Required Text:


Supplementary Texts:


**Course Description:**

This course surveys theory and methods for the analysis of categorical response and count data. The course begins with an overview of likelihood-based inference for categorical data analysis. Methods for describing and analyzing contingency tables are surveyed. These include loglinear modeling of association structures, the Cochran-Mantel-Haenszel approach to detecting conditional association, linear predictor modeling using weighted least squares, and tests of marginal homogeneity. Dichotomous response models such as the logistic regression model will be described and applied in several settings including cohort and case-control studies. Poisson regression models will be used to analyze rate data from event history studies. Ordinal and polychotomous response models such as the cumulative and multinomial logit models will also be introduced. Time permitting, these regression models will be adapted and extended to accommodate longitudinal data. [See the course outline below.]

The statistical package SAS (e.g. PROC CATMOD, FREQ, GENMOD, and LOGISTIC) will be used extensively in this course. The freeware package R (or its commercial relative Splus) will be used to perform less standard analyses or small-scale simulation studies.

Note: SAS, Splus, and R are available on the HP machines in theUNIX Computing Lab (346 SH). SAS is also available in the Myers Computing Lab (41 SH). Students can purchase a personal copy of SAS, version 8, for around $10! The software R can be downloaded from http://cran.us-r-project.org to your personal computer.

**Course Objectives:**

The student who successfully completes this course should have a reasonable grasp of the theoretical foundations of categorical data analysis. As examples, the student will be able to derive and work with sampling distributions of sufficient counts. He or she will understand and be able to apply basic asymptotic techniques (e.g. multivariate central limit theorem and delta method). He or she will be familiar with a variety of estimation methods and the basic properties of the corresponding estimators. He or she will be familiar with a variety of methods for analyzing categorical or count data and understand in what settings they are applicable. The successful student will have a working knowledge of R and the SAS procedures PROC FREQ, GENMOD, LOGISTIC, and perhaps some CATMOD.

**Course Organization:**
Lecture. We will cover many of the topics introduced in Agresti (2002) and include several topics from Stokes, Davis, and Koch (2000). Although the majority of the meetings will be in the lecture/discussion format, several meetings will be set aside for student presentations and discussion.

Homework. Homework problems (applied, computational, and theoretical) will be assigned on a regular basis. Some will be handed in and graded. Solutions to select problems will be handed back to you or posted on the web. The textbook (Agresti 2002) includes a supporting website: http://web.stat.ufl.edu/~aa/cda/cda.html, which includes solutions to odd numbered problems.

Projects. There will be two take-home projects (due 11:30am, Fri, March 13 and 11:30am, Mon, May 11). The projects will require you to address some combination of applied and theoretical problems. You must work alone on these two projects.

Course Outline/Pace [approx number of lectures in brackets]:

I. Intro to Categorical Data Analysis (AA Chapter 1) [10]

II. Basic Asymptotic Tools [3]

III. Intro to Contingency Tables (AA Ch. 2, 3, 10) [8]

IV Regression Models for Categorical and Count Responses (AA Chapters 4-7)
   A. Dichotomous Response Models [9]
   B. Poisson Regression [1]
   C. Ordinal Response Models [3]

V. Loglinear Models for Contingency Tables (AA Ch. 8-9) [6]
VI. Regression Models for Correlated Categorical Responses (AA Ch. 11,12) [3]
   A. Multivariate Dichotomous Regression
   B. Multivariate Ordinal Regression

Course Guidelines and Policies:

Reading Ahead. It is vitally important that you read ahead. If the material in a lecture is completely new to you, you will find it very difficult to get much out of lecture.

Participation and Attendance. Students are expected to attend, and participate in, class. You will be asked many questions, and you will be strongly encouraged to ask lots of questions.

Working Together. Unless instructed otherwise (e.g. for the two class projects), you may work together on the homework problems. However, you must write up your own solutions in your own words. If you are personally asked to please write up your own solutions and subsequently turn in material that is obviously in the same words as a fellow student, the work will be considered to be plagiarized. Plagiarism will be dealt with according to the policies of the University.

Late Homework. Unless otherwise instructed, homework is due at 11:30 AM. Late homework has a half-life of 24 hours; that is you get 50% credit if it is handed in late, but within 24 hours of the due time; you get 25% credit for the next 24 hours; etc. Homework not handed in directly to me must be handed in to a department secretary (located in 241 SH). The homework must include a hand-in time and date, and must
be signed by the department secretary. (It follows that you cannot hand in homework after the main office
is closed.)

**Grading Questions.** Questions about grading must be asked within one week of the graded work's return.

**Grading and Components for Evaluation**

Your final score $S$ will be computed as $S = 0.5H + 0.2P_1 + 0.2P_2 + 0.1P$, where $H =$ percent correct
on homework, $P_1$ and $P_2$ are the scores on the two take-home projects, and $P =$ participation score.

Letter grades (including '+'s and '-'s) will be awarded according to a 90-80-70-60 schedule (e.g. if $S \geq 90$
then a grade of A- or better will be awarded). Class participation will be considered when a student "falls
on the borderline" between two grades. These are guaranteed cutoffs, so it is possible (but unlikely) that
everyone receives an 'A.' I do, however, reserve the right to lower (but not raise) the cutoffs. Note that with
this grading scheme you are not "graded on a curve," and so you are not competing with fellow students.
Therefore, you are not penalized for working together to better understand concepts.

