THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 3302
STATISTICAL MODELING FOR DISCOVERY II
SPRING 2026

Course overview

Instructor

Instructor: Sagnik Nandy
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Class Website: Carmen
Lectures: MWF at 13:50-14:45 pm in Cockins Hall 0240
Office hours: M 9:15-10:15am,
W 4:15-5:15pm, and F 9:15-10:15am at CH 428C

Course description

STAT 3302 introduces statistical modeling techniques for categorical, count, and multivariate data, with an emphasis on regression-based methods and real-world applications. Topics include likelihood-based inference for binary data, logistic and probit regression, interpretation and diagnostics for generalized linear models, and models for multinomial, ordinal, and count responses. In the latter part of the course, students transition to multivariate statistics, covering random vectors and covariance structure, the multivariate normal distribution, principal component analysis, and clustering. Throughout the course,

theory is presented at a conceptual level and reinforced through hands-on data analysis and model interpretation using R.

Course learning outcomes

- By the end of this course, students will be able to:
- Formulate and interpret statistical models for binary, categorical, count, and multivariate data.
- Apply likelihood-based methods, including generalized linear models, for estimation, inference, and prediction.
- Interpret model parameters in applied contexts.
- Assess model fit using diagnostics, residual analysis, and hypothesis testing.
- Analyze real-world datasets using statistical software (R) and communicate results clearly.
- Understand foundational multivariate concepts, including covariance structure, principal component analysis, and clustering.

Course materials

Textbook:

- J. Dobson and A. Barnett (2018), An Introduction to Generalized Linear Models, Fourth Edition, Chapman & Hall/CRC Texts in Statistical Science. https://library.ohio-state.edu/record=b8615141~S7A.
- C. Rencher and W. F. Christensen (2012), Methods of Multivariate Analysis, Third Edition, Wiley. https://library.ohio-state.edu/record=b7149844~S7.
- Alan Agresti (2006), Introduction to Categorical Data Analysis, 2nd Edition

Primary source of reference will be class notes posted on canvas. Students will need to have a personal computer with either R (along with R Studio) or Python (preferably Jupyter Notebook) installed for doing

the course assignments. One might also need access to high-speed internet.

Course delivery

Lectures will be delivered live **in person**. Office hours are **in person.**

On occasion (due to illness, holiday or travel), live lectures may be replaced by pre-recorded lectures that will be posted to the course website, or by live lectures via Zoom. Announcements for these will be made through the course website. I will also announce any class cancellation at least one week in advance.

Attendance is mandatory but will not be tracked. If you need to miss a lecture, you may contact me or a classmate to get course notes. I will also post course notes on the course website.

Grading and faculty response

Homework, Quizzes and Exams

Assignment or category	Percentage
Homework	**20**
Quiz	**20**
Midterms	**30**
Final Exam	**30**
Total	**100**

Grades will be recorded on the class website.

Homework: Homework will be assigned on bi-weekly basis except on midterm or final exam weeks. Late assignments will NOT be accepted. Students are required to write clear and detailed answers to all homework problems to receive full credit.

You are encouraged to work together with classmates on the homework, but do not copy any solutions. Each student must produce their own homework solutions to be submitted electronically. Students are required to acknowledge their collaborators in their submission. Students are not permitted to look up or request solutions to homework problems in online forums or websites. The use of generative AI for homework is prohibited unless specifically mentioned by the instructor. On certain homework the instructor might allow the use of generative AI for visualization and exploration purpose. The instructor will report suspected use of generative AI to appropriate authorities.

All homework must be submitted online as a PDF file through the class website (Carmen).

Quizzes: In-class quizzes will be administered regularly. Quiz content will primarily be based on the homework problems, though exact problem statements will not be repeated. Each quiz will consist of a single question and will be completed within a 15-minute time limit. Quiz dates and content will be announced in advance and posted on Canvas. The quizzes will be closed book and closed notes. Furthermore, cheat sheets will not be allowed for quizzes.

