PSY-64600: Multilevel Modeling
Spring 2018, Purdue University

Course Objectives

The goals of this course are to familiarize students with (1) generalized linear mixed (multilevel) models that are often used in the social sciences, and (2) best practices in the models' applications and interpretations. These models are extensions of classic linear regression models, and they go by many names: multilevel modes, hierarchical models, mixed models, etc. Throughout the course, models and methods will be introduced conceptually and will be illustrated using real and simulated data.

At the end of this class, students should have working knowledge of linear and generalized multilevel models and be able to competently apply and interpret such models in the analysis of their own research data.

Course Requirements & Grading

Students will read a contemporary text and various articles on the development and application of multilevel models. They will complete eight structured data analysis assignments and submit brief written reports of results (5% each; 40% total). Using a problem and a dataset of their own choosing, students will design and carry out an analysis of data using multilevel modeling. They will present their results in a seminar session of the class (15%), and they will report their results in a formal scientific paper following APA guidelines (45%).

Instructor
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Time and Place
Lecture: M 9:30-11:20 Room 3102 (Psychological Sciences Building)
Lab: T 9:30-10:20 Room 255 (Peirce Hall)

Prerequisites
Graduate coursework in regression and ANOVA, or by permission.

Texts
Snijders, T.A.B., & Bosker, R.J. (2012). *Multilevel analysis: An introduction to basic and advanced multilevel modeling* (*2nd ed.*). Sage.
Gelman, A., & Hill, J. (2007). *Data analysis using regression and multilevel/hierarchical models*. Cambridge.

Other Readings (*Assigned with week noted in parenthesis)

*(14) Bauer, D.J., Preacher, K.J., & Gil, K.M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychological Methods, 11*(2), 142-163.

*(12) Burke, C. T., Shrout, P. E., & Bolger, N. (2007). Individual differences in adjustment to spousal loss: A nonlinear mixed model analysis. *International Journal of Behavioral Development, 31*(4), 405-415.

*(8) Cranford, J. A., Shrout, P. E., Iida, M., Rafaeli, E., Yip, T., & Bolger, N. (2006). A procedure for evaluating sensitivity to within-person change: can mood measures in diary studies detect change reliably?. *Personality and Social Psychology Bulletin, 32*(7), 917-929.

*(13) Cudeck, R., & Harring, J. R. (2007). Analysis of nonlinear patterns of change with random coefficient models. *Annual Review of Psychology, 58*, 615-637.

*(3) Curran, P. J., & Bauer, D. J. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. *Annual Review of Psychology, 62*, 583-619.

*(3) Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods, 12*(2), 121-138.

*(14) Gleason, M. E., Iida, M., Shrout, P. E., & Bolger, N. (2008). Receiving support as a mixed blessing: Evidence for dual effects of support on psychological outcomes. *Journal of Personality and Social Psychology, 94*(5), 824-838.

*(13) Harring J. R., & Blozis, S. A. (2016). A note of recurring misconceptions when fitting nonlinear mixed models. *Multivariate Behavioral Research, 51*(6), 805-817.

Hox, J. (2010). *Multilevel analysis: Techniques and applications, 2nd Edition*. Mahwah, NJ: Erlbaum.

*(2) Lord, F. M. (1967). A paradox in the interpretation of group comparisons. *Psychological Bulletin, 68*(5), 304-305.

*(14) Preacher, K. J., & Selig, J. P. (2012). Advantages of Monte Carlo confidence intervals for indirect effects. *Communication Methods and Measures, 6*(2), 77-98.

*(14) Stroup, W. W. (2015). Rethinking the analysis of non-normal data in plant and soil science. *Agronomy Journal, 107*(2), 811-827.

Policies

- Attendance: This is an elective graduate class. If you do not want to be here, then drop the class. If you want to be here, come to class.
- Missing class: If you miss class or lab, it is your responsibility to know all material covered and find out what announcements have been made. Classmates are helpful.
- Assignments: Assignments are to be handed in on the specified date. There will be a penalty of 20% off of the earned credit for every day late (i.e. 1% of final grade for each day).
- Collaborating: You can, and are even encouraged to, collaborate on assignments. However, each student is responsible for handing in his/her own assignment in his/her own words/syntax. You cannot collaborate on the final project.
- Class materials: Presentations, data, and syntax/code (unless otherwise credited) are subject to the instructor's copyright and should not be sold or shared without my permission. Similarly, please do not record me without my permission. If you need special accommodations, please see me at the onset and/or provide appropriate documentation.

- Purdue's Honor Pledge: Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breeches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern. "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

CAPS Information

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 and http://www.purdue.edu/caps/ during and after hours, on weekends and holidays, or through its counselors physically located in the Purdue University Student Health Center (PUSH) during business hours.

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Schedule

	Week	Topic	Reading	Assignment due (Mondays)
1	01/08/18	Overview, review, core concepts, clustered data	SB Ch1-3; GH Ch1-2	
2	01/15/18	MLK Day (no class)		
3	01/22/18	Random intercept model/RM ANOVA/MANOVA	SB Ch4; GH Ch11,22	Ex1: Plots, expectations
4	01/29/18	Hierarchical linear model	SB Ch5; GH Ch12-13	Ex2: Compare approaches
5	02/05/18	Model specification	SB Ch6,8; GH CH12,24	Ex3: Random effects
6	02/12/18	Model checking	SB Ch10	Ex4: Testing hypotheses
7	02/19/18	Model checking	SB Ch10	
8	02/26/18	Variance decomposition	SB Ch7,13	Ex5: Testing assumptions
9	03/05/18	Power analysis	SB Ch11; GH Ch20	Ex6: Reliability; **Project idea**
10	03/12/18	Spring Break (no class)		
11	03/19/18	Longitudinal MLM	SB Ch15	Ex7: *N* versus *n*
12	03/26/18	Longitudinal & Generalized MLM	SB Ch15,17; GH Ch17	
13	04/02/18	Generalized MLM	SB Ch17	Ex8: Trajectories
14	04/09/18	Multivariate MLM/Multilevel Mediation		**Paper draft**
15	04/16/18	Open questions/Project presentations		
16	04/23/18	Project presentations		
17	04/30/18			**Final paper**

SB = Snijders & Bosker
GH = Gelman & Hill