

Syllabus *Advanced Statistical Modeling*

EDP 381D
Unique Number: 10790
Fall, 2016

Course Description:

The course is designed to introduce students to more advanced extensions of some of the models covered in introductory multilevel modeling and other statistical courses offered in the Quantitative Methods program. The objective is for each student to develop a familiarity with each of these models as a starting point for using the models themselves and for the critical evaluation of others' use of these models. Beyond introducing students to some of the more advanced statistical models, this course is designed to expose students to methodological research – how such research is developed, designed and conducted and to offer students the opportunity to start conducting their own methodological research. This particular course will focus primarily on extensions to the multilevel model to handle **complex data structures**.

The first part of the course is designed to introduce students to each of a few advanced statistical models. This coverage will focus mostly on use and interpretation of relevant parameters and on appropriate model selection given the researchers' data structure and analytic research questions. Discussions will focus on the ideas that drove derivation of these model extensions. During the remainder of the course each student will select an advanced model or models and design an associated methodological study.

Pre-requisites:

Pre-requisites include successful completion of both a multilevel modeling course and a structural equation modeling course, or consent of instructor.

Mathematical/Statistical skills: This course requires use of several intermediate graduate-level mathematical/statistical skills. Students are required to have mastered basic structural equation and multilevel modeling as well as the fundamentals of matrix algebra. In this class, you will not be provided with an in-depth review of these concepts.

Computer programs: Given many of the models that will be discussed are founded in the multilevel modeling framework, an introduction to use of MLwiN software will be provided. There is a free 30-day trial version (see <http://www.bristol.ac.uk/cmm/software/mlwin/download/>) of MLwiN that students can download once that material is being covered. Note, however, this course is not designed to teach students how to use specialized software for estimating the models being mastered. Students will be directed to the software and associated resources that can be used to estimate the relevant models (e.g., MLwin, Mplus). Students are expected to have the expertise to figure out how to use the relevant specialized software or write their own estimation code to conduct their real data analysis (see *Assignments* section). As part of their research presentations, students are expected to show tips on how to use the software or estimation code that they used for their own project.

Meeting time and location:

Days: Tuesdays and Thursdays

Time: 11-12:30pm*

Location: SZB 444

Instructor:

Name: Dr. Tasha Beretvas

Office: SZB 538E

Office hours: Wednesdays, 2-3:30pm*, and by appointment

E-mail: tberetvas@austin.utexas.edu

Note: Do not call me. I don't answer my office phone. Please use email for correspondence.

*Due to prior professional commitments, there are a few class and formal office hour times when I will be out of town and thus unavailable. For missed formal office hours, please contact me in advance to set up an additional appointment. For missed class times, I will post a video of the missed lecture or have a colleague cover missed material and will provide any activities that might support your independent learning during my absence.

Missed office hours will include: 9/28; 10/12; 10/19

Missed face-to-face classes will include: 10/20; 11/22

Last, my sincerest apologies in advance, however, unfortunately my schedule is typically very full. As soon as you know that you might need to meet with me outside of regularly scheduled office hours, please be sure to email or talk to me suggesting a date/time for an appointment.

Course Materials

Required: Chapters and articles will be posted on Canvas (<http://canvas.utexas.edu/>). You can access Canvas (and all other campus resources) through my.utexas.edu (a new UT system). The site is mobile-responsive and is also accessible through the redesigned UT iPhone and Android app.

Required: Access to and familiarity with APA Style manual (6th edition).

Optional: Class handouts matching the overheads used by the instructor will be made available on Canvas by 10am on the day of the relevant class.

Assignments:

There are multiple assignments including:

- Readings (ungraded)
- Article summary (5%)
- Real data analyses (10%)
- Methodological project (75%):
- Review of another student's project (10%)

Readings

Readings have been assigned for almost every topic covered (see *Topics*). Students may choose to read the selections either before or after the class sessions, whichever better helps you to solidify learning. If you choose one of the topics for your methodological project, I'd strongly recommend you read each reading particularly carefully and use the references and you should supplement these readings (do your own research to find additional sources).

