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, and multinomial-Poisson homogeneous modeling. 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 polytomous 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 FREQ, GENMOD, and LOGISTIC) and the freeware package **R** will be used in this course.

**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.

**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/or 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](http://web.stat.ufl.edu/~aa/cda/cda.html), which includes solutions to odd numbered problems.

**Point-Earning Opportunities.** You should always be prepared for the possibility of an unannounced PEO, e.g. always bring along the book and a calculator. Missed PEOs (and exams) cannot be made up unless you have a legitimate excuse. See Section VIII, Grading--Attendance and Examinations in the CLAS Student Academic Handbook.

**Projects.** There will be two take-home projects (due 9:30am, Fri, March 11 and 9:30am, Wed, 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) [7]
II. Basic Asymptotic Tools (AA Sections 1.3, 3.1.5-3.1.7, 14.1) [6]
III. Intro to Contingency Tables (AA Ch. 2, 3, 10) [8] IV Regression Models for Categorical and Count Responses (AA Chapters 4-7)
V. Loglinear Models for Contingency Tables (AA Ch. 8-9) [4] 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 \textit{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 9:30 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 (which includes credit on PEOs).

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). 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 (Help and General Policies)**

**Textbook (Agresti 2002) support:**

Start at \url{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. Sometimes it is effective to ask specific questions via email. Course web pages; start at \url{http://www.stat.uiowa.edu/~jblang/s220}.

**Help with SAS:**

- [Creating (temporary and permanent) SAS data sets](#)
• Some helpful links...
  o [SAS in a nutshell](#), [SAS basics for Windows](#), [SAS INSIGHT](#) (pdf file), [SAS INSIGHT intro](#), [SAS basics (inc. INSIGHT)](#)
  o or go to search engine [Google](#), enter the key words "SAS basics".
• Use [SAS Options statement](#)
• [Using SAS ODS](#) (Output Delivery System)

**Help with R software:**

• [An Introduction to R](#), by Elizabeth Slate and Elizabeth Hill.

**Administrative Home**
The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the [CLAS Student Academic Handbook](#).

**Electronic Communication**
University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences. ([Operations Manual, III.15.2.](#) Scroll down to k.11.)

**Accommodations for Disabilities**
A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See [www.uiowa.edu/~sds/](http://www.uiowa.edu/~sds/) for more information.

**Academic Fraud**
Plagiarism and any other activities when students present work that is not their own are academic fraud. Academic fraud is a serious matter and is reported to the departmental DEO and to the Associate Dean for Undergraduate Programs and Curriculum. Instructors and DEOs decide on appropriate consequences at the departmental level while the Associate Dean enforces additional consequences at the collegiate level. See the CLAS Academic Fraud section of the [Student Academic Handbook](#).
**CLAS Final Examination Policies**

Final exams may be offered only during finals week. No exams of any kind are allowed during the last week of classes. Students should not ask their instructor to reschedule a final exam since the College does not permit rescheduling of a final exam once the semester has begun. Questions should be addressed to the Associate Dean for Undergraduate Programs and Curriculum.

**Making a Suggestion or a Complaint**

Students with a suggestion or complaint should first visit the instructor, then the course supervisor, and then the departmental DEO. Complaints must be made within six months of the incident. See the CLAS Student Academic Handbook.

**Understanding Sexual Harassment**

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment for assistance, definitions, and the full University policy.

**Reacting Safely to Severe Weather**

In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Public Safety web site.

*These CLAS policy and procedural statements have been summarized from the web pages of the College of Liberal Arts and Sciences and The University of Iowa Operations Manual.

**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

I hope you all have an enjoyable and successful semester. Good luck in all of your courses.
This page was last updated: (Joseph B. Lang)