Mixed Models (STT 868)

Spring 2021

Instructor:	Haolei Weng	**Time:**	MWF 9:10 – 10:00 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: TBA

Grader: Nilanjan Chakraborty (chakra46@msu.edu). Email Nilanjan 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 course will be mainly focused on the methodology and theory in the analysis of two major classes of mixed models – linear mixed models (LMM) and generalized linear mixed models (GLMM). Along this line, some applications of mixed models and extensions will be briefly introduced for the analysis of longitudinal data that are ubiquitous in the biological and health sciences.

Prerequisites: Linear Model Methodology (STT 867).

Main References:

- Eugene Demidenko (2013). *Mixed Models: Theory and Applications with R (2nd Edition)*, John Wiley & Sons.
- McCulloch, Searle and Neuhaus (2008). *Generalized, Linear, and Mixed Models (2nd Edition)*, Wiley-Interscience.
- Jiang (2007). *Linear and Generalized Linear Mixed Models and Their Applications*, Springer.
- Diggle, Heagerty, Liang and Zeger (2002). *Analysis of Longitudinal Data (2nd Edition)*, Oxford University Press.

Tentative Course Topics:

- Model identifiability
- MLE, ANOVA estimation, MINQUE, Restricted MLE
- Hypothesis testing and confidence interval
- Generalized linear models
- Quasi-likelihood estimation
- Generalized estimation equations
- Best (linear) prediction for random effects
- Parametric models for covariance structure
- Marginal and transition models

Grading Policy

1. Homework (35%)
   - There are a total of 6 homework assignments. Each homework is posted on D2L and due in two weeks. Students should submit their homework as a clearly readable PDF to D2L.
   - 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.
   - 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.
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	9:10am - 10:00am, Jan. 20, 2021
Break Days	Mar. 2 - Mar. 3, 2021
Midterm	8:30am - 10:00am, Mar. 8, 2021
Last Class	9:10am - 10:00am, Apr. 21, 2021
Final Exam	12:45pm - 2:45pm, Apr. 27, 2021
Grades Due	May 4, 2021

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.