ST 544 Course Syllabus

ST 544 – Applied Categorical Data Analysis

Section 001

Spring 2020

3 Credit Hours

Course Description

This course focuses on the concepts, methods and models used to analyze categorical data, particularly contingency tables, count data and binary/binomial type of data. The topics covered will include Pearson Chi-squared independence test for contingency tables, measures of marginal and conditional associations, small-sample inference, logistic regression models for independent binary/binomial data and many extended models for correlated binary/binomial data including matched data and longitudinal data. The course will emphasize the implementation of methods/models using SAS and the interpretation of the results from the output.

Learning Outcomes

Upon completion of the course, the students will be able to

1. Recognize different types of categorical data and choose appropriate methods/models for them.
2. Conduct appropriate statistical analysis using existing software and properly interpret the computer output.
3. Communicate results to non-statisticians.

Course Structure

The course meets for lectures twice per week. Students are required to complete homework, two midterm exams and a final exam.

Course Policies

Students are permitted to work together on homework problems, but each student is responsible for their own final write-up of each assignment. When asked to solve problems using computer software, students are required to provide computer program, minimal computer output, highlight/circle all relevant results, and give appropriate discussion if asked.

Instructors

Daowen Zhang (dzhang2) - *Instructor*
Email: dzhang2@ncsu.edu
Web Page: http://www.stat.ncsu.edu/people/dzhang/

Phone: 919-515-1933
Fax: 919-515-1169
Office Location: 5122 SAS Hall
Office Hours: Mondays and Wednesdays, 2:00 – 3:00pm or by appointment
TA: Wenli Shi
TA Email: wshi4@ncsu.edu
TA Office Location: 1101 SAS Hall
TA Office Hours: 10:00-11:30AM TTh

Course Meetings

Lecture

Days: TTh
Time: 1:30-2:45PM
Campus: Main
Location: Room 00131, Winston Hall
This meeting is required.

Course Materials

Textbooks

An Introduction to Categorical Data Analysis by Alan Agresti
Edition: Second
ISBN: 978-0-471-22618-5
Free e-book is available from D.H. Hill Library
This textbook is required.

Expenses

None.

Materials

None.

Requisites and Restrictions

Prerequisites

ST 512 or ST 514 or ST 515 or ST 516

Co-requisites

None.

Restrictions

None.

General Education Program (GEP) Information

GEP Category

This course does not fulfill a General Education Program category.

GEP Co-requisites

This course does not fulfill a General Education Program co-requisite.

Transportation

This course will not require students to provide their own transportation. Non-scheduled class time for field trips or out-of-class activities is NOT required for this class.

Safety & Risk Assumptions

None.

Grading

Grade Components

Component	Weight	Details
Homework	**20%**	12 homeworks of 10 points each. The best 10 will be used.
Mid-Terms (2)	**40%**	2 Mid-terms, 20% each (2/18 & 3/31). In class, closed book. Students are allowed to bring one page of an 8.5 by 11 piece of paper with notes.
Final Exam	**40%**	1:00-4:00pm, 5/5/2020. In class, closed book, comprehensive. Students are allowed to bring three 8.5 by 11 pieces of paper with notes.

Letter Grades

This Course uses Standard NCSU Letter Grading:

97 ≤ **A+** ≤ 100
93 ≤ **A** < 97
90 ≤ **A-** < 93
87 ≤ **B+** < 90
83 ≤ **B** < 87
80 ≤ **B-** < 83
77 ≤ **C+** < 80
73 ≤ **C** < 77
70 ≤ **C-** < 73
67 ≤ **D+** < 70
63 ≤ **D** < 67
60 ≤ **D-** < 63
0 ≤ **F** < 60

Requirements for Credit-Only (S/U) Grading

In order to receive a grade of S, students are required to take all exams and quizzes, complete all assignments, and earn a grade of C- or better. Conversion from letter grading to credit only (S/U) grading is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to http://policies.ncsu.edu/regulation/reg-02-20-15.

Requirements for Auditors (AU)

Students auditing the class should earn at least 50% of the homework score to get an AU grade (exams not required). Otherwise an IN will be assigned.

Policies on Incomplete Grades

If an extended deadline is not authorized by the Graduate School, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at http://policies.ncsu.edu/regulation/reg-02-50-03. Additional information relative to incomplete grades for graduate students can be found in the Graduate Administrative Handbook in Section 3.18.F at http://www.fis.ncsu.edu/grad_publicns/handbook/

Late Assignments

Homework will be due at the beginning of class.

Attendance Policy

For complete attendance and excused absence policies, please see http://policies.ncsu.edu/regulation/reg-02-20-03

Attendance Policy

Students are expected to attend every class. So please read the book and ask questions whenever you have questions. If you decide to come to the class, please come on time. Your instructor and fellow students will appreciate it if their class is not interrupted.

Absences Policy

None.

Makeup Work Policy

Late assignments will only be accepted for some emergency (e.g., medical) cases or with the instructor's permission.

Additional Excuses Policy

None.

Academic Integrity

Academic Integrity

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01

Academic Honesty

See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.

Honor Pledge

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

Electronically-Hosted Course Components

Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office at Suite 2221, Student Health Center, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) (https://policies.ncsu.edu/regulation/reg-02-20-01/).

Non-Discrimination Policy

NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://policies.ncsu.edu/policy/pol-04-25-05 or http://www.ncsu.edu/equal_op/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

Trans-Inclusive Statement

In an effort to affirm and respect the identities of transgender students in the classroom and beyond, please contact the instructor if you wish to be referred to using a name and/or pronouns other than what is listed in the student directory.

N.C. State University Polices, Regulations, and Rules (PRR)

Students are responsible for reviewing the PRRs which pertain to their course rights and responsibilities. These include: http://policies.ncsu.edu/policy/pol-04-25-05 (Equal Opportunity and Non-Discrimination Policy Statement), http://oied.ncsu.edu/oied/policies.php (Office for Institutional Equity and Diversity), http://policies.ncsu.edu/policy/pol-11-35-01 (Code of Student Conduct), and http://policies.ncsu.edu/regulation/reg-02-50-03 (Grades and Grade Point Average).

Course Schedule

NOTE: The course schedule is subject to change.

Lecture TTH 1:30pm – 2:45pm — Week 1-3

Introduction to categorical data: type of data; type of sampling schemes; exact inference and maximum likelihood inference; contingency tables; risk difference, relative risk, odds ratio; tests of independence: Pearson chi-squared tests, MH test, Cochran-Armitage trend test

Lecture TTH 1:30pm – 2:45pm — Week 4-6

Multiway table and GLMs: partial and association; CMH tests; generalized linear models; GLMs for binary data and count data; GLM model inference and diagnosis; over-dispersion for count data

Lecture TTH 1:30pm – 2:45pm — Week 7-9

Logistic regression: interpretation and inference of logistic regression models; model checking; logistic model with categorical predictors; multiple logistic regression

Lecture TTH 1:30pm – 2:45pm — Week 10-11

Building logistic model: model selection; predictive power; ROC curve; exact inference for sparse data; conditional logistic regression models

Lecture TTH 1:30pm – 2:45pm — Week 12-13

Multicategory logit models: baseline category logit model for nominal data; cumulative logit model for ordinal data; tests of independence using multicategory models

Lecture TTH 1:30pm – 2:45pm — Week 14-16

Models for matched data, correlated/longitudinal categorical data: McNemar test; population-level and subject-level odds-ratio; generalized estimating equations (GEEs) and generalized linear mixed models for correlated/longitudinal binary/count/multinomial categorical data