SYLLABUS: STAT 3302
STATISTICAL MODELING FOR DISCOVERY II
SPRING 2021

Course overview

Instructor

Instructor: Dr. Jennifer A. Sinnott
Email address: jsinnott@stat.osu.edu
Office hours: Virtual Hours via Carmen Zoom.
Jennifer A. Sinnott: Monday and Wednesday, 3:00 - 3:55pm, or by appointment.
Katie Smillie: Tuesday and Thursday, 3:00-3:55pm, or by appointment.
(Links will be posted on Carmen.)

Grader or Teaching Assistant

Co-Instructor: Ms. Katie Smillie (smillie.7@osu.edu)
Graders: Ms. Ruochen Zhao (zhao.3005@osu.edu); Ms. Zhizhen Zhao (zhao.3053@osu.edu);
Mr. David Ruttenberg (ruttenberg.6@osu.edu)

Course description

This course continues to investigate statistical models for data analysis and discovery in big-data settings. The regression methods developed in STAT 3301 are extended to data settings with binary and multi-category outcomes. An introduction to some of the most commonly used statistical methods for exploring and analyzing multivariate data is provided. Interpretation and communication of the results of analyses is emphasized.

Course learning outcomes

By the end of this course, students should successfully be able to:

1. Build, fit and interpret statistical models for binary outcomes.
2. Understand the difference between nominal and ordinal outcomes and build regression models that are appropriate for each.
3. Recognize the types of questions that can be answered by regression models for multi-category data and structure models to answer those questions.
4. Comprehend the statistical principles that underlie basic methods for multivariate data analysis.

Course materials

A. J. Dobson and A. Barnett (2008), An Introduction to Generalized Linear Models, Fourth Edition, Chapman & Hall/CRC Texts in Statistical Science.

The link to the Dobson / Barnett textbook is:

https://library.ohio-state.edu/record=b8615141~S7

A. C. Rencher and W. F. Christensen (2012), Methods of Multivariate Analysis, Third Edition, Wiley. Available online at http://onlinelibrary.wiley.com.proxy.lib.ohio-state.edu/book/10.1002/9781118391686.

And the link to the second textbook is:

https://library.ohio-state.edu/record=b7149844~S7

Course technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at https://ocio.osu.edu/help/hours, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** http://ocio.osu.edu/selfservice
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Baseline technical skills necessary for online courses

- Basic computer and web-browsing skills
- Navigating Carmen

Technology skills necessary for this specific course

- CarmenZoom
- Collaborating in CarmenWiki

Necessary equipment

- Computer: current Mac (OS X) or PC (Windows 10+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed
- Microphone: built-in laptop or tablet mic or external microphone

Necessary software

- This class requires you to use the statistical software package called R (The R Project for Statistical Computing; http://www.r-project.org/) to illustrate certain aspects. Here is the information for obtaining R.
  - o You can download R for Windows, Mac, and Linux, from the CRAN archive at https://cran.r-project.org.
  - o An in-depth introduction to R is available at http://cran.r-project.org/doc/manuals/R-intro.pdf
  - o Hands-on tutorials are available in the Swirl system, which you can learn about at http://swirlstats.com/. In particular, "R Programming: The basics of programming in R" is an appropriate first tutorial for students who have never used R.
- An easier to use interface to R is available in the software package RStudio. This package is available for Windows, Mac, and Linux and can be downloaded for free from http://rstudio.org. **Note that RStudio requires R to be installed.**
- This class requires the use of the (free) R Markdown authoring framework to complete assignments. Information about R Markdown will be provided in class; an online guide with overview information can be found at https://rmarkdown.rstudio.com.
- Microsoft Office 365 ProPlus All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Each student can install Office on five PCs or Macs, five tablets (Windows, iPad® and Android™) and five phones.
  - o Students are able to access Word, Excel, PowerPoint, Outlook and other programs, depending on platform. Users will also receive 1 TB of OneDrive for Business storage.
  - o Office 365 is installed within your BuckeyeMail account. Full instructions for downloading and installation can be found https://ocio.osu.edu/kb04733.

Course delivery

The course will use a mix of **synchronous** and **asynchronous** content. This content is described below, with notes about the typical weekly schedule.

Each week **by Monday morning**, a collection of **asynchronous content** will be posted. Students are expected to work through and complete the material by the end of the day on **Thursday**. Specifically, the asynchronous material will include:

- **Reading assignments** from the textbooks.
- **Videos** representing the equivalent of two 55-minute lectures that provide in-depth discussion of the topics for the week.
- **Quizzes** on the reading and lecture material, to help you apply and retain the material.
- Most weeks, a **homework assignment**, to help assess your understanding of the material, will be posted as well. Students are encouraged to begin to work on the assignment during the week and bring questions to the synchronous session on Fridays. The homework assignment will typically be due **the following Tuesday**.