Article Summary

This summary is designed to provide students with practice composing the start of a literature review for a methodological article. Students will be given a week to complete the summary. The summary is expected to be no more than four double-spaced pages in length, to follow APA Style recommendations, and to be written clearly and well. A rubric will be assigned to help guide contents of the article summary.

The intent of this assignment is to provide students with the opportunity to practice reading and deeply understanding the contribution of a pair of related articles, as well as practice at summarizing methodological research articles' findings and at identifying areas for future methodological research based on what was done (or not done) and found (or not found).

(The article summary will be worth **5%** of the final grade)

Real Data Analyses

Given a good portion of the new material that will be covered will focus on extensions to the multilevel model and use of MLwiN software will be introduced, this assessment is intended to encourage students to actively use MLwiN – including setting up data for analysis – and to practice formulation of these model extensions and interpretation of resulting parameters.

(This real data analysis assignment will be worth **10%** of the final grade)

Methodological Project

The methodological project is designed for students to delve more deeply into the relevant topic they choose and to learn how to design a methodological study of interest. This project will also involve the student's mastering the relevant software needed to conduct an analysis of some real data. This particular assignment requires the student to conduct research on one of the advanced models and to write up a description of the proposed research. The project will include both an analysis of a real dataset and a proposal for a simulation study. The final project should be considered as a proposal for publishable research. Projects must constitute new work on the part of each student. In other words, projects already started for assignments like the QP proposal or research with other faculty cannot be used for this assignment. The final product is expected to be about 20-30 double-spaced pages in length.

The final score for the project includes the following components:

- 1) Progress Checks (**10%**)
- 2) A review of the methodological literature pertinent to and supporting the need for the study (**30%**)
- 3) A method section detailing the real data analysis (**15%**)
- 4) A results section detailing the results of the real data analysis (**10%**)
- 5) A method section detailing the proposed simulation study (**25%**)
- 6) Discussion of proposal (expected results, future research, limitations) (**5%**)
- 7) A short (12-minute) presentation of the proposed study (**5%**)

(The final methodological project score will be worth **75%** of the final grade)

Progress Checks will be conducted weekly upon completion of the discussion of new models. These (very) informal “presentations” or write-ups will consist of the students sharing a description of the progress they’ve managed on their projects either to the whole class or in small groups. These progress checks will also provide fellow students and the instructor with the opportunity to provide critical feedback and are designed to keep students on track for completing their projects.

Presentation Each student will provide a short (not longer than 12 minutes) formal presentation of their methodological project during the last week of semester. Other faculty and students from the Quantitative Methods area will be invited to attend these presentations. Guidelines for the presentation will be provided. Regardless of your choice of career after obtaining your PhD, you will be expected to present your research so this provides an opportunity to practice doing so. Note additional, more informal presentations will be required throughout the semester to share progress and receive feedback from the instructor and fellow students.

Review of Another Student’s Project

Each student will also write up a **formal review** of the components of a fellow student’s proposed study. Review of others’ research (conference proposals and manuscripts submitted for publication) is a critical skill required of most doctoral level researchers. Reviews will be anonymous to the recipient (although not to the instructor!). There will be **tight deadlines** for providing feedback in the review of the components. In some cases, the component will be distributed on a Tuesday with the review due two days later (that Thursday).

(The Review will be worth a total of **10%** of the final grade).

Academic writing

This course includes an unusually large writing component (the methodological project and each of its components). Thus, students are encouraged to check with the [Sanger writing center](#) which does have some resources to support graduate students’ writing. In addition, students will be expected to follow the most recent APA style for all assignments as required in most publication outlets.

Class Behavior

Students may use laptops in class to take notes only. I would find it difficult to take notes online because while easy to type text, it is easier to draw explanatory pictures and graphs, and to hand-write equations. However, if you do find it easier to type notes, then you may use your laptops during class. That being said, I still expect professional use thereof including **no email, web surfing, use of Facebook, instant messaging, nor any other electronic activity during class time**. Cell phones should also be completely silenced, including loud vibrations, and they should not be used for texting in class. If you need to have the cellphone turned on due to personal emergency possibilities (child- or elder-care) then just let me know and that is, of course, acceptable.

