Course Information
STAT 6225.10: Longitudinal Data Analysis (2023F)

- **Time** and **Location**: W 12:45PM - 3:15PM, 1776 G C-106, **Instructor**: Dr. Hua Liang

  Office: Rome Hall, Room 754
  Office number: 202-994-7844
  Email: hliang@gwu.edu

- **Office Hours**: W 11:30pm-12:00pm or by appointment

- **Textbook**:

  1. Pinheiro, J.C. and Bates, D.M. (2000). *Mixed-Effects Models in S and S-PLUS*. New York: Springer. (Required).
  2. Galecki, A. and Burzykowski, T. (2013). *Linear Mixed-Effects Models Using R: A Step-by-Step Approach*. New York: Springer. (Recommended).
  3. Diggle, P.J., Heagerty, P., Liang, K.Y., and Zeger, S.L. (2002). *Analysis of Longitudinal Data*. 2nd edition, Oxford: Oxford University Press. (Recommended).

- **Exams**: There will be one midterm examination and one final examination. These will contribute the majority of your final grade. The first exam will cover linear mixed-effect models. The final examination will be held during the final exam week, and covers the entire course, with emphasizing on the latter part of the course. Each examination will have both mathematical and conceptual (written) components.

- **Home Work**: Homework will be given on a biweekly basis. Regularly homework is due in class every other Tuesday, or otherwise the date announced. Some will be of a theoretical basis, and some will be real data analysis. Data analysis should be used R, or Splus, or SAS. If you missed the class, you can ask/copy the assignment.

- **Quiz and Attendance**: There won't be any quiz in class. However, you are expected to attend almost all classes. Poor attendance will significantly affect your final grade.

- **Final Grade**: Your final grade will depend on the following components with these proportions: homework (40%), midterm (30%), final exam (30%). Last, poor attendance of the class will be taken into account for you final grade. The percentage grades needed to achieve an A, B, C, or D will follow approximately the following scale: $90-100=A$, $80-89=B$, $70-79=C$, $55-69=D$, $0-54=F$.

- **Academic Integrity** I personally support the GW Code of Academic Integrity. It states: "Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For the remainder of the code, see: `http://www.gwu.edu/ ntegrity/code.html`

- Support for Students Outside the Classroom Disability Support Services (DSS). Contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242. For additional information please refer to: http://gwired.gwu.edu/dss/

  The University Counseling Center (UCC) (202-994-5300) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. See http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices

- **Security** In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

Outline

1. Introduction-motivating examples
2. Basic facts for longitudinal data
3. Grouped data
   - repeated measures, longitudinal data, growth curve data, panel data, time series, functional data,
   - multilevel data
     - Data structures, classes, and methods for grouped data in R
   - Trellis displays for grouped data
4. Linear mixed-effects models
   - brief review of linear models
   - the lmList function in R
   - linear mixed-effects (LME) model
   - Multilevel LME models
   - the lme function in R
5. Extending the basic LME model
   - modelling the random effects covariance structure
   - variance functions for modelling heteroscedasticity
   - correlation structures: serial, spatial
     - Rcapabilities for extending and customizing the lme function
   - the gls function in R
6. Nonlinear regression model
   - brief review of nonlinear least-squares
   - the nls function in R
   - starting estimates: self-starting models
   - the nlsList function in R
7. Nonlinear mixed-effects models
   - nonlinear mixed-effects (NLME) models

- the nlme function in R
- extending the basic NLME model
- using covariates with nlme
- the gnls function in R

8. Generalized estimating equations (GEE)
9. Generalized linear mixed-effects models
10. Non/Semi-parametric mixed-effects models