PSY 610.S25 Seminars in Special Topics: Multi-Level Models (MLM)
Fall 2018
3 credits
Tues/Thurs 10:00am-11:20am
FREY 326

Instructor
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COURSE DESCRIPTION

The purpose of this special topics course is to familiarize students with the general linear model (multilevel model, hierarchical linear model, latent growth curve model, random coefficients model) that is commonly used to analyze data from longitudinal, repeated measures, and hierarchical designs. The course is organized to take students through each of the cumulative steps in a multilevel analysis: deciding with type of model is appropriate, setting up the data file and coding variables, fitting models, evaluating fixed and random effects and/or alternative covariance structures, predicting between- and within-person variation using covariates, and interpreting and displaying empirical findings. By the end of the semester, students should have acquired enough background knowledge and technical expertise to apply these models in practice.

LEARNING OBJECTIVES

The key objective in this course is for students to acquire the skills necessary for implementing statistical analyses. Emphasis will be placed on the linkage of substantive theories to statistical models by discussing how to formulate testable hypotheses, assess model assumptions, and interpret output from SAS. By the end of the course, students should be able to:

- Describe and identify nested or hierarchical data structures
- Write equations in both mixed/composite and multilevel/hierarchical formats
- Decompose within and between person variance
- Interpret fixed and random effects
- Discuss implications of centering time-varying predictors
- Conduct analyses in longitudinal and intensive repeated measures datasets using SAS and interpret results
- Present analytic plan, methods, and results of MLM analysis in clear and accurate way

READINGS

Abbreviation	**Selected chapters from:**
Hox	Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). New York, NY: Routledge. ISBN-10: 1848728468 | ISBN-13: 978-1848728462.
BR	Raudenbush, S. W., & Bryk, A. S. (2001). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage. ISBN-10: 076191904X | ISBN-13: 978-0761919049
SB	Snijders, T., & Bosker, R. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. Thousand Oaks, CA: Sage. ISBN 0-7619-5889-4, ISBN 0-7619-5890-8
SW	Singer, J. D. & Willet, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, NY: Oxford University Press.
Abbreviation	**Other assigned readings may include (these may also be useful for your projects or future work):**
	Wolfinger, R., & Chang, M. (2016). Comparing the SAS GLM and MIXED procedures for repeated measures. Retrieved from: https://stats.idre.ucla.edu/wp-content/uploads/2016/02/mixedglm.pdf
	Carriere I., & Bouyer, J. (2002). Choosing marginal or random effects models for longitudinal binary responses: application to self-reported disability among older persons. *BMC Medical Research Methodology*, *2*:15.
	Hoffman, L. (2007). Multilevel models for examining individual differences in within-person variation and covariation over time. *Multivariate Behavioral Research*, *42*(4), 609-629.
	MacCallum, R. C. & Kim, C. (2000). Modeling multivariate change. In T. D. Little, K. U. Schnabel, & J. Baumert (Eds.), *Modeling longitudinal and multilevel data* (pp. 51-68). Mahwah, NJ: Lawrence Erlbaum.
	Singer, J. D. (1998). Using SAS PROC MIXED to fit multilevel models, hierarchical models, and individual growth models. *Journal of Educational and Behavioral Statistics*, *24*(4), 323-355.
	Sliwinski, M.J., Almeida, D.M., Smyth, J.M., & Stawski, R.S. (2009). Intraindividual change and variability in daily stress processes: Findings from two measurement-burst diary studies. *Psychology and Aging*, *24*, 828-840
	Schwartz, J. E., & Stone A. A. (2007). The analyis of real-time momentary data: A practical guide. In A. A. Stone, S. Shiffman, A. A. Atienza, & L. Nebeling (Eds.), *The science of real-time data capture. Self-reports in health research*. New York, NY: Oxford University Press.
BL	Bolger, N., & Laurenceau, J. P. (2013). Intensive longitudinal methods. *New York, NY: Guilford*. http://www.intensivelongitudinal.com/
Hoffman	Hoffman, L. (2015). *Longitudinal analysis: Modeling within-person fluctuation and change*. Routledge. http://www.pilesofvariance.com/index.html

Additional readings will be added as needed.

ASSIGNMENTS AND GRADING POLICY

HOMEWORK

Homework assignments will be described in class and posted on our course's shared googledrive. Students submit assignments by uploading their materials to their designated folder in googledrive. Unless otherwise noted, these assignments should be submitted by the start of the class period after they were assigned. We will typically discuss assignments in the following class – bring along your code and output to make notes during this discussion. Many of these assignments involve analyzing sample datasets in SAS and interpreting results. We have arranged for SAS access on students' PC laptops (unfortunately, SAS is not available on Macs) and for SAS to be available on computers in the PSYA-141 classroom for student use.

Homework assignments will be graded on a 0-2 point scale. 0 represents inadequate performance. 1 represents mostly successful performance (homework completed but with notable errors or insufficient information). 2 represents fully successful performance. Partial credit will be given. The lowest homework grade will be dropped. No homework assignments will be accepted after the due date. At present, a minimum of 5 homework are planned.

MIDTERM EXAM

The midterm exam will test students' mastery of the theory and skills developed to date. These are essential for students' completion of the final project. The midterm involves analyzing a sample dataset in SAS, interpreting results, and answering questions based on these analyses and results.

MLM PROJECT

Each student will complete a project for the course that applies MLM to a topic of the student's choosing. This project involves several steps--including peer review--which will be submitted throughout the semester. More information on each of these steps will be made available in the course's shared googledrive.

