Linear Model Methodology (STT 867)

Fall 2020

Instructor:	Haolei Weng	**Time:**	MW 10:20 – 11:40 AM
Email:	wenghaol@msu.edu	**Modality:**	Online-synchronous

Course Platforms

1. Course lectures will be delivered synchronously in the Zoom meeting room at `https://msu.zoom.us/j/9893562397`. Meeting ID: 9893562397.

2. All the relevant course materials will be uploaded on D2L. In D2L, you will access lecture notes, homework, solutions, exams, announcements, emails, etc. Regularly check D2L!

3. Every lecture will be recorded and the recordings will be shared on D2L. The passcode required for joining the Zoom Meeting will be posted on D2L.

Office Hours

1. Place: The same Zoom meeting room at `https://msu.zoom.us/j/9893562397`

2. Time: 9:00 – 10:00 AM, Tue. and 10:00 – 11:00 AM, Fri. or by appointment

Grader: Anirban Samaddar (samadda1@msu.edu). Email Anirban first when you have questions or concerns about homework grading.

Objectives: This course is intended for doctoral students in statistics or closely related fields. The main focus is on the fundamental principles and theory of linear regression models. The course will cover classical estimation and inference theory, as well as some more recent topics.

Prerequisites: Knowledge of mathematical statistics at Casella & Berger level (STT 862). One year of calculus and linear algebra.

Textbook: André I. Khuri (2009). *Linear Model Methodology*, CRC Press.

Main References:

- Rencher and Schaalje (2008). *Linear Models in Statistics*, John Wiley & Sons.
- Rao and Toutenburg (1999). *Linear Models: Least Squares and Alternatives*, Springer-Verlag.
- Hastie, Tibshirani and Friedman (2009). *The Elements of Statistical Learning*, Springer-Verlag.
- Hastie, Tibshirani and Wainwright (2015). *Statistical Learning with Sparsity*, Chapman & Hall/CRC.

Tentative Course Topics:

- Least squares, Gauss-Markov Theorem and extensions
- Hypothesis testing and confidence region
- Simultaneous confidence intervals
- *Less-than-full-rank* linear models
- Estimable/Testable linear functions
- Distributional properties of quadratic forms
- Model selection and prediction
- Shrinkage methods

Grading Policy

1. Homework (35%)

   - Homework sets are assigned on a weekly basis and uploaded on D2L every Wednesday night. Students should submit their homework as a clearly readable PDF to D2L by 11:59 PM Wednesday in the following week.
   - Late homework might be possibly accepted if extenuating circumstances are present. Students should inform the instructor in advance.
   - The solutions to homework are posted on D2L after the due date of homework submission.
   - Copying homework or existing solutions is strictly forbidden. Any form of academic dishonesty will result in 0 point for homework.
   - Using references for help or discussing with fellow students is encouraged.
   - Two lowest homework scores will be dropped.

2. One Midterm (30%), One Final (35%).

   - The two exams will be done online. We will use D2L to post exams and submit solutions, and use Zoom for online proctoring. More details will be given near the exam dates.
   - Make-up exam is possible if there are excused absences. Students should discuss with the instructor in advance.

3. Final grades might be possibly curved.

Attendance Policy

1. Some students may not be able to attend a portion of (or even all) classes in a synchronous way for various reasons. To accommodate this scenario, regular class attendance is not required.

2. Students who cannot join synchronous online sessions can watch the recorded videos that will be posted on D2L.

Learning Continuity Statement: Students may experience interruptions to their studies for a host of reasons (e.g., illness, need to provide medical or child care, sustained loss of internet). It is thus critical to communicate clearly and frequently with the instructor, especially when you become unable to engage in course content for a prolonged period. To provide students with as much flexibility as possible to continue their semester after an interruption to their progress, policies include (and not limited to) reducing a certain number of assignments, giving make-up exams, and providing additional office hours. In extreme cases where a student cannot reliably progress through course content for more than one week, they must inform the instructor of their situation via wenghaol@msu.edu so that individualized accommodations can be made. In general, the instructor will respond to emails within one business day.

Course Continuity Statement: Instructors may experience interruptions in their ability to participate in the educational process. The department will work with the instructor to find informal replacements for short absences (a week or less) and engage formal replacements for extended absences.

Important Dates:

First Class .... 10:20am - 11:40am, Sept. 2, 2020
Labor Day (holiday) .... Sept. 7, 2020
Midterm .... 10:20am - 11:40am, Oct. 21, 2020
Thanksgiving Holiday .... Nov. 26 - 27, 2020
Last Class .... 10:20am - 11:40am, Dec. 9, 2020
Final Exam .... 7:45am - 9:45am, Dec 18, 2020
Grades Due .... Dec 22, 2020

General:

- For students with disabilities, please contact Resource Center for Persons with Disabilities at `https://www.rcpd.msu.edu/`.

- The instructor reserves the right to modify the syllabus as it is deemed necessary. Any such changes will be announced in class, and students will be notified via email and D2L announcement.