Psychology 607: Multilevel Modeling
Spring 2019, LISB 217, M/W 11:30 – 12:50* (*except May 8)*

Instructor Information

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Course overview

This course is intended to provide you with a thorough conceptual understanding of random coefficient multilevel modeling and to acquaint you with some of the mathematical and statistical underpinnings of this technique. In addition, this course will give you the opportunity to gain significant hand-on experience with the statistical software used to analyze multilevel models. My goal is that, by the end of the course, you will be sufficiently familiar with this class of models to be able to apply them independently to your own data and critically evaluate empirical articles that employ these kinds of analyses.

Course Organization and Requirements

Recommended Background

The prerequisite for this class is a graduate course in multiple regression analysis. Multilevel analysis has developed out of the basic regression framework, and the concepts of multiple regression analysis often have multilevel analogs. Of course, not all graduate regression courses cover the same material. The lecture on estimation techniques and algorithms will assume familiarity with the matrix formulation of the regression equation, and the lecture on categorical outcomes will assume basic exposure to logistic regression techniques. If you are unfamiliar with matrix multiplication, the expression $b=(X'X)^{-1}X'y$, logistic response functions, or odds ratios, I would strongly suggest that you review the relevant sections of a basic regression text. For example, check out:

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (1983). Applied multiple regression/correlation analysis for the social sciences. Hillsdale, NJ: Erlbaum.

Required Readings

Albright, J. J., & Marinova, D. M. (2010). Estimating multilevel models using SPSS, Stata, SAS, and R. *Indiana University*.

Hayes, A. F. (2006). A Primer on Multilevel Modeling. *Human Communication Research*, *32*(4), 385–410. doi:10.1111/j.1468-2958.2006.00281.x

Raudenbush, S.W., & Bryk, A.S. (2002). Hierarchical linear models: Applications and data analysis methods, 2nd ed. Thousand Oaks, CA: Sage. (*Called "R&B" in schedule below*.)

Additional substantive articles in preparation for class discussions and special topics (e.g., using R or dyadic analysis). These will be posted to Canvas.

Homeworks

Performance in this course will be evaluated through four brief homework assignments. Homework assignments are due (to Canvas) as outlined in the Course Schedule below. The HW assignments will be annoying but highly educational. I strongly recommend you begin work on the homework assignments as soon as they are handed out rather than waiting until shortly before the due date. This will allow you enough time to complete the homework and an opportunity to ask questions in class or during my office hours and still turn the assignment in on time. Late assignments will only be accepted with prior permission, and no late assignments will be accepted after graded assignments have been returned to the class.

Grading

Total homework points will determine your course grade. Your scores will be combined and weighted to yield one score out of 100%. I will average the top 10 scores from class and use that number to determine the cutoff for letter grades. To get an A- you will need to get 90% of the average top score, to get a B- you will need to get 80% of the top score, and so on. If everyone does poorly on the paper nobody suffers, and it is also possible for every single person to get an A (since you could all do as well as 90% of the mean of the top 10 students).

Computing

Every homework assignment will involve substantial computing work. In this course, our primary tools will be R/RStudio and associated packages. Current versions of both programs are available in the Psychology computing labs. If you are using your own computer and software, make sure that you have R with the lme4 package (the current version of R is 3.5.3 and of lme4 is 1.1-18.1). R documentation for multilevel modeling can be found all over the internet and particularly good resources will be posted on the course website.

Course Website

The Canvas site for this course is at **http://canvas.uoregon.edu.** All readings, documents, lectures, articles for discussion, and homework assignments will be posted there.

Other Policies

Late/missed assignments. There are 4 homeworks. The due dates are shown on the calendar. Late assignments will not be accepted unless previously arranged for good reason.

Plagiarism/cheating. Always unacceptable and defeats the purpose of graduate school. Seriously please don't do this. I will respect you much more if you simply tell me that you are unable or unwilling to do the homeworks than if you cheat.

Students with special needs. The UO works to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in disability-related barriers to your participation, please notify me as soon as possible. You may also wish to contact Disability Services in 164 Oregon Hall at 346-1155 or disabsrv@uoregon.edu.

Course Schedule and Readings

Month	Day	Topic	Reading	HW Due
April	1	Multilevel data tangles with traditional analytic approaches		
	3	Precursors to the random coefficient model for multilevel data		
	8	The two-level random coefficient model and its submodels	R&B Ch 2, 4, 5	
	10	Computation! Precursors in R		
	15	Hypothesis testing and examples	R&B Ch 3	HW1
	17	Articles	TBA on Canvas	
	22	Shrinkage estimators	R&B Ch 4 85-94, Ch 5 152-158	
	24	Centering I	R&B Ch 2 31-35, Ch 5 134-149	
	29	Centering II		
May	1	Categorical DVs	R&B Ch 10	
	6	Growth modeling I (*Special guest lecture!*)	R&B Ch 6	HW 2
	8	Growth modeling II (*Special guest lecture!*) **Special time: 12 – 1:20pm**		
	13	Articles	TBA on Canvas	
	15	Diary data		
	20	Cross-classification	R&B Ch 12	HW 3
	22	Estimation techniques and algorithms Assumption violation and diagnostics	R&B Ch 9 pp. 259-284	
	27	*NO CLASS Memorial Day*		
	29	Power and sample size issues		
June	3	*NO CLASS Elliot OOT*		
	5	Articles	TBA on Canvas	
	10			
Finals Week	*12*	**HW 4 due at 5pm PST**		