GRADING

Course grades will be determined as follows:

Homework	20%
Midterm	40%
Project	40%

ATTENDANCE

Attendance does not directly contribute to points earned. Students, however, are strongly advised to attend every class session. The class sessions build upon each other – frequently reviewing prior material in order to extend to the next application.

CHANGES TO SYLLABUS
The instructor reserves the right to modify the course syllabus if necessary and will make formal announcements of these changes in class and provide written notice of changes via email. The most up-to-date version of the syllabus will always be posted on the course googledrive. Students are responsible for noting these changes.

The instructor follows Stony Brook University requirements, including those described in the following statements:

Student Accessibility Support Center Statement
If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Student Accessibility Support Center. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities.

Academic Integrity Statement
Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Instructor's Note: Students should feel free to discuss the readings, lectures, analyses, and ideas outside of class. In and out of class, students are encouraged to work together on challenging issues. Students may collaborate on homework assignments but each student must submit an assignment with original and unique answers. Students may assist each other with projects – indeed, we have two peer review assignments to facilitate this kind of feedback this semester – but each student must submit a totally original and unique project. See above SBU Academic Integrity Statement.

Critical Incident Management
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most

academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

INITIAL COURSE SCHEDULE

(this schedule--including due dates--<u>will</u> change depending on class pacing and students' needs)

Day	Date	Topic	Reading (for next class)	Assignment (due next class)
Tues	Aug. 28	Course Overview & Rationale for MLM	Hox Ch 1 (or SB Ch 2)	
Thur	Aug. 30	Intro to SAS		
Tues	Sep. 4	Regression/GLM Review - BP	Wolfinger & Chang	HW 1: GLM Review & SAS Basics
Thur	Sep. 6	Regression/GLM Review WP (I)	Wolfinger & Chang	Try it: re-run code from lecture
Tues	Sep. 11	Regression/GLM Review WP (II)	Hox Ch 2 (or WS Ch 3 or SB Ch 4)	HW 2: GLM Review WP Part 2
Thur	Sep. 13	Introduction to MLM for repeated measures	Hox Ch 2 (or WS Ch 3 or SB Ch 4)	Try it: re-run analyses w/age centered at 11 & compare results
Tues	Sep. 18	Fitting MLMs (& adding predictors)	Hox Ch 4 (pp. 54-69) (or SB section 4.5, or BR pp. 31-37,134-142)	HW 3
Thur	Sep. 20	Centering (pt 1)		Try it: questions at end of lecture 7 slides so you can follow along with lecture 8
Tues	Sep. 25	More Centering (pt 2)	**Project Step 1 due today!**	HW 4: The within and between of it
Thur	Sep. 27	Even More Centering (pt 3)	Sliwinski, Hoffman, & Hofer (2010) AND Hox section 5.6.3 (short)	Try it: estimate commands for High/Low N intercept & slope
Tues	Oct. 2	Centering (pt 4 - interactions & age convergence)		HW 5: Age Convergence (due Oct. 9). Hard copy of Project Step 2 due next class.
Thur	Oct. 4	**Peer Review: IN-CLASS WORK DAY**	Bring your APA manual, e-copy of your Step 2, class notes	**By 11:59 pm Oct. 4:** 1: Submit Review sheet & track changes doc to classmate. 2: Submit Review sheet to your HW folder. **Oct. 11:** Revised Step 2 due.
Tues	Oct. 9	**FALL BREAK**	**NO CLASS**	
Thur	Oct. 11	Age convergence & variance components	**Revised Project Step 2 due today!**	HW 5: continued

Tues	Oct. 16	Age convergence & introduction to the Design Matrix	Hoffman (2007)	Try it: questions at end of lecture 12 slides so you can follow along with lecture 13
Thur	Oct. 18	Design Matrix & Outline for Review		Try it: re-run analyses from lecture 13 slides
Tues	Oct. 23	Review Day 1		
Thur	Oct. 25	Review Day 2		
Tues	Oct. 30	Review Day 3		Midterm distributed (due Nov. 6)
Thur	Nov. 1	Dispersion/Heterogeneous Variance Models		Try it: questions at end of lecture 18 slides
Tues	Nov. 6	Dispersion Models cont'd	**Midterm Due today!**	
Thur	Nov. 8	Lag Models		
Tues	Nov. 13	Lag Models, 3 Level Models	Hox pp. 35-37 (dataset description)	Try it: questions at end of lecture 21 slides
Thur	Nov. 15	**Peer Review: IN-CLASS WORK DAY**	Bring your APA manuals, e-copy of your Step 3, class notes	**By 11:59pm Nov. 15:** 1: Submit Review sheet & track changes doc to classmate. 2: Submit Review sheet to your HW folder. **Nov. 27:** Revised Step 3 due.
Tues	Nov. 20	3 Level Models		
Thur	Nov. 22	**THANKSGIVING DAY**	**NO CLASS**	
Tues	Nov. 27	3 Level Models for Change		
Thur	Nov. 29	3 Level Models for Change Part 2	**Revised Project Step 3 due today!**	
Tues	Dec. 4	Measurement Burst Designs		
Thur	Dec. 6	Measurement Burst Designs & Power Analysis		Project_Step_4: Final Revised Hyp, Analytic Approach, Methods, Results, References
Fri	Dec. 15	**Final MLM (Step 4) Project due today by 11:59pm**		