# STA 4504/5503: Categorical Data Analysis
**Fall 2022**

*UF Course Catalog: Description and inference using proportions and odds ratios, multi-way contingency tables, logistic regression, and other generalized linear models, log-linear models applications. Prerequisite: STA 3024 or STA 3032 or STA 4210 or STA 4322.*

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**Instructor Office Hours**: TBD
**Graduate Teaching Assistants: TBD**
**GTA Office Hours/Location:** TBD

## Course Description and Objectives

**Days:** MWF
**Time:** 12:50 pm – 1:40 pm
**Place:** FLO 0100

**Course Description:** This course will cover a wide range of analysis techniques used when dealing with categorical data. Course content includes description and inference for binomial and multinomial observations using proportions and odds ratios; multiway contingency tables; generalized linear models for discrete data; logistic regression for binary responses; multi-category logit models for nominal and ordinal responses; inference for matched pairs and correlated clustered data; loglinear models.

**Course Objectives:** At the end of the course a student should:

- be able to identify and analyze categorical variables
- be able to calculate and interpret odds ratios and relative risks and associated inference procedures
- be able to apply statistical tools to make inference about a single binomial proportion or two sample proportions.
- understand and be able to calculate the different goodness of fit statistics
- understand and explain the properties of different measures of association by estimating various forms of measures of association from retrospective, cross-sectional and prospective
  studies.
- be able to analyze three-way tables.
- understand the fundamental importance of the logistic model.

## Required Course Materials

**Textbook**: An Introduction to Categorical Data Analysis, 3rd Edition, Author(s): A. Agresti
ISBN-13: 9781119405269

**Scientific or Graphing Calculator:** You will need a calculator capable of basic arithmetic operations and taking square roots will be needed for in-class exams. Internet-enabled electronic devices, such as cell phones or tablets, cannot be used as calculators during exams.

**Web-enabled device:** You will need some type of web-enabled device such as a laptop, smartphone, or tablet to use in-class to access Canvas as needed.

## Course Resources

The Canvas, https://lss.at.ufl.edu/, course website will be used extensively throughout the semester to post notes and make course announcements. You must log on using your gatorlink username and password and access the course webpages from there. Important information about the course will be posted here including this syllabus, announcements, notes, assignments and your grades throughout the semester and computer output to supplement the examples done in class.

## Course Computer Programs and Applets

Some assignments will require you to use statistical applets or a statistical software package to analyze and visualize data. Two free downloaded programs that will be used in this course are JMP, a SAS-based software system and R. A list of other statistical applets will be posted on Canvas.

## Study Approach

You are to skim the lecture slides and text sections before class to familiarize yourself with the material and its organization. The lecture notes will be posted on Canvas. Next, you are to carefully study the lecture slides and textbook sections after each lecture to increase understanding. Remember to use the notes to help you to complete all assignments.

## Help

Remember to ask for help! You can come by during my scheduled office hours or make an appointment to see me. I can also answer some questions via email. *Emails received during the working week will be answered within 24 hours however emails received over the weekend may not be answered until Monday morning.*

- Always use GatorMail for email. I do not check Canvas inbox regularly.
- Always put STA 4504 in the subject line of your email. I teach multiple courses and use course numbers to search emails from students.

## Course Assignments

Your final course grade will be based on a combination of assessment types including computer/ homework assignment, in-class exams, and a final computer project. Due dates will be posted on the course schedule, on the Canvas course page and announced in class.

**Homework/Computer Assignments:**

Approximately seven computer/homework assignment will be assigned during the semester. The objective of these assignments is to help you develop a more in-depth understanding of the material and help you prepare for the exams. Therefore, doing the homework promptly and carefully is necessary for success in this course. Homework assignments in this course:

- Give you an opportunity to practice using formulas and interpreting results of various analyses.
- Give you feedback on what you understand and on what areas need more review.
- Help you apply concepts from class in situations requiring more intense computation and analysis.

The computer/homework assignments will vary in length and content. Some assignments will involve analyzing data sets and submitting a written summary of your analysis. Others will mainly involve solving exercises like those in the textbook.

Students are expected to work independently, unless otherwise specified in writing. Offering and accepting solutions from others is an act of plagiarism, which is a serious offense, and all involved parties will be penalized according to the UF Student Honor and Conduct Code. Discussion amongst students is encouraged, but when in doubt, direct your questions to the instructor.

Due dates for all computer assignments will be posted on Canvas. There will be a 5% penalty per day for late work and no assignments will be accepted more than two days after the due date.

**Exams:**

There will be three in-class exams which will be contain multiple choice and open-ended items. All students must bring to the exam: their student ID number, picture ID, a calculator, and pencils. In case of conflict or illness, if a student is unable to take an exam at the scheduled time, they must get in touch with the instructor prior to the exam time for any arrangements to be made for a makeup. Each case will be reviewed individually. Valid and detailed documentation is a prerequisite under such extenuating circumstances. A grade of zero is the minimum punishment of any type of dishonesty on an exam.

