Multilevel Modeling
Y639 / S639 - Spring 2013

Instructor: Leslie Rutkowski, Phd   Email: lrutkows@indiana.edu
Office: ED4004   Office Phone: 812-856-8261
When(Where): Tue(ED1084)/Thu(ED2015)   Time: 9:30 - 10:45
Office Hours: Tue & Thu 11:00-12:00

Textbook and Other Readings

Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling (**2nd ed.**) by Tom Snijders and Roel Bosker, Sage (ISBN 0-7619-5890-8).

Additional methods-based and applied readings that support the lecture topic will also be assigned.

Software: SAS (PROC MIXED, PROC NLMIXED, and general data manipulation)

Course website: Oncourse

Prerequisites: Successful completion of at least two statistics courses at the graduate level and a good understanding of regression and ANOVA.

Course information

Clustered data are ubiquitous in the social and natural sciences. Students are nested within classes; families are nested within communites; birds are nested, well, within nests! This type of structure often ensures that nested units (students, families, birds) are more similar to others within their cluster than to units outside of their cluster. That is, students in a given school are often more similar to each other because of demographic similarities, pedagogical approaches and other factors than to students in other schools. Ignoring this similarity has potentially serious consequences for other analytic methods that do not account for the hierarchical structure of the data. Further, relationships within a cluster often differ from relationships between clusters. Assuming that these relationships are the same can also have important implications on analysis results.

This course will introduce students to the theory and practice of multilevel models - an increasingly common technique for dealing with clustered data. Examples for the course will come primarily from the field of education; however, the methods are presented in general and examples are easily extended to many fields. Students will learn to develop, implement, interpret, and report research involving multilevel analyses. Further, students are expected to gain proficiency in SAS as it pertains to multilevel analysis.

Course Outline

The course will *tentatively* follow this schedule:

~ Week	Topic	Reading
1	Introduction, multilevel structures and multilevel data	S&B 1,2,3
2	Random intercept models	S&B 4
3	SAS for MLM	Notes
4	Random slope models	S&B 5
5	Random slope models	S&B 5
6	Centering / Estimation	Enders & Tofighi, 2007 / S&B 4.7, 4.8 & 5.4
7	Estimation / Inference	S&B 4.7, 4.8 & 5.4 / S&B 6 & 7
8	Inference / Testing assumptions	S&B 6 & 7 / S&B 10
9	Model building	S&B 6.4, & 7
10	Exploratory data analysis	Notes
11	3 Level Models	S&B 4.9 & 5.5
12	(Time permitting) Design considerations	S&B 11
13	Longitudinal data	S&B 12
14	Longitudinal data/Logistic regression	S&B 12 /14
15	Logistic regression	S&B 14

Evaluation

Student evaluation will be based on attendance & class participation (10%), quality of assignments (50%), final project proposal (5%), final project structured-poster presentation (5%), and the quality of the final project (30%).

While a major focus in this course surrounds the theory and concepts of multilevel models, there is also a strong emphasis on applying these methods via computer programs since simple hand calculated solutions are generally not possible. As such, you will be expected to participate in several labs throughout the semester. These labs are important for understanding and applying many of the concepts covered in the course. Based on the material covered in the lab, you will be assigned two in-depth assignments that provide you with an opportunity to demonstrate your knowledge of the material learned so far. These assignments will require data analysis in conjunction with some theoretical extensions of your understanding. You will have *one week* to complete the assignment. Students are welcome to work in pairs on the homework assignments.

Late assignments are **not allowed** without prior approval of the instructor. With approval, any assignment that is more than 48 hours tardy and is *not* due to an officially excusable absence or illness will result in a reduced grade for that assignment. Specifically, late assignments will be subject to a 20% point deduction. For example, an assignment that is worth 50 possible points and that is turned in late will be graded starting from 40 (of 50) total possible points.

The final project will require students to conduct an analysis that answers a *well-defined* research question. It is necessary that you pre-approve course projects with me. This will be accomplished by way of a project proposal due around mid-term, which will count for 5% of your total grade. The range of possible projects is very broad and could include a comprehensive literature review, an empirical analysis, a theoretical piece, a comparative study (comparing different software packages, approaches to handling missing data, etc) or a simulation study. I encourage you to focus your efforts toward your research interests and to work with an eye toward a peer-reviewed publication.

To ensure that the data are readily available for your project, you must submit descriptive statistics (means, STD, correlation matrix) for your study variables with your proposal. Details will be provided as the time nears.

I would encourage you to begin thinking about this project *now*. You are welcome to bring ideas to me at any time for feedback until submission of the proposal. After you receive feedback on your proposal, any significant changes to your project are at your own risk. In other words, I will not give detailed feedback on the quality and sufficiency of a newly designed project after you have received feedback on your initial project proposal. With that in mind, I would *s*trongly encourage you to do some preliminary data analysis (or, at the very least, data management) before you submit your proposal to gauge the feasibility of your proposed study.

To fulfill the class presentation requirement, students will present the findings from their final project during during a structured poster session held the last week of class. To receive full credit on the poster presentation, it should be of conference quality. Low cost poster printing is available in the Information Commons at Wells Libarary (see http://kb.iu.edu/data/aozu.html for more information).

The letter grade will be assigned according to the following table:

Numeric grade	Letter grade
98-100	A+
93-97.99	A
90-92.99	A-
87-89.99	B+
83-86.99	B
80-82.99	B-
72-79.99	C+
64 -71.99	C
58 - 63.99	C-
51-57.99	D
0-50.99	F

Quality of Written Work
Particularly for the final project, I expect a reasonable degree of readability. That is, the final draft should be throroughly proof-read, grammatically correct, and it should adhere to the structure of a research paper. If you have trouble writing, there is a free writing tutorial service available (http://www.indiana.edu/~wts). While tutors do not edit, nor do they make corrections to your papers, they will work with you to improve any aspect of your writing that needs attention.

Academic Honesty
All students are expected to adhere to Part II of the *The Code of Student Rights, Responsibilities, and Conduct.* As such, academic dishonesty is not tolerated and any infractions will be handled in strict accordance with Part III of *The Code.*

E-Mail Policy
I reply to email within 24 to 48 hours. I only check email Monday-Friday, 9:00am to 5:00pm. I will not reply to email over the weekend. If you do not hear from me after 48 hours, please feel free to email me again. If your email necessitates lengthy clarification of class readings, discussions, or assigned problems, I will ask that you come see me about your concerns/questions during office hours.

Notes on the Calendar

Date(s)	Events
7 Feb (†)	First Assignment Distributed
14 Feb	*Tentatively* no class
15 Feb (†)	First Assignment Due
1 Mar (†)	Project Proposal Due
9 Mar - 17 Mar	Spring Break
21 Mar (†)	Second Assignment Distributed
29 Mar (†)	Second Assignment Due
23 & 25 April	Structured Poster Presentations
25 Apr	Final Project Due

(†) These dates are subject to slight change, depending on course progress.