projects with greater independence, which should prove useful in a variety of professional and academic contexts. This course also prepares students for a successful senior thesis experience but is designed to be useful for **all** junior concentrators. Professors and researchers will give guest talks to recruit potential senior thesis students or to share advice on their own experiences and career paths.

Because communication is a key component of the statistical practice, this course requires writing several short papers and giving multiple

presentations. Communicating well requires revision and so this course provides frequent opportunities for you to iterate over and improve your verbal and written communication skills and to provide constructive feedback to your peers.

It is crucial that you keep up with the weekly assignments. You will also schedule meetings with the teaching staff and other students outside of the regular class meeting time.

**Materials:** There is no textbook. Readings will be distributed as needed.

**Accommodations:** If you have documentation from the Accessible Education Office, please let us know early in the semester so that arrangements can be made.

**Computing:** This course involves using the software R, which is available for free. No previous experience with R is necessary. However, those without previous R experience should expect to spend extra time on some assignments as they familiarize themselves with the program. The teaching staff will provide support.

**Grading and Requirements:**

15% *Participation.* You are expected to attend and fully participate in all class meetings. For weeks with assigned readings, you are expected to come to class ready to engage with the topic. In addition, you will periodically meet with the teaching staff and other students between class meetings. Some weeks, you will submit topics for upcoming projects or comments on others' work before class meeting (via Canvas).

15% *Explanation of basic principle.* The first module involves explaining a basic principle in statistics (such as the two-sample $t$-test) orally and in writing. **Paper & Presentation**

25% *Simulation.* The second module is completed in groups. It involves conducting a simulation in R to explore a statistical issue (such as the consequences of missing data). **Research Plan, Presentation, Literature Review, & Abstract**

45% *Final project.* The final project is an open-ended research question or complex analysis of a data set. We encourage you to work on a topic that interests you, possibly related to a senior thesis project. **Research Plan or Analysis Plan, Presentation & Paper**

**Lateness Policy:** Assignments are due at the beginning of class meetings. Because class meetings will depend upon the completed assignment, it is crucial that you keep up. There will be no extensions aside from exceptional circumstances, such as serious illness documented by UHS or a death in the family. Should you have an unavoidable scheduling conflict with a due date, please make arrangements with the teaching staff ahead of time.

**Collaboration Policy:** All work submitted in this course must be your own. Your peers and the teaching staff will provide feedback and suggestions, but all papers, presentations, and projects must be the result of your own writing, research, and thinking. For group assignments, all submitted content must be the work of the students in the group. Be sure to cite any resources that inform your submitted assignments, such as books, articles, websites, lectures, etc.

**Learning Goals:** Topics will be drawn from the list below. Statistical content will be introduced as needed.

- *Writing:* You will be able to:
  - outline an argument
  - structure a long or short paper
  - write clear code
  - use tools such as LaTeX, BibTeX, beamer, github, and R-Markdown
- *Reading:* You will be able to:
  - identify the main ideas and salient facts in a technically difficult statistics paper
  - identify the limits of your background for understanding the details of a technically difficult paper given your background knowledge; know when not to waste time on the details
  - examine the arguments of a statistics paper
  - critically review papers from other fields that make use of statistics
- *Speaking:* You will gain experience:
  - giving clear and concise presentations
  - creating slides that align with best practices for scientific presentations
  - delivering a compelling and engaging narrative of your work
  - adapting your communcation approach based on the background knowledge of the audience
- *Listening:* You will gain experience:
  - providing constructive feedback to others on their writing and presentations
- *Research:*
  - You will explore a range of possible topics for senior theses or other future research projects
  - You will learn to develop a realistic analysis plan given a general topic and available data
  - You will gain experience exploring a statistical research question via simulation