ST 732, Applied Longitudinal Data Analysis, Spring 2010

Tuesday & Thursday 8:30 - 9:45AM, SAS Hall, 1216

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Location: Tutorial Center in 1101 SAS Hall

Course Prerequisite: ST 512, Experimental Statistics for Biological Sciences II, or equivalent. Thus, students should be familiar with basic notions of probability, random variables, and statistical inference, analysis of variance, and (multiple) linear regression. Familiarity with matrix algebra is also useful. We will review matrix algebra at the beginning of the course and make considerable use of matrix notation and operations throughout. ST 512 involves the use of the SAS (Statistical Analysis System) software package; thus, students are expected to have had some exposure to the use of SAS. The course is meant to be accessible both to non-majors and majors. The underlying mathematical theory will not be stressed, and the main focus will be on concepts and applications. Please see the instructor if you have questions about the suitability of your background.

Course Resources:

- Text Book: Lecture notes prepared by Marie Davidian will be used. These may be purchased at the Sir Speedy across the street from Patterson on Hillsborough. You should obtain a copy.
- Dr. Davidian’s course webpage: http://www.stat.ncsu.edu/people/davidian/courses/st732.
- Dr. Boos’s course webpage: http://www.stat.ncsu.edu/people/boos/courses/st732.

Course Topics:

1. Preliminaries: Introduction
   Review of matrix algebra
   Random vectors, multivariate normal distribution, review of linear regression
   Introduction to modeling longitudinal data, exploring covariance structure
2. Classical methods for normally distributed, balanced repeated measurements:
   Univariate repeated measures analysis of variance
   Multivariate repeated measures analysis of variance
   Drawbacks and limitations of classical methods

3. Methods for normally distributed, unbalanced repeated measurements:
   General linear models and models for correlation
   Random coefficient models
   Linear mixed effects models

4. Methods for non-normally distributed, unbalanced data:
   Probability models for discrete and continuous nonnormal data and generalized
   linear models
   Generalized estimating equations for population-averaged models

**Grading:** Homework 10%, Project 20%, Mid-term 35%, Final Exam 35%.

**Miscellaneous:**

1. Homework will be assigned once every two weeks. It will be due at the beginning
   of class. As a rule, I do not accept late homework. I allow students to work in
   groups on homework if they like, but no one should copy directly from someone
   else’s paper (either present or past students). I strongly urge everyone to work
   on their own as much as possible.

   You **should not** obtain copies of previous student hw’s or use them for helping
   to complete assignments.

2. Data Analysis Project: Students will carry out an analysis of data collected
   in a study that will be described in detail in the assignment using methods
   covered in the class (which methods are relevant is to be determined by the
   student). Students will need to formalize the scientific questions posed by the
   investigator, carry out the appropriate analyses, interpret the results, and write
   a comprehensive report for the investigator reporting on all of these activities.
   The assignment will be handed out in late march and will be due on the last day
   of class.

3. The midterm and final exams will be in-class, closed book exams (legal hand-
   written note sheet is allowed).

4. I will regularly ask for feedback on how the class is going. Please help me with
   your suggestions.

5. Academic Integrity: It is the understanding and expectation that a student’s
   signature on any test or assignment means that the student neither gave nor
   received unauthorized aid.