Makeup Assignments:

Only in exceptional circumstances and only with **prior** permission from the instructor, or with a verifiable medical excuse, will students be able to hand in an assignment late. If a student is granted permission to hand an assignment in late, they will still be **penalized 10%** of the assignment's grade for every day after the due date. Without permission or the medical excuse, the student will receive a **zero** for the missed assignment.

If a student becomes ill on the day that an assignment is due, it is the **student's responsibility** to contact the instructor and to arrange delivery of the assignment by the time it is due. In this case, if the assignment is not complete, then the student will receive credit only for what was attempted. If a student misses class when a project check is scheduled, they must submit their progress check to the instructor. It is important to complete assignments **before** the day on which they are due.

Religious holy days sometimes conflict with the scheduling of class meetings and assignments. It is the policy of The University of Texas at Austin that a student must notify the instructor of their pending absence **at least 14 days prior** to the date of the religious holy day's observance. If a student has to miss a class, assignment's due date, or examination to observe a religious holy day, then the student will be given an opportunity to complete the missed work within a reasonable time after the absence. However, it is the student's responsibility to consult the instructor (as noted earlier, in advance of the holy day) to re-schedule a new deadline.

Grading System:

Grades are assigned based on percentage of accumulated points:

A : 93-100; **B+**: 86-89; **C+**: 76-79; **D**: 60-69; **F**: 0-<60
A-: 90-92; **B** : 83-86; **C** : 73-76;
 B-: 80-82; **C-**: 70-72;

Graduate students must receive a minimum overall grade of a **B-** (i.e. 80%) to be awarded credit (**CR**) for the course.

Attendance:

Students are responsible for all material covered during class time. It is expected that students will attend class, however attendance will not be taken. If a student misses a class, then the **student is responsible** for obtaining both the course material that was missed as well as any class announcements from his/her classmates.

Students are expected to arrive on time for the beginning of class. Students anticipating late arrival should notify the instructor before class. A pattern of tardiness can negatively affect your grade.

If a student cannot attend a class on the day that an in-class assignment is due, then the student is responsible for notifying the instructor **in advance** and arranging timely delivery of the assignment.

Scholastic Dishonesty Policy: All ***graded*** assignments **must** be the work of the individual student. As noted earlier, the methodological project must entail a **new study** for the student. Practice in class and readings provide opportunities for collaboration; graded assignments do not.

The University defines academic dishonesty as cheating, plagiarism, unauthorized collaboration, falsifying academic records, and any act designed to avoid participating honestly in the learning process. Scholastic dishonesty also includes, but is not limited to, providing false or misleading information to receive a postponement or an extension on a test or other class assignment, and submission of essentially the same written assignment for two courses without the prior permission of faculty members.

By accepting this syllabus and participating in this course, you have agreed to these guidelines and ***must*** adhere to them. Students who violate University rules on scholastic dishonesty will receive an F for the course grade, be referred to the appropriate university officials, and may receive a maximum penalty of suspension from the University. For more information on scholastic dishonesty, students may review the Student Judicial Services web-site: <http://catalog.utexas.edu/general-information/the-university/#universitycodeofconduct>).

Disability Accommodation

Students who have a documented disability that may impair their ability to complete assignments or otherwise satisfy course criteria are encouraged to meet with the course instructor to identify, discuss and document any feasible instructional modifications or accommodations. They must notify the instructor no later than the end of the second week of the semester/term in which the course is offered. Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259, <http://www.utexas.edu/diversity/ddce/ssd/>

Emergency Evacuation Policy

Occupants of buildings on the UT Austin campus are required to evacuate and assemble outside when a fire alarm is activated or an announcement is made. Please be aware of the following policies regarding evacuation from the Office of Campus Safety and Security, 512-471-5767, <http://www.utexas.edu/safety/>

- Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors.
- Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- Behavior Concerns Advice Line (BCAL): 512-232-5050
- Link to information regarding emergency evacuation routes and emergency procedures can be found at: utexas.edu/emergency.

Campus Carry See [campus carry website](#) and get signatures on [acknowledgment form](#).

