



THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

Statistics 6520

Applied Statistical Analysis with Missing Data

Fall 2025

NOTE: Syllabus is subject to change as the semester evolves

Instructor: Dr. Elizabeth A. Stasny, 319 Cockins Hall, stasny.1@osu.edu

Office Hours (Stasny): Immediately following class, as needed

Zoom Office Hours (Stasny): 12:30 – 1:30 p.m. Tuesdays

Course Assistant: Ms. Yingyu Cheng, cheng.1753@osu.edu

Office Hours (Cheng): 1:50 – 2:50 p.m. Thursdays, 328 Cockins Hall

Textbook: Roderick Little and Donald Rubin, *Statistical Analysis with Missing Data*, Third Edition, 2020, John Wiley & Sons, Inc. The unlimited user ebook is available at <http://proxy.lib.ohio-state.edu/login?url=https://onlinelibrary.wiley.com/doi/book/10.1002/9781119482260>.

Be sure you are looking at the correct textbook for assigned problems. Supplemental reading assignments may be posted on the course website.

Other Missing Data References:

Enders, *Applied Missing Data Analysis* (Methodology in the Social Sciences Series), Second Edition

Lohr, *Sampling: Design and Analysis*, 3rd Edition, Chapter 8

Rubin, *Multiple Imputation for Nonresponse in Surveys*

Prerequisites: An excellent background in the material covered in Statistics 6201, 6302, or 6802, and Statistics 6450 or 6950, or Public Health Biostatistics 6201. In particular, students should be knowledgeable about and comfortable with maximum likelihood estimation, regression and logistic regression, and Bayesian statistics.

In class, we will briefly review appropriate statistical analyses for complete datasets and then modify the models and methods to handle datasets with missing data. The course will include a significant component of statistical computing to deal with missing data.

Course Requirements: You are responsible for all material covered in class, in assigned readings, and on homework assignments. You are expected to attend all classes*.

Course delivery:

Classes will typically be delivered in person from 3:00 – 3:55 MWF as scheduled. On two planned occasions, the class will be taught live over Zoom at the regularly scheduled class time. The dates for these planned Zoom classes are Monday, October 13, and Wednesday, October 15. Although I do not expect this to happen, other classes may be held synchronously over Zoom or asynchronously via CarmenCanvas to prevent disruption of instruction in the case of instructor illness or other unanticipated instructor absence.

Use of Electronic Devices during Class: Any recording during class, using video, audio, or still photography, is permitted **only with prior permission** from the instructor.

Computing: I will use the Statistical package R for the computing needs in the course. R is freely available for most operating systems (<http://www.r-project.org/>). If you are not already familiar with R, there are online tutorials available. I recommend getting started with swirl. This site <http://swirlstats.com/students.html> has instructions for downloading R, RShiny, and opening the swirl tutorial system. There you can learn the basics of working with R via the tutorial "R Programming: The basics of programming in R." Alternately, you may use any statistical package you prefer for the work in this course; I may not be able to help you with the package you choose, however.

Homework: Assignments will generally be due every 1 – 2 weeks. It is your job to ensure that your homework is easy to grade. Any computer output must be edited and annotated; graphs and plots must be clearly labeled and discussed in the text of the homework. Problems that are out of order, or with parts not clearly identified, may not receive full credit. **No late assignments of any type will be accepted***. Although you certainly may discuss homework with others outside of class, your submissions must be your own and should demonstrate your personal understanding of the problems.

Midterms: On or about Friday, October 3, and Friday, November 7, during the usual class time.

Final: Friday, December 12, noon – 1:45 p.m.

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

- Describe the missing data mechanism and underlying assumptions and identify different patterns of missing data
- Describe the difference in statistical analyses between the missing data problem and the complete data problem (including weighted methods)
- Perform simple missing data analyses; describe weaknesses
- Implement likelihood-based analysis with ignorable missing response; implement the EM-algorithm with a statistical package
- Describe the principle of Bayesian analysis with missing data; implement multiple imputation with a statistical package
- Describe and implement missing data models in contingency tables
- Describe modern statistical methods to deal with non-ignorable missing data
- Implement and interpret statistical methods for missing data in a practical scenario

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/>.

Grades: The final numerical grade will be determined as follows:

Homework (lowest grade dropped)	20%
Midterm Exams	20% each
Final Exam	35%
Class Participation	5%

* Obviously, if you are ill or caring for someone who is ill, we will make alternate arrangements. Please contact me by email as soon as possible and keep me apprised of your situation.

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 followed for copying, retaining, or disseminating materials outside of the course.

Civil Rights Compliance

All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation. To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office: online reporting form at <http://civilrights.osu.edu/>, call 614-247-5838 or TTY 614-688-8605, or Email civilrights@osu.edu.

Accessibility accommodations for students with disabilities

The University strives to make all learning experiences as accessible as possible. 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, please 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; 098 Baker Hall, 113 W. 12th Avenue.

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. You can reach an on call counselor when CCS is closed at 614-292-5766; 24-hour emergency help is also available through the National Suicide and Crisis Lifeline by calling or texting 988.

Other

OSU's policy statement on accommodations for religious holidays may be found at <https://oaa.osu.edu/religious-holidays-holy-days-and-observances>.

OSU's policy statement on Artificial Intelligence and Academic integrity may be found at <https://ugeducation.osu.edu/academics/syllabus-policies-statements/standard-syllabus-statements>.

Tentative Schedule of Topics

(Actual schedule will evolve as the term progresses)

Introduction to missing data, definitions, types of missingness (Chapter 1) Exploratory data analysis with missing data	(5 classes)
Weighting Methods for missing data (Chapter 3) Comparisons involving complete-case and available case methods	(4 classes)
Single Imputation Methods and Uncertainty Measures (Chapters 4 and 5)	(5 classes)
Multiple Imputation (Chapter 5)	(4 classes)
Maximum Likelihood Methods for Missing Data (Chapter 7; Chapter 6 for review of MLE)	(6 classes)
Bayes Methods (Chapter 10; Chapter 6 for review material) Multiple Imputation	(5 classes)
Missing Data in Contingency Tables (Chapter 13)	(5 classes)
Missing Not at Random Models (Chapter 15)	(4 classes)

Class Schedule For My Planning Purposes – Subject to Change as Needed

Monday	Tuesday	Wednesday	Thursday	Friday
Aug. 25	26 First Day of OSU classes	27 First Day of Statistics 6520	28	29
Sept. 1 Labor Day – no classes	2	3	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	26
29	30	Oct. 1	2	3 Midterm 1
6	7	8	9	10
13 Zoom class meeting	14	15 Zoom class meeting	16 Fall Break – no classes	17 Fall Break – no classes
20	21	22	23	24
27	28	29	30	31 Halloween 🎃
Nov. 3	4 Election Day	5	6	7 Midterm 2
10	11 Veterans' Day – no classes	12	13	14
17	18	19	20	21
24	25	26 Thanksgiving Break – no classes	27 Thanksgiving – no classes	28 Thanksgiving Break – no classes
Dec. 1	2	3	4	5
Dec. 8	9	10 Last Day of Classes	11	12 Final Exam – noon – 1:45 p.m.