PSYC216A Multivariate Statistics (II)
Applied Hierarchical Linear Models

Department of Psychology
Brandeis University
Spring 2014

Dr. Xiaodong Liu

Lectures: Monday, 9:00am – 11:50pm, Goldfarb Library room 230
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Office hours: Tuesday & Thursday 1:30-2:30 or by appointment
Teaching Assistant: Monika Lohani, mlohani@brandeis.edu, Office hours: TBA

Course Description

This course is devoted to the introduction and application of Multi-level Modeling (MLM)/Hierarchical Linear Models (HLM). The broad object of the course is to acquaint students with the basic theory, methods, and most importantly, applications of MLM / HLM by using SPSS & HLM (related codes for SAS, R, and STATA will also be given as reference for those of interest). More specifically, this course is designed to (a) acquaint students with the basic logic of the multi-level models; (b) help students understand the circumstances under which MLM/HLM should be applied; (c) enable students to master the basics of software (mainly SPSS & HLM) for the application of multi-level models; (d) expose students to the literature in which MLM/HLM techniques have been used; and (e) expose students to a number of more advanced extensions of HLM (such as cross-classified model and hierarchical generalized linear models).

Learning Objectives and Expected Skill Development

Students who successfully complete this course will be able to:
1) Understand the concepts and principles related to the statistical models covered in this course, including: general linear model, two-level & three-level HLM models, and cross-classified model;
2) Know how to set up and do related data analysis in SPSS and HLM;
3) Read/interpret the results/output in SPSS and HLM;
4) Write statistical report, and
5) Communicate the related statistics to general audiences.

Prerequisites

This is an advanced applied statistic course. Students should have successfully finished PSY210A and PSY210B or equivalent courses.

Class Format

Class meetings will consist of lectures, discussions, and programming practices with computer demonstration and computer lab work.
Textbook & references:

Required:

Recommended (as references):

Computing
Most of the work in this course will be done by using the statistic packages SPSS & HLM. Students also have the option to use SAS, R, or STATA.

Course requirements:
Students enrolled in this course will be expected to: (a) attend all classes; (b) complete assigned readings at the appropriate time; (c) complete at least four assignments (short memos) by the designated deadline. Students who would like to practice working collaboratively may do the assignment together and submit a joint work with one other student; (d) complete a brief (about 15 minutes) class presentation (details will be given in class); and (e) submit a final paper (a research proposal using HLM or a paper with empirical data). Students will be evaluated on their performance on class participation (10%), assignments (60%), the class presentation (15%), and the final paper (15%).

Academic integrity
Academic integrity is central to the mission of educational excellence at Brandeis University. Each student is expected to turn in work completed independently, except when assignments specifically authorize collaborative effort. It is not acceptable to use the words or ideas of another person – be it a world-class philosopher or your lab partner – without proper acknowledgement of that source. This means that you must use author citations, endnotes, and, where appropriate, quotation marks to indicate the source of any phrases, sentences, paragraphs, or ideas found in published volumes, on the internet, or created by another student.

Violations of University policies on academic integrity, described in Section Three of Rights and Responsibilities, may result in failure in the course or on the assignment, or in suspension or dismissal from the University. If you are in doubt about the instructions for any assignment in this course, it is your responsibility to ask for clarification.

Special needs
Students with a documented disability on record or with special other needs who wish to have a reasonable accommodation made for this class, please see the instructor.
Course Outline (subject to change)

1/13: Introduction: Theoretical & statistical considerations for Multilevel Models
Readings: L (pp. 1-9); SB (Ch.s 1&2)

1/20: No class (Martin Luther King’s Day)

1/27: From GLM to MLM: the null/unconditional model, ICC
Readings: L (pp. 9-17); SB (Ch.3)

2/3: Random intercept models (regression with means-as-outcomes)
Readings: L (pp. 9-17); HTT(Ch.3, pp. 61-86), SB (Ch.4)

2/10: Random-coefficients (intercepts-and Slopes-as-outcomes) models, reliability of the estimate
Readings: L (pp. 9-17); HTT(Ch.3, pp. 61-110); SB(Ch.5)

2/17: NO class (Brandeis winter break)

2/24: Principles of estimation and hypothesis testing, Empirical Bayes/shrinkage estimator
Readings: L (pp. 23-37 & 42-47); SB (Ch.s 6,7,12)

3/3: Assumptions and assessing the adequacy of hierarchical models
Readings: L (pp. 17-23 & 37-42); SB (Ch. 8&10)

3/10: Centering in HLM
Readings: L (pp. 48-53); HTT(Ch.2)

3/17: HLM modeling approaches, Three-level models
Readings: HTT(Ch.4)

3/24: HLM for longitudinal data / latent growth curve models
Readings: HTT(Ch.s 5&6); SB (Ch. 15)

3/31: Hierarchical Generalized Linear Models (I)
Readings: L (pp.53-59); SB (Ch. 17); HTT(2012) (Chs. 1-4)

4/7: Hierarchical Generalized Linear Models (II)
Readings: L (pp. 53-59); SB (Ch. 17); HTT(2012)(Chs. 6&7)

4/14: Hierarchical Multivariate Linear Models (HMLM): HLM for latent variables, Log-linear model
Readings: HTT(Ch.7); SB (Ch. 16)

4/21: NO class (Brandeis vacation week)

4/28: Cross-classified MLM, Latent class models
Readings: HTT(Ch.8); SB (Ch. 13)

Final project due on Monday, May 5.