Applied Statistical Analysis II/Quantitative Methods II
POP77004/77082

Spring 2026

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1. **Description**

   This course extends what you did in the previous term by focusing on non-linear model forms for the outcome variable. These are typically called "generalized linear models" (GLMs), although for historical reasons people in the social sciences call them "maximum likelihood models". The principle we will care about is how to adapt the standard linear model that you know so that a broader class of outcome variables can be accommodated. These include: counts, dichotomous outcomes, bounded variables, and more. There is a strong theoretical basis for the models that we will use. Also, the bulk of the learning in the course will take place outside of the classroom by reading, practicing using statistical software, replicating the work of others, and doing problem sets.

2. **Office Hours**

   I will hold office hours for individual 15-min meetings, please sign up! If you cannot attend regular office hours, please contact me via email.

3. **Requirements**

   Aside from the baseline requirements - class attendance, punctuality, and reading ahead in preparation for class - you are required to work on 4 problem sets. The average of your top 3 problem sets accounts for 50% of your course grade. We will distribute problem sets nearly every or every other week, and will expect to receive electronic copies of your assignment via GitHub.

   Our midterm exam is scheduled for Week 6, and you will turn in a replication project at the end of the semester. Each of these counts for 25% of your grade.

   Late assignments will not be accepted. Given that assignments should be turned in at regularly scheduled dates, and given that the midterm exam and replication also have a date fixed known well in advance, I will not allow incompletes in this class.

4. **Readings**: This is a list of interesting and pertinent books that will be used during the course. You need to consult them occasionally, but you **do not need to purchase them**. I will provide the assigned readings in PDF format on the course website.

   - Eliason, Scott (1993). Maximum likelihood estimation: Logic and practice. Sage Publications.
   - Dunteman, George H., and Moon-Ho R. Ho (2006). An introduction to generalized linear models. Sage Publications.
   - Faraway, Jon (2016). Extending the linear model with R. Chapman & Hall/CRC.
   - Gill, Jeff, and Michelle Torres (2019). Generalized linear models: A unified approach. Sage Publications.
   - Greene, William H (2012). Econometric analysis. Pearson Education.
   - Long, John S (1997). Regression models for categorical and limited dependent variables. Sage Publications.

5. **Class Materials, Structure, and Assignments**

- *Class materials*: All materials presented in class, and the readings used to prepare for this course, will be made available on the course website.
- *Class Structure*: I want our class to thrive no matter how we meet or your individual methods of participating in class. I cannot guarantee an identical experience for each student. But, my goal is that all students receive a high-quality experience to the extent possible, and that all students are treated equitably and consistently.

  To ensure this, communication is important. I commit to responding to emails within 48 hours of receipt, and my intention is to respond faster than that most of the time. I will likely be slower on weekends. Likewise, if your situation changes regarding health, housing, or in any other aspect with regard to your ability to participate in class, please contact me and the appropriate student support organization as soon as feasible. It is easier for me to address your needs if I know about them. This does not mean I can successfully respond to every request, but I want to emphasize that I aim for you succeed in life, not just this course.

  This semester some students might be sick, and if you are sick, understand that I will be flexible. Please make sure to email me so that we can discuss your individual circumstances. Otherwise, it is expected that you prepare for class and participate in office hours. Attendance directly and indirectly impacts your final grade. If you do attend meetings, please arrive on time; we will start promptly.

  The lectures will provide you with core concepts and theoretical foundations of regression analysis in the social sciences. Lectures will be supported by a PowerPoint style presentation. I will post a handout of the shortened, student version of the lecture on the course website, under the "Slides" tab. You may want to use this brief outline to follow the lecture and take additional notes.

  If class is moved online for an unexpected reason, all class sessions on Zoom will be recorded for students in the course to refer back. The content presented through video conferencing will be posted on the course website for the sole purpose of educating the students enrolled in the course. The release of such information (including but not limited to directly sharing, screen capturing, or recording content) is strictly prohibited, unless the instructor states otherwise. Doing so without the permission of the instructor will be considered an Honor Code violation.

  Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. Please read the Rules of Zoom Engagement for further advice on participating in our Zoom class sessions.

- *Absences, Late Work, and Appeals*: Late work will not be accepted without prior permission, and students who miss assignments will receive a score of 0 absent extraordinary circumstances. With that said, please consult me as soon as possible if there is an event that hinders your ability to participate in the class.

  Appeals made on the validity of grading or assignment questions have to be made within five working days after publication of the results. The appeal has to be submitted with the original assignment. The appeal must explain in detail why an error has been made, and provide supporting evidence. If an assignment is re-graded due to a successful appeal, this may result in

a better grade, a lower grade, or no grade change. Insufficient grounds for an appeal include: a student missed a lecture that covered relevant material, a student does not feel well but decided to complete the assignment anyway, a student did not understand the material, a student says that she/he wanted to give the correct answer but made a typographical error, a student would like additional consideration to receive a better letter grade.