You may be provided with a packet of formulas and statistical tables to be used on the exams, if needed. A copy of this packet will be available in Canvas so that you will know what information will be provided to you on each exam.

**Final Computer Project:** In lieu of a fourth in-class exam, a final take-home computer project will be assigned. This assignment will primarily cover the material in the last class module but

may have some cumulative questions for the course. Students are required to work on this assignment independently.

**Grading Scheme:**

| | |
|---|---|
| Exams (3@18% each) | 54% |
| Final Computer Project | 18% |
| Computer/Homework Assignments (~7@4% each) | 28% |

Your final overall numeric score is rounded to the nearest integer. So, for example, if your average is 76.4 your grade will be 76. If your grade is 76.5, your grade will be 77.

Letter grades will be assigned according to the table shown.

The instructor reserves the right to adjust the percentages if needed

| Numeric Score | Letter Grade |
|---|---|
| 91-100 | A |
| 88-90 | A- |
| 85-87 | B+ |
| 81-84 | B |
| 78-80 | B- |
| 75-77 | C+ |
| 68-74 | C |
| 65-67 | C- |
| 60-64 | D |
| 0-59 | E |

## Course Policies

**Grading Policies**:

*Requirements for class attendance and make-up exams, assignments, and other work in this course as well as policies regarding absences, religious holidays, illness, and student athletes are consistent with UF Attendance Policies.

Additional make-up policy requirements:

- Every effort should be made to complete the assignment/exam during the open period. Only extreme situations will warrant a makeup. Contact the instructor prior to the exam - as soon as you realize you will be unable to take the assignment/exam at the scheduled time. Each case will be reviewed individually. Valid and detailed documentation is a prerequisite for scheduling a makeup under such extenuating circumstances.
- If you have an emergency on the day of the assignment/exam, the instructor must be contacted by midnight of the day of the assignment/exam.
- Make-up exams will be scheduled within a week from the assignment deadline. Student is responsible for attending scheduled make-up. Instructor reserves the right to utilize the UF posted final exam day as a make-up date.
- Additional Note: Being on vacation or booking a trip prior to the completion of the semester is not a valid reason to request a makeup. Please reference the most recent Academic Calendar, https://catalog.ufl.edu/UGRD/dates-deadlines/pdfs/.

*If you have a disability that requires academic accommodation, contact the Disability Resource Center (DRC). The DRC will provide documentation to the students who must then provide this documentation to the instructor when requesting information. You must submit this documentation prior to submitting any assignments for which you are requesting accommodation.

* Incompletes are only assigned when extraordinary circumstances (such as an accident, or extended hospitalization), arising after the date for dropping the course, prevent the student from completing the course requirements. Having a failing grade in the course is not a valid reason for requesting an Incomplete. Information on Medical Withdrawal can be found at https://umatter.ufl.edu/ . Information on how to Drop a class can be found in UF's Academic Catalog https://catalog.ufl.edu/ and https://catalog.ufl.edu/UGRD/academic-regulations/dropping-courses-withdrawals/

*There is no "extra credit" or forgiven grades – you are responsible for all your work done (or left undone).

*If you have a question concerning a graded assignment, you should notify me within seven days after a graded assignment is posted to schedule a meeting.

**Honor Code on Exams and Final Computer Project:** You are required to abide by the University of Florida Student Honor Code. Any violation of the academic integrity expected of you will result in a minimum academic sanction of **a failing grade on the assignment or assessment.** Any alleged violations of the Student Honor Code will result in a referral to Student Conduct and Conflict Resolution. Please review the Student Honor Code and Student Conduct Code at sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/

**The Honor Code will be strictly enforced for all exams and the final computer project.**

**Classroom Behavior:** During class students should silence their cellular phones and refrain from eating, drinking, reading newspapers, doing homework, listening to music, excessive talking and all other behaviors that are distracting and disrespectful to the instructor and their fellow students.

**Privacy Policy**: Student records are confidential. Only information designated "UF directory information" may be released without your written consent. This applies to parents or anyone else who contacts me about your grades.

**Faculty Course Evaluations:** Student feedback is welcomed by the instructor and beneficial to future students in the course. Students are requested to provide feedback on the quality of instruction in this course by completing a brief confidential evaluation towards the end of the semester at https://evaluations.ufl.edu. Summaries of the evaluation results can be found at https://evaluations.ufl.edu/results.

## Other University Services

**U Matter, We Care:** Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited
to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

***Sexual Assault Recovery Services (SARS): Student Health Center, 392-1161**
***University Police Department, 392-1111 (or 9-1-1 for emergencies), http://www.police.ufl.edu**

***Student Health Care Center:** Call 352-392-1161 for 24/7 information to help you find the care you need or visit the Student Health Care Center website.