Required **synchronous content** will be presented synchronously (or in-person, for the hybrid class) on **Fridays**. Students are expected to attend and participate in these class meetings (please see "Attendance, participation and discussions" below for further details). The synchronous meetings will be used to contextualize the week's asynchronous content using examples, discussion, and questions, with new material introduced as appropriate. The final few minutes of class will be used to provide an overview of what you should expect the following week.

The instructors for all three sections of Stat 3302 will hold office hours several times during the week via CarmenZoom. The schedule and Zoom links will be posted on Carmen. Students in any section can attend any of these office hours.

The graders for the course will hold virtual office hours several times during the week through the Mathematics and Statistics Learning Center (MSLC). The schedule and information for how to attend these virtual sessions will be made available on Carmen.

Grading and faculty response

Grades

Assignment or category	Percentage
Homework	20
Quizzes	20
Midterm 1	15

Midterm 2	15
Project	15
Final Exam	15
Total	100

Assignment information

Homework: The goal of homework assignments is to help you learn the material. There will be homework assignments posted on the course website, and they will be typically due once per week, with dates and times provided. Homework problems that require R software should be completed in R Markdown and html or pdf files should be uploaded. Homework problems that do not require R may be handwritten (electronically, or on paper and scanned) and uploaded as pdf files.

Academic Integrity and Collaboration for Homework: You are encouraged to work with other Stat 3302 students on homework and you may consult references both internal and external to the course material. **However, each student must produce their own assignment to be handed in. Do not copy any part of another student's homework. You must list at the top of your homework your collaborators and any references (texts or other online materials) that you consulted.**

Quizzes: The goal of the quizzes is to keep you motivated to read the textbook and keep up with the asynchronous content. There will be quiz questions assigned weekly. These will be administered online, through Carmen. There will be no time restrictions on completing the quizzes, and you will have multiple attempts.

Academic Integrity and Collaboration for Quizzes: You may consult your course text and lecture materials, but **you may not consult materials, people, or online forums outside of Stat 3302**. You are allowed to discuss quiz questions with other Stat 3302 students, but I strongly encourage you to attempt these quizzes on your own, to help you evaluate your understanding and learning. You are allowed multiple attempts at the quizzes for just this reason: to encourage you to try them on your own without penalty to your grade.

Exams: The goal of the exams is both to help you solidify your understanding of the material and to evaluate you on your knowledge. There will be two midterm exams and one final exam. All exams will be delivered remotely, via Carmen.

Academic Integrity and Collaboration for Exams: For exams, you may consult your course text and lecture materials, but **you may not consult other students in Stat 3302 OR materials, people, or online forums outside of Stat 3302**. **Exams should be completed without any external help or communication.**

Projects: In groups of ~4, students will be responsible for completing a project. The project will consist of analyzing a data set using the tools discussed in the class. **More details on the project will be provided later.**

Academic Integrity and Collaboration for Projects: You are (of course) encouraged to work with other Stat 3302 students on the projects, and you may consult references both internal and external to the course material. A single project report will be handed in on behalf of your group. **This report must be the original work of students in the group, and the ideas and words must not be taken from sources outside of the group.**

Late assignments

Generally late assignments are not accepted. If you are unable to complete an assignment on time, please get in touch with me *as soon as possible* so we can discuss your situation.

Grading scale

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70 –72.9: C-
67 –69.9: D+
60 –66.9: D
Below 60: E

Faculty feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call **614-688-HELP** at any time if you have a technical problem.)

Grading and feedback

For weekly assignments, you can generally expect feedback within **7 days**.

E-mail

I will reply to e-mails within **48 hours on school days**.

Discussion board

I will check and reply to messages in the discussion boards every **48 hours on school days**.

Attendance, participation, and discussions

Student participation requirements

Because this is a distance-education course, your attendance is based on your online activity and participation. The following is a summary of everyone's expected participation:

- **Logging in**: AT LEAST TWICE PER WEEK
Be sure you are logging in to the course in Carmen each week, including weeks with holidays or weeks with minimal online course activity. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible.*

- **Office hours and live sessions**: OPTIONAL/FLEXIBLE, BUT STRONGLY ENCOURAGED
All live, scheduled events for the course, including my office hours, are optional. For synchronous content, I will provide a recording that you can watch later. If you are required to discuss an assignment with me, please contact me at the beginning of the week if you need a time outside my scheduled office hours.

