Stat 501: Fall 2022 Course Project Instructions

The purpose of the final project is to explore topics in probability that we did not cover in class, or to explore topics we covered in class in further detail, and to share these explorations with your classmates.

I am intentionally leaving the project somewhat open-ended, so you have a chance to follow whatever interests you may have. You can summarize a branch of probability, do some enlightening examples or proofs of topics we already covered, summarize a research paper, or go into depth on a topic we covered only briefly.

Requirements

Your instructor will assign you into groups of two or three based on common interests. You are also encouraged to study and work with your group on other course material. A discussion board and "locker" (place to store files) restricted to your group will be set up for you to use in D2L. You may use that discussion board for group communication, or your can set up your own communication preference (e.g., Microsoft Team, Slack, etc.). Each member of the group has a responsibility to communicate with the other members of the group on a regular basis and start on each project component well before the deadline.

The final project will consist of:

1. **Proposal**. A short paragraph with the names of your group and a few sentences describing what you plan to research for your project. The proposal must include at least *three* references of papers, articles, books, etc. that you plan to use for your project.

2. **Report**. A 4–5 page, 12 pt font, single-spaced, written report of your topic. (Tables and figures are included in the page limit; references and appendices (if needed) are not.) It is required that the report be written in R Markdown. The report must include:

   - A descriptive title,
   - Name(s) of your group,
   - In-text citations and a list of references in a consistent format, e.g., APA.
   - If applicable, any R code should be included as an appendix. The body of the report is not required to fit a specific outline, since it will vary depending on the topic, but generally papers have some sort of introduction, background, results or discussion, and conclusion.

3. **Peer review**. Each individual will review one anonymized draft of your peers' projects. Peer reviews will be graded individually, based on the completeness and constructiveness of your feedback. A rubric for providing feedback will be provided.

4. **Presentation**. A 10-minute in-class presentation on your topic. Presentations will be held during the last week of classes—Wednesday December 7 and Friday December 9. It is expected that each group member present an equal portion of the material.

Deadlines

All components will be submitted via **D2L** (not Gradescope), due by 5:00pm on the due date.

Project Component	Due Date	Percent of Project Grade
Proposal	Fri, Oct 28	5% (based on completion)
Anonymized draft report	Mon, Nov 7	5% (based on completion)
Peer review feedback	Fri, Nov 11	10% (graded individually)
Final report	Fri, Dec 2	50%
Presentation slides	Prior to presentation	5% (based on completion)
Presentations	In-class Dec 7 & 9	25%

Potential final project ideas

If you're not sure where to start in your exploration, here is a list of related areas or topics in probability and mathematical statistics (in no particular order):

- Buffon's Needle
- Martingales
- Markov chains
- Permutation and randomization tests
- Bootstrapping
- Branching processes
- Random walks
- Brownian motion
- Stochastic calculus
- Queuing theory
- Characteristic functions
- Reliability theory
- Risk assessment
- Any topic we might have touched on in class, but covered at a deeper level

Alternatively, you could read, digest, study the background for, and explain a journal article related to probability and mathematical statistics:

- Journals published by the American Statistical Society (ASA): https://www.amstat.org/publications/journals
- Journals published by the Institute of Mathematical Statistics (IMS): https://imstat.org/journals-and-publications/ims-journals-and-publications/
- Journals published by the Bernoulli Society for Mathematical Statistics and Probability: https://bernoullisociety.org/publications
- *Biometrika*: https://academic.oup.com/biomet
- *Journal of Applied Probability:* https://www.cambridge.org/core/journals/journal-of-applied-probability
- *Journal of the Royal Statistical Society: Series B:* https://rss.onlinelibrary.wiley.com/journal/14679868

You could also explore an area of probability and mathematical statistics as it is applied to a domain field such as econometrics, actuarial science, quantitative biology, etc.