- *Academic Integrity*: Cheating and plagiarism will not be tolerated. I strongly encourage you to review the College's policies regarding academic honesty. In general, if you have any questions, please feel free to ask me.

6. **Additional Information**

- *Students with Disabilities*: Students with disabilities enrolled in this course who may need disability-related classroom accommodations are encouraged to make an appointment to speak with me within the first week of the semester. All conversations will remain confidential. If you have a disability-related need for reasonable academic adjustments in this course, you are required to provide the instructor with an accommodation notification letter from the Office of Disabilities Services. If you need immediate accommodations or physical access, please arrange to meet with me as soon as your accommodations have been finalized.

- *Religious observances*: Some students may wish to take part in religious observances that occur during this semester. If you have a religious observance that conflicts with your participation in the course, please talk to me within the first week of the semester to discuss accommodations.

- *Physical Health*: Though we are all minimizing our contact with others, at the very first sign of not feeling well, stay at home and reach out for a health consultation. Please consult the campus FAQ for how to get a health consultation.

- *Mental Health*: Completing a MSc degree can be a difficult time. Please reach out to me with any concern, and know that Mental Health Services' professional staff members work with students to resolve personal and interpersonal difficulties, many of which can affect the academic experience. These include conflicts with or worry about friends or family, concerns about eating or drinking patterns, and feelings of anxiety and depression. Your health is a critical part of your success in life, not just your coursework.

7. **Reading and Exam Schedule**

The following is an anticipated schedule of course topics. The plan is to cover a new topic each week, but we will go as fast as needed to make sure that everyone is understanding the material. Check the course website to see what we will be covering in the upcoming lecture. We also have a Google Calendar that is posted on the course website with up-to-date information on problem sets, office hours, lectures, and exams. Note that the date in the table below references the Monday of every week (i.e. Week 1 starts on Monday January 22).

Module Outline

- Week 1: Review of Probability Models, Introduction to Likelihood Models
- Week 2: Generalized Linear Models
- Week 3: Maximum Likelihood Estimation - Looking Under the Hood
- Week 4: Binary Choice Models
- Week 5: Review
- Week 6: Exam

- Week 7: Reading Week (No Lecture)
- Week 8: Multinomial Choice Models (Unordered & Ordered)
- Week 9: Event Count Models
- Week 10: Duration Models, Censoring and Truncation, Selection Models
- Week 11: Replication Presentations
- Week 12: Replication Presentations

Week	**Topic**	**Assignments**
1	Probability and Likelihood Models • Readings: – Eliason Chapter 1 – Long Chapters 1, 2.1 - 2.3, 2.5	PS 1 handed out
2	GLMs • Readings: – Dunteman & Ho Chapters 1 - 4 – Gill Chapter 2 - 4	
3	Public holiday, lecture Tuesday Properties of ML models • Readings: – Eliason Chapter 3 – Gill Chapters 5 • Supplemental readings: – Dunteman & Ho Chapter 5 – Greene Chapter 14 – Greenhill, Brian, Michael D. Ward, and Audrey Sacks. 2011. "The separation plot: A new visual method for evaluating the fit of binary models." American Journal of Political Science, 55(4): 991-1002 – Long Chapter 2.5-2.6	
4	Binary choice models • Readings: – Dunteman & Ho Chapters 6-7 – Gill Chapter 6 – Long Chapter 3.1- 3.9, 4 • Supplemental readings: – Ai, Chunrong, and Edward C. Norton. 2003. "Interaction terms in logit and probit models". Economics Letters, 80:123-129. – Alvarez, R. Michael and John Brehm. 1995. "American ambivalence towards abortion policy: Development of a heteroscedastic probit model of competing values". American Journal of Political Science, 39(4): 1055-1082.	PS 1 due; PS 2 handed out
5	Review	PS 2 due
6	Exam	
7	Reading week	

8	Multinomial choice models (Unordered & ordered) • Readings: – Long Chapter 5 – Long Chapter 6	PS 3 handed out
9	Event count models • Readings: – Dunteman & Ho Chapter 8 – Long Chapter 8	
10	Duration models, censoring, truncation, selection • Readings: – Dunteman & Ho Chapter 9 – Long Chapter 7 • Supplemental readings: – Reed, William, and David H. Clark. 2000. "War initiators and war winners: The consequences of linking theories of democratic war success." Journal of Conflict Resolution, 44(3): 378–395. – Sigelman, Lee and Langche Zeng. 2000. "Analyzing censored and sample-selected data with Tobit and Heckit models." Political Analysis, 8(2): 167-182. – Tobin, James. 1958. "Estimation of relationships for limited dependent variables." Econometrica: Journal of the Econometric Society: 24-36.	PS 3 due; PS 4 handed out
11	Replication presentations	Replications due
12	Replication presentations	PS 4 due