- **Participating in discussion forums**: OPTIONAL
You may post questions and answer questions related to the course material to the discussion forum on Carmen. If you email me to ask a question that I think other students would benefit from, I will often encourage you to post it to the discussion board so that I can answer it publicly. I may from time-to-time post discussion topics to the discussion forums; you are encouraged to respond to these to help build our online sense of community.

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.

- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)

Other course policies

Health and safety

The Ohio State University Wexner Medical Center's Coronavirus Outbreak site (https://wexnermedical.osu.edu/features/coronavirus) includes the latest information about COVID-19 as well as guidance for students, faculty and staff.

I expect that you will read and follow the guidelines and requirements for campus safety, which are available at https://safeandhealthy.osu.edu.

If you are unable to attend or participate in class for an extended period of time due to illness or quarantine, please let me know as soon as possible and we will make arrangements.

Student academic services

Student academic services offered on the OSU main campus http://advising.osu.edu/welcome.shtml.

Student support services

Student support services offered on the OSU main campus http://ssc.osu.edu.

Academic integrity policy

Academic integrity is a shared responsibility. We want to have a supportive and fair learning environment for all students. If you find yourself struggling with the course material as the semester proceeds, reach out to me or to the other teaching staff for extra assistance. Attend office hours. If you are struggling on homework assignments or quizzes, reach out to me or to other students for help. Violations of academic integrity standards on the part of even a single student can have negative repercussions for all students. For example, if we detect evidence of cheating on exams, not only will the procedures for investigation of academic misconduct be pursued for any involved students, but it may also result in more stringent administration of subsequent exams. **Please help us to maintain a positive and fair learning environment for all students by adhering to these policies for academic integrity.**

Note: The policies here are identical to those in the **Assignment Information** section.

Homework: You are encouraged to work with other Stat 3302 students on homework and you may consult references both internal and external to the course material. **However, each student must produce their own assignment to be handed in. Do not copy any part of another student's homework. You must list at the top of your homework your collaborators and any references (texts or other online materials) that you consulted.**

Quizzes: You may consult your course text and lecture materials, but **you may not consult materials, people, or online forums outside of Stat 3302**. You are allowed to discuss quiz questions with other Stat 3302 students, but I strongly encourage you to attempt these quizzes on your own, to help you evaluate your understanding and learning. You are allowed multiple

attempts at the quizzes for just this reason: to encourage you to try them on your own without penalty to your grade.

Exams: For exams, you may consult your course text and lecture materials, but **you may not consult other students in Stat 3302 OR materials, people, or online forums outside of Stat 3302**. **Exams should be completed without any external help or communication.**

Projects: You are (of course) encouraged to work with other Stat 3302 students on the projects, and you may consult references both internal and external to the course material. A single project report will be handed in on behalf of your group. **This report must be the original work of students in the group, and the ideas and words must not be taken from sources outside of the group.**

Ohio State's academic integrity policy

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. Instructors shall 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/.

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu

Accessibility accommodations for students with disabilities

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; http://slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- [Carmen (Canvas) accessibility](#)
- Streaming audio and video
- Synchronous course tools

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available

through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at
suicidepreventionlifeline.org

Disclaimer

This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and in particular we reserve the right to change due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.

Course schedule (tentative)

Week	Dates	Topics, Readings, Assignments, Deadlines
1	Jan 11, 13, 15	Introduction and Motivation, Review of Binomial Model and Maximum Likelihood Estimation
2	Jan 20, 22	Simple Logistic Regression: Model Formulation
3	Jan 25, 27, 29	Estimation of Parameters, Multivariable Logistic Regression
4	Feb 1, 3, 5	Model Evaluation and Diagnostics in Logistic Regression
5	Feb 8, 10, 12	Model Building in Logistic Regression
6	Feb 15, 17, 19	Binomial Regression; **Midterm 1 Feb 15**
7	Feb 22, 26	Poisson Regression
8	Mar 1, 3, 5	Models for Ordinal and Multicategory Data
9	Mar 8, 10, 12	Introduction to Multivariate Data
10	Mar 15, 17, 19	Multivariate Numerical Summaries
11	Mar 22, 24, 26	The Multivariate Normal Distribution; **Midterm 2 Mar 22**
12	Mar 29, Apr 2	The Multivariate Normal Distribution, continued **No synchronous session this week.**
13	Apr 5, 7, 9	Principal Components Analysis
14	Apr 12, 14, 16	Linear Discriminant Analysis; **Project due Apr 13**
15	Apr 19, 21, 23	Catch-Up, Review, and Further Directions
FINAL	TBD (Apr 26-30)	**Final Exam Date TBD**