***GatorWell Health Promotion Services:** For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell website or call 352-273-4450.

## Academic Resources

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information.

## COVID -19

In response to COVID-19, the following recommendations are in place to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to further the health and safety of ourselves, our neighbors, and our loved ones.

- If you are not vaccinated, get vaccinated. Vaccines are readily available and have been demonstrated to be safe and effective against the COVID-19 virus. Visit One.UF for screening/testing and vaccination opportunities.
- If you are sick, stay home. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 to be evaluated.
- As with any excused absence, you will be given a reasonable amount of time to make up missed work.

Tentative Course Schedule Fall 2022

| Date | Day | Chapter | Suggested Textbook Reading | Topic | Assignment |
|---|---|---|---|---|---|
| 24-Aug | W | 1 | 1.1-1.2 | Introduction to Categorical Data Analysis | |
| 26-Aug | F | 1 | 1.1-1.2 | Probability Distributions for Categorical Data | |
| 29-Aug | M | 1 | 1.1-1.2 | Probability Distributions for Categorical Data | |
| 31-Aug | W | 1 | 1.3-1.4 | Inference for a Proportion | |
| 2-Sep | F | 1 | 1.3-1.4 | Inference for Discrete Data | |
| 5-Sep | M | | Labor Day | | |
| 7-Sep | W | 2 | 1.1-1.4 | Review Activity | HW1 |
| 9-Sep | F | 2 | 2.1-2.2 | Analyzing Contingency Tables | |
| 12-Sep | M | 2 | 2.3 | The Odds Ratio | |
| 14-Sep | W | 2 | 2.4 | Chi-Squared Tests of Independence | |
| 16-Sep | F | 2 | 2.6 | Fisher's Exact Test | |
| 19-Sep | M | 2 | 2.7 | Association in Three-Way Tables | |
| 21-Sep | W | 1-2 | Review | | HW2 |
| 23-Sep | F | | **Exam 1** | | |
| 26-Sep | M | 3 | 3.1 | Components of a Generalized Linear Model (GLM) | |
| 28-Sep | W | 3 | 3.2-3.3 | GLM for Binary Data and Counts | |
| 30-Sep | F | 3 | 3.4 | Statistical Inference and Model Checking | |
| 3-Oct | M | 3 | 4.1 | The Logistic Regression Model | |
| 5-Oct | W | 4 | 4.1 | The Logistic Regression Model | HW3 |
| 7-Oct | F | | Homecoming | | |
| 10-Oct | M | 4 | 4.2 | Statistical Inference for Logistic Regression | |
| 12-Oct | W | 4 | 4.4 | Multiple Logistic Regression | |
| 14-Oct | F | 4 | | Work on Computer Homework Assignment | |
| 17-Oct | M | 4 | 4.4 | Multiple Logistic Regression | |
| 19-Oct | W | 4 | 4.3 | Logistic Regression with Categorical Predictors | HW4 |
| 21-Oct | F | 5 | 4.5 - 4.6 | Summarizing Effects in Logistic Regression and Predicative Power | |
| 24-Oct | M | 5 | 5.1 | Strategies on Model Selection | |
| 26-Oct | W | 5 | 5.2 | Model Checking | HW5 |
| 28-Oct | F | 3-5 | **Exam 2** | | |
| 31-Oct | M | 6 | 6.1-6.2 | Logit Models for Nominal and Ordinal Responses | |
| 2-Nov | W | 6 | 6.1-6.2 | Logit Models for Nominal and Ordinal Responses | |
| 4-Nov | F | 6 | 6.1-6.2 | Logit Models for Nominal and Ordinal Responses | |
| 7-Nov | M | 6 | 6.1-6.2 | Logit Models for Nominal and Ordinal Responses | |
| 9-Nov | W | 8 | 8.1 | Binary Matched Pairs McNemar's Test | HW6 |
| 11-Nov | **F** | | Veterans Day | | |
| 14-Nov | M | 8 | 8.1 & 8.5 | Binary Matched Pairs McNemar's Test &Rater Agreement | |
| 16-Nov | W | 8 | 8.5 | Rater Agreement | |
| 18-Nov | F | 6 and 8 | **Exam 3** | | |
| 21-Nov | M | 7 | 7.1 | Loglinear Models for Counts | HW7 |
| 23-Nov | **W** | | Thanksgiving | | |
| 25-Nov | **F** | | Thanksgiving | | |
| 28-Nov | M | 7 | 7.2 | Statistical Inference for Loglinear Models | |
| 30-Nov | W | 7 | 7.2 | Statistical Inference for Loglinear Models | |
| 2-Dec | F | 11 | 11.1 | Discriminant Analysis | |
| 5-Dec | M | 11 | 11.1 | Discriminant Analysis | |
| 7-Dec | W | 11 | Notes | Discriminant vs Logistic | Final Computer Project |