**Miscellaneous**

**Textbook (Agresti 2002) support:**

Start at [http://web.stat.ufl.edu/~aa/cda/cda.html](http://web.stat.ufl.edu/~aa/cda/cda.html). (Includes datasets and solutions to odd
numbered problems.)

**Help outside of class:**

I have regular [office hours](http://www.stat.uiowa.edu/~jblang/s220). Sometimes it is effective to ask specific questions via email.
Course web pages; start at [http://www.stat.uiowa.edu/~jblang/s220](http://www.stat.uiowa.edu/~jblang/s220).

**Help with SAS:**

- [Creating (temporary and permanent) SAS data sets](http://web.stat.ufl.edu/~aa/cda/cda.html)
- Some helpful links...
  - [SAS in a nutshell](http://web.stat.ufl.edu/~aa/cda/cda.html), [SAS basics for Windows](http://web.stat.ufl.edu/~aa/cda/cda.html), [SAS INSIGHT](http://web.stat.ufl.edu/~aa/cda/cda.html) (pdf file), [SAS INSIGHT intro](http://web.stat.ufl.edu/~aa/cda/cda.html), [SAS basics (inc. INSIGHT)](http://web.stat.ufl.edu/~aa/cda/cda.html)
  - or go to search engine [Google](http://web.stat.ufl.edu/~aa/cda/cda.html), enter the key words "SAS basics".
- Use [SAS Options statement](http://web.stat.ufl.edu/~aa/cda/cda.html)
- [Using SAS ODS](http://web.stat.ufl.edu/~aa/cda/cda.html) (Output Delivery System)

**Help with R software:**

- [An Introduction to R](http://www.stat.uiowa.edu/~jblang/s220/syllabus.htm), by Elizabeth Slate and Elizabeth Hill.

**College of Liberal Arts and Sciences: Policies and Procedures**
Administrative Home of the Course
The administrative home of this course is the College of Liberal Arts and Sciences, which
governs academic matters relating to the course such as the add/drop deadlines, the second-
grade-only option, issues concerning academic fraud or academic probation, and how credits
are applied for various graduation requirements. Different colleges might have different
policies. If you have questions about these or other CLAS policies, visit your academic
advisor or 120 Schaeffer Hall and speak with the staff. The CLAS Academic Handbook also
contains important CLAS academic policies:
www.clas.uiowa.edu/students/academic_handbook/index.shtml

Academic Fraud
All forms of plagiarism and any other activities that result in a student presenting work that is
not his or her own are academic fraud. All academic fraud is reported first to the departmental
DEO and then to the Associate Dean for Academic Programs and Services. See Academic
Fraud at http://www.clas.uiowa.edu/students/academic_handbook/ix.shtml for the complete
policy.

Making a Suggestion or a Complaint
Students have the right to make suggestions or complaints and should first visit with the
instructor, then with the course supervisor if necessary, and next with the departmental DEO.
All complaints must be made as soon as possible. For more information visit, Student
Complaints at http://www.clas.uiowa.edu/students/academic_handbook/ix.shtml#5

Accommodations for Disabilities
Under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973,
instructors must provide reasonable academic accommodations for qualified students with
disabilities. Students seeking academic accommodations first register with Student Disability
Services and meet with a counselor in that office who reviews documentation and determines
eligibility for services. Students approved for accommodations arrange to meet privately with
course instructors. Visit Student Disability Services at http://www.uiowa.edu/~sds/.

Understanding Sexual Harassment
Sexual harassment is reprehensible and will not be tolerated by the University. It subverts the
mission of the University and threatens the well-being of students, faculty, and staff. Visit this
site (http://www.sexualharassment.uiowa.edu/) for definitions, assistance, and the full
University policy.

Resources for Students
Writing Center 110 English-Philosophy Building, 335-0188, www.uiowa.edu/~writingc
Speaking Center 12 English-Philosophy Building, 335-0205,
www.uiowa.edu/~rhetoric/centers/speaking
Mathematics Tutorial Laboratory 314 MacLean Hall, 335-0810, www.uiowa.edu/mathlab
Tutor Referral Service Campus Information Center, Iowa Memorial Union, 335-3055,
www.imu.uiowa.edu/cic/tutor_referral_service

Student Classroom Behavior
Students have the right to a classroom environment that encourages learning. The ability to
learn is lessened when students engage in inappropriate classroom behavior, distracting others;
such behaviors also is a violation of the Code of Student Life. When disruptive activity occurs,
a University instructor has the authority to determine classroom seating patterns and to request
that a student exit the classroom, laboratory, or other area used for instruction immediately for
the remainder of the period. One-day suspensions are reported to appropriate departmental,
collegiate, and Student Services personnel (Office of the Vice President for Student Services and Dean of Students).

**University Examination Policy**

**Final Examinations.** An undergraduate student who has two final examinations scheduled for the same period or more than three examinations scheduled for the same day may file a request for a change of schedule before the published deadline at the Registrar's Service Center, 17 Calvin Hall, 8-4:30 M-F, (384-4300).

**Missed exam policy.** University policy requires that students be permitted to make up examinations missed because of illness, mandatory religious obligations, certain University activities, or unavoidable circumstances. Excused absence forms are required and are available at the Registrar web site: [http://www.registrar.uiowa.edu/forms/absence.pdf](http://www.registrar.uiowa.edu/forms/absence.pdf)

*I hope you all have an enjoyable and successful semester. Good luck in all of your courses.*

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