STAT 7410 Theory of the Linear Model
Autumn 2023

Lecture: MWF 1:50pm–2:45pm in Evans Lab 2001

Instructor: Yoonkyung Lee
Office: 440H Cockins Hall
Phone: 292-9495
Office Hours: M 3:00-3:55pm, R 2:00-2:55pm or by appointment
Email: yklee@stat.osu.edu or lee.2272@osu.edu

Grader: Rui Zhang
Office Hours: by appointment only
Email: zhang.9473@osu.edu

Course web page:
The course has a web page on Carmen (`https://carmen.osu.edu/`). You will find the class schedule, course announcements, homework assignments, and other information about the class on the web page. Please check it out on a regular basis.

Text: *A First Course in Linear Model Theory*, 2nd edition by N. Ravishanker, Z. Chi and D. K. Dey, CRC Press (required)
Available online through the OSU library at ProQuest Ebook Central (3 copies at a time)

Prerequisites: Stat 6802 (Statistical Theory II), 6860 (Foundations of the Linear Model) and solid understanding of linear algebra at the undergraduate level, 6910 and 6950 (Applied Statistics I and II)

Course Description

Statistics 7410 is a course on the theory of the linear model, the most commonly used statistical model. The course will present topics on the definition, estimation and hypothesis testing in this class of models. In addition, we will discuss statistical methods for multiple comparisons and issues related to a breakdown in the model assumptions. More advanced topics in this course include the discussion of blocking, random and mixed effects, and an introduction to generalized linear models.

Grading

Homework: 30%
Midterm: 30% (tentatively on Wednesday October 11)
Final exam: 40% (Wednesday December 13, 2:00pm-3:45pm)

While the standard grading scale generally applies, final grades may be curved upwards.

Homework Assignments

There will be homework assignments posted on the course website. Homework is due approximately once per week, typically on Friday of the week following the homework posting. Check Carmen for exact dates and times. Homework assignments will be submitted for grading via Carmen.

Late assignments: No late homework assignments will be accepted with few exceptions. If you have documented reasons for missing work or needing extra time, please contact me as soon as possible prior to the due dates. Where appropriate, due dates could be extended.

Exams

There will be one midterm exam. The midterm will be delivered in person, during class time. Information about the exam will be posted well in advance through the course website and also announced in class. The final exam will be comprehensive and cover all the material for the course. It will be in person, during the scheduled final exam hours. There will be no make-up exams.

Academic Integrity Policy

Although students are encouraged to work together on assignments, each student is expected to write and submit individual solutions to homework problems. The midterm and final exam are to be completed on your own without any external help or communication.

Academic misconduct will not be tolerated and will be dealt with procedurally in accordance with university 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 at `http://studentlife.osu.edu/csc/`.

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 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.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site (`https://safeandhealthy.osu.edu/tracing-isolation-quarantine`) for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or `http://slds.osu.edu`.

Religious accommodations

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

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	8/22-8/25	Introduction, Linear models (4.1), Linear algebra (Chapter 1)
2	8/28-9/1	Least squares, Geometry (4.2, 2.6)
3	9/4-9/8	9/4 (M): Labor Day Generalized inverses (3.1-3.2), Fitted values, Residuals (4.2) **Homework 1 Due**: 9/8 (F)
4	9/11-9/15	Estimability, Gauss-Markov theorem, Generalized LS (4.3-4.5) **Homework 2 Due**: 9/15 (F)
5	9/18-9/22	Multivariate Normal Distribution (5.1-5.3) **Homework 3 Due**: 9/22 (F)
6	9/25-9/29	Distribution of quadratic forms (5.4), Inference for estimable functions (7.1) **Homework 4 Due**: 9/29 (F)
7	10/2-10/6	Hypothesis testing, F-test (7.2-7.3)
8	10/9-10/13	Likelihood ratio test (8.1) 10/11 (W): **Midterm** 10/12 (R) - 10/13 (F): **Autumn Break**
9	10/16-10/20	Confidence intervals and regions (7.4)
10	10/23-10/27	Departures from model assumptions (8.2), Model diagnostics (8.3) **Homework 5 Due**: 10/27 (F)
11	10/30-11/3	Multiple hypothesis testing (10.4) **Homework 6 Due**: 11/3 (F)
12	11/6-11/10	Linear mixed effects models (11.1-11.2) 11/10 (F): **Veterans Day**
13	11/13-11/17	Prediction **Homework 7 Due**: 11/17 (F)
14	11/20-11/24	Penalized regression (9.2, 14.3) 11/22–11/24: **Thanksgiving Break**
15	11/27-12/1	Nonparametric regression (14.2) **Homework 8 Due**: 12/1 (F)
16	12/4-12/6	Review
17	12/13 (W)	**Final exam** (2:00pm-3:45pm)