Exams: There will be two midterms and one final exam. All exams are in-class and closed book. For each exam (including the final exam) you are allowed to bring one 8.5"x11" sheet of handwritten notes (both sides) and a scientific calculator (without the ability to perform integration and differentiation). You will not be allowed to use your cell phone, tablet, laptop, smart watch, or any other device with capability to connect to the Internet, or to other devices. The final exam will be

comprehensive. Statistical tables will be provided for all exams as needed. The Midterm exams will be on **Wednesday, February 18** and **Wednesday, April 1** during class, and the Final exam will be on **Tuesday, May 5 at 4:00-5:45pm** in our regular classroom.

Makeup Policy

No make-up exams or early exams will be permitted except in truly exceptional circumstances, and only when clear and verifiable documentation is provided. Even in such cases, granting a make-up or alternative exam time is entirely at the instructor's discretion. The same policy applies to in-class quizzes.

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

- **Grading and feedback:** For weekly assignments, you can generally expect feedback within 14 days.
- **E-mail:** You are expected to attend office hours. I do not guarantee answers to emails. If you sent an email include [STAT 3302] in the subject.

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

Disclaimer

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

Generative AI Policy

There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite, and others. These tools will help shape the future of work, research and technology, but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes. Specifically, students are not to use unauthorized assistance in the laboratory, on field work, in scholarship, or on a course assignment unless such assistance has been authorized specifically by the course instructor. In addition, students are not to submit their work without acknowledging any word-for-word use and/or paraphrasing of writing, ideas or other work that is not your own. These requirements apply to all students undergraduate, graduate, and professional.

To maintain a culture of integrity and respect, these generative AI tools should not be used in the completion of course assignments unless an instructor for a given course specifically authorizes their use. Some instructors may approve of using generative AI tools in the academic setting for specific goals. However, these tools should be used only with the explicit and clear permission of each individual instructor, and then only in the ways allowed by the instructor.

The instructor may, at their discretion, incorporate AI-generated content into class materials for instructional purposes.

Tentative Schedule of Topics

Week	Topics
1	Review of Bernoulli and Binomial Distributions
2	Logistic Regression (Model description and fitting) Assignment 1 (Due January 21)
3	Logistic Regression (Inference and diagnostics) Quiz 1 (January 28)
4	Probit Regression
5	Probit Regression Assignment 2 (Due February 11)
6	Multinomial and categorical models **Mid-term 1 (Wednesday February 18)**
7	Ordinal response models Assignment 3 (Due Wednesday February 25)
8	Poisson and Count Regression Quiz 2 (Wednesday March 4)
9	Random vectors and covariance structure
10	Spring Break

11	The multivariate normal distribution Quiz 3 (Wednesday March 25)
12	Estimation and inference under the multivariate normal model **Midterm 2 on (Wednesday, April 1)**
13	Estimation and inference under the multivariate normal model Assignment 4 (Due Wednesday April 8)
14	Principal Component Analysis (PCA)
15	Clustering and unsupervised learning Quiz 4 (Wednesday April 22)
16	Review

Other course policies

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.

Please **do not disseminate any course materials, including any lecture videos, assignments, and solutions** outside of the course.

Academic integrity policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the

University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute Academic Misconduct.

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: Any activity that tends to compromise the academic integrity of the University or subvert the educational process. Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an excuse for academic misconduct, so please review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

If an instructor suspects that a student has committed academic misconduct in this course, the instructor is obligated by University Rules to report those suspicions to the Committee on Academic Misconduct. If COAM determines that a student violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University.

If students have questions about the above policy or what constitutes academic misconduct in this course, they should contact the instructor.

Statement on intellectual diversity

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about

controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

Religious accommodation

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns

arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement **and** the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Civil Rights Compliance Office.

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 **by dialing 988 to reach the Suicide and Crisis Lifeline**.

Accessibility accommodations for students with disabilities

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If students anticipate or experience academic barriers based on a disability (including mental health and medical conditions, whether chronic or temporary), they should let their instructor know immediately so that they can privately discuss options. Students do not need to disclose specific information about a disability to faculty. To establish reasonable accommodations, students may be asked to register with Student Life Disability Services (see below for campus-specific contact information). After registration, students should make arrangements with their instructors as soon as possible to discuss your accommodations so that accommodations may be implemented in a timely fashion.

If students are ill and need to miss class, including if they are staying home and away from others while experiencing symptoms of viral infection or fever, they should let their instructor know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations.

SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This 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.