Generalized Linear Models
STAT 7430

3 Credit Hours

Instructor

Elly Kaizar
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Office hours

Usually Thursday ~~1:30-2:30pm~~ 12:00-1:00pm, or by appointment.
(Check Carmen for changes or cancellations.)

Lectures

Tues and Thurs 9:35-10:55am, 2186 Smith Lab

Website

carmen.osu.edu

Course Description

This course introduces the statistical theory and methods to extend regression to non-normal data. This course covers the construction and estimation of parameters in generalized linear models, including specific treatment of nominal and ordinal logistic regression, log linear models, Poisson regression, gamma regression, models for dependent data, and other topics as time permits.

Prequisites

Stat 6910, 6950, 7410, and 6801-2, or permission of the instructor. Students should be particularly familiar with maximum likelihood estimation and linear models.

Required Text

McCullagh, PM and JA Nelder. *Generalized Linear Models*, 2nd edition. Chapman & Hall, 1989.
Additional Resources will be listed on the course website

Computing

This course will be taught in the R computing language. If you are not already familiar with R programming, there are a plethora of online tutorials available.

Requirements

Students are responsible for all material covered in class, in assigned readings, and on homework assignments. Attendance at all classes is strongly recommended.

Evaluation

Homework (10) 10%
Midterm Exam 1 25%
Midterm Exam 2 25%
Final Exam 40%

Homework: Homework assignments are intended to help you check your understanding and encourage you to think more deeply about course topics. Homework due dates and times will be posted on Carmen, but these may be extended at the instructor's discretion and as indicated on Carmen. No late homework will be accepted. Please contact the instructor if you have an emergency or other situation that may prevent you from turning in your assignment on time.

All homework should be submitted to the Carmen website as a single .pdf file, where the problems are included in numerical order and your name is included at the top of the first page of the file.

You are encouraged to work together on solving homework exercises, but do not copy any part of a homework from another student or other source. Each student must produce his/her own homework write-up to be handed in. Feel free to ask me for help after you have made an attempt of the questions. Not all questions on all homework assignments will be graded. Possible solutions to all the problems will be available on Carmen after the due date, and students should check their own answers against these. All homework assignments are given equal weight.

Exams: Exams are closed book/closed notes. Calculators are allowed – communication devices (including cell phones) are not. You may bring a single 8.5"x11" page of notes (double sided) to the midterm exams. You may bring two 8.5"x11" pages of notes (double sided) to the final exam. Statistical tables will be provided on exams as needed. Tentative dates for the exams are:

- Midterm 1: Tuesday, February 12
- Midterm 2: Thursday, March 21
- Final Exam: Monday April 29, 8:00am-9:45am

Tentative Schedule

Date	Topic	Readings
1/8	Introduction	M&N Chapter 1, 2.1
1/10	GLM Components: Random and systematic components	M&N Chapter 2.2
1/15	GLM Components: Link component; Goodness of Fit	M&N Chapter 2.2, 2.3
1/17	Residuals and Improving Fit	M&N Chapter 2.4
1/22	ML Estimation Robust Variance Estimation	M&N Chapter 2.5 Freedman, David A. On The So-Called "Huber Sandwich Estimator" and "Robust Standard Errors". The American Statistician; Vol. 60, Iss. 4, 2006, pages 299-302
(on your own)	(Review of Linear Models)	M&N Chapter 3
1/24	Bernoulli/Binomial Review	M&N Chapter 4.1-4.3
1/29	Bernoulli/Binomial Models	M&N Chapter 4.3
1/31	Logistic Regression	M&N Chapter 4.2-4.6
2/5	Logistic Regression	M&N Chapter 4.2-4.6

2/7	Polytomous Data	M&N Chapter 5.1-5.3
2/12	MIDTERM 1	
2/14	Polytomous Regression, part I	M&N Chapter 5.4-5.6
2/19	Polytomous Regression, part II	
2/21; 2/26	Log-Linear Models, part I	M&N Chapter 6.1-6.4
2/28	Log-Linear Models, part III Independence graphs	M&N Chapter 6.5 Reading TBD
3/5	Poisson Models	
3/7	Gamma Regression	M&N Chapter 8
3/12; 3/14	Spring Break	
3/19	Review	
3/21	MIDTERM 2	
3/26	Quasi-Likelihood	M&N Chapter 9
3/28	Quasi-Likelihood	
4/2; 4/4	Generalized Estimating Equations	Liang K-Y, Zeger SL. (1986) Longitudinal data analysis using generalized linear models. Biometrika. 73(1):13-22.
4/9; 4/11	Conditional models: GLMM	§ Stiratelli, Laird and Ware (1984) Random-effects models for serial observations with binary response. Biometrics. 40:961-971.
		§ Rabe-Hesketh, Skrondal, and Pickles (2002) Reliable estimation of GLMM using adaptive quadrature. Stata Journal. 2(1): 1-21.
		§ Hu, Goldberg, Hedecker, Flay and Pentz. (1998) Comparison of Population-averaged and Subject-specific approaches for analyzing repeated binary outcomes. American Journal of Epidemiology 147(7): 694--703.
4/16	Transition Models	Zeger SL and Qaqish, B (1988) Markov Regression Models for Time Series: A Quasi-Likelihood Approach. Biometrics. 44(4):1019-1031.
4/18	Enrichment Topic TBD	

Academic misconduct

Cheating, plagiarism and other forms of academic dishonesty will not be tolerated. Any violation will be prosecuted to the fullest extent. Particular considerations for work in this course are noted below.

Exams. You must complete the midterm and final exams yourself, without any external help or communication.

Written homework assignments. Your written assignments should be your own original work. You should formally cite the ideas and words of your research sources, including direct quotes from the textbook. 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.

Collaboration and informal peer-review. The course includes many opportunities for informal collaboration with your classmates. Study groups and peer-review are encouraged, but you should only turn in work that is yours. If you're unsure about a particular situation, please just ask Dr. Kaizar ahead of the due date.

Ohio State's academic integrity policy
Cheating, plagiarism and other forms of academic dishonesty will not be tolerated. 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. The instructor will report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct: http://studentlife.osu.edu/csc/.

Disclaimer
This syllabus should be taken as a fairly reliable guide for the course content. However, I reserve the right to change due dates or methods of assessment. Official announcements will be those made in class or on the course website.

Special accommodations

Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, slds@osu.edu; slds.osu.edu.