Tentative List of Topics, Readings and Assignment Deadlines

Date	Topic	Readings	Assignment
8/25	Course Introduction	Hoogland & Boomsma (1998)	
8/30	Monte Carlo Simulation	Burton, Altman, Royston, & Holder	
9/1	Multilevel modeling (MLM) review	(2006)	
9/6	Multilevel model fit indices	(Opt.) Maas & Hox (2005)	Receive Article Summary assign.
9/8	MLM Centering	Enders & Tofghi (2007)	
	Intro to MLwiN	Look at MLwiN manual	
9/13	Partially clustered data	Bauer, Sterba & Hallfors, (2008)	Article Summary <u>Due</u> *
	Mediation	Krull & MacKinnon (2001)	
		(Opt.) Yuan & MacKinnon (2009)	
9/15	CCrem*	Rasbash & Browne (2001)	
		Beretvas (2008b)	
9/20		Shi, Leite & Algina (2010)	
	MMrem	Meyers & Beretvas (2006)	
9/22	CCMMrem	Beretvas (2008a)	
	More MLwiN including MCMC	Goldstein (2003, chapter 12)	Receive Real Data Analysis assign.
		Grady & Beretvas (2010)	
9/27	MMREM and CCREM Extensions	Leyland & Næss (2009)	
	rCCREM	Beretvas, Israni & Kaplan (2016)	
9/29	Latent Variable Regression in MLM	Seltzer, Choi & Thum (2003)	Real Data Analysis <u>Due</u> *
10/4	Parallel Process Models for Individual and Cluster Outcomes and Models' Extensions	Choi & Seltzer (2010) opt. Harring, Beretvas & Israni (2015)	
10/6	Multilevel Measurement Models	Kamata (2001)	
		Beretvas & Kamata (2005)	
		(Opt.) Beretvas & Walker (2012)	
10/11	SEM review	Any SEM text; Bandalos & Leite (2013)	

	Longitudinal SEM Models 2 nd Order Latent Growth Models	Hancock, Kuo & Lawrence (2001) Leite (2007) Geiser, Keller, & Lockhart (2013)	
10/11	Multilevel SEM	Stapleton (2013) Hox & Maas (2001)	
	Measurement error in MLMs	Geldhof, Preacher & Zyphur (2014)	
	Mediation with complex data	Li & Beretvas (2013) Lachowicz, Sterba, & Preacher (2015)	
10/13	Longitudinal mediation	Preacher, Zhang & Zyphur (2011) Cheong, MacKinnon & Khoo (2003) Cheong (2011)	
10/18	Mixture modeling	Pastor & Gagné (2013) Lubke & Muthén (2005)	
	Monte Carlo Simulation Revisited	(Opt.) Nylund, Asparouhov & Muthén (2007)	
	Selection of reasonable parameters, design conditions, outcomes	(Opt.) Allua, Stapleton & Beretvas (2008)	
10/20	Presentation Preparation		
10/25	Initial topic Presentations		Initial topic selection 500-word Abstract due*
10/27	Group discussions-topics, Abstracts Lit Review Outline		Abstract Reviews due* Lit Review Outline due* In-class Outline review
11/1	Lit Review - Full Use of large-scale datasets		Methodological article selection
11/3	Group consulting		Applied dataset and variable selection
11/8	Method sections		Literature Review due*

11/10	Group consulting		Lit Review Review due* Real data analysis (Method and Results) due* Method section presentation
11/15	Reviewing methodological research manuscripts		First draft of complete paper due*
11/17	Writing		
11/22			Paper Reviews due*
11/24	<i>Thanksgiving!</i>		...
11/29			Project presentations
12/1			Project presentations
12/8			Final papers due*

Note: (Opt.) = optional. **Due*** = tentative due date for assignment; assign. = assignment.

Please note that most of these dates are tentative and will be adapted based on class progress. However, the deadlines are not tentative for the following assignments with each due at the start of class (i.e., 11am CST): **First Drafts** (11/15), **Proposal Reviews** (11/22), **Project Presentations** (11/29 and 12/1) and **Final papers** (12/8).

*Article summary assigned to this topic.

References

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