EDP 380C 16: Hierarchical Linear Modeling

Unique: 11900

Fall 2024

Lecture	Tuesday and Thursday 2:00 PM - 3:30 PM
Location	SZB 4.302
Credits	3 credits

Instructor	Dr. Man Chen
Pronouns	She/her/hers
Office	SZB 5.308L
Email	man.chen@austin.utexas.edu
Office hours	Tuesday and Thursday, 3:30 PM – 4:30 PM or by appointment

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Course Description

EDP 380C.16 Hierarchical Linear Modeling (HLM) provides an introduction to the basic concepts and applications of hierarchical linear (i.e. multilevel) models, including random intercept and random slope and intercept models; models for longitudinal data; and multilevel generalized linear models. HLM is a methodology that can be used for analyzing various nested data structures, such as students within schools, and measurement occasions within individuals. The primary objective is for students to understand when and how to use hierarchical linear models, with an emphasis placed both on the statistical concepts of the modeling framework and the application of hierarchical linear modeling to data sets via software.

Pre-requisites

- EDP 480C.4 Correlation and Regression Methods
- Experience with at least one statistical software for data management and analysis (e.g., R, SAS, Stata, Python). For example, you should be able to load a dataset, calculate summary statistics for a set of variables in a dataset, create new variables and add them to a dataset, and compute and interpret the output of linear regression models in your preferred language.

Learning Outcomes

By the end of this course, students will be able to

1. Identify the properties of nested data and explain statistical treatments of multilevel data.
2. Summarize and visualize multilevel data within and across levels.
3. Select and apply multilevel models that are appropriate for various forms of clustered data.
4. Interpret multilevel model results and communicate the findings.

Course Requirements and Grading

Required Textbook

- Snijders, T.A.B., & Bosker, R.J. (2012). Multilevel analysis: An introduction to basic and advanced multilevel modeling. (2nd ed.) Sage.

References

- Hox, J., Moerbeek, M., & van de Schoot, R (2017). *Multilevel analysis: Techniques and applications* (3rd ed). Routledge. The electronic version of the second edition is available through the UT library.
- Luke, D.A. (2020). *Multilevel modeling* (2nd ed.). Thousand Oaks, CA: Sage. The electronic version is available online through the UT library.
- Raudenbush, S.W., & Bryk, A.S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed). Newbury Park, CA: Sage.

Statistical Computing

We will use the R environment (R and R studio) for demonstrations in this class. In principle, you are welcome to use any other programs instead, but I won't be able to provide examples and technical support for any software not demonstrated in class.

R: https://www.r-project.org

RStudio: https://www.rstudio.com

Getting Help with Technology

Students needing help with technology in this course should contact the ITS Service Desk.

Classroom Expectations

- **Class attendance** [Other than normal emergency accommodations, in-person attendance is required. In the event you must miss a class, please notify me in advance with a legitimate reason. You will be responsible for the materials and announcements that you missed. Missing a class without an advanced notice/reason would result in a deduction in the attendance

grade.]

- **Class participation** [Student participation is an integral component of this course and your feedback is important to me. Class participation is not included in the course grade but I strongly encourage you to participate actively in class activities and discussions. There will be pre-course survey given in the beginning of the semester and a mid-semester survey. These surveys provide opportunities for you to share your learning experience which will help me tailor the course content and course instruction so that everyone can learn as much as possible.]
- **Respectful learning environment** [Please be respectful to each other and maintain a healthy learning environment in all course activities. Any concern in this regard should be brought to the attention of the instructor.]

Evaluation & Grading

There will be **seven** assignments designed to familiarize you with multilevel models and the use of multilevel modeling software and packages. There will be a cumulative take-home exam in the end of the semester that evaluates your knowledge of multilevel modeling. For instance, you will analyze a dataset that has a multilevel structure, report the results in tables, and interpret the results.

- **Class attendance (5%)**
- **Assignments (70% = 7 * 10%)**
    - Each assignment accounts for 10% of the final grade. Assignments consist of several questions related to the statistical methods and models recently covered. Students are expected to summarize and visualize the data, conduct data analysis using different models, and interpret the analysis results in a similar way demonstrated in class. Assignments will be posted on Canvas on Tuesdays and will be due on Tuesdays the following week. Assignments will be submitted and graded through Canvas. Students may discuss the homework assignments with others but the responses should be your own work.
- **Final exam (25%)**
    - The final take-home exam will be cumulative, covering all topics that we discuss during the semester. **The exam will be distributed on Tuesday, December 3rd, 2024 and will be due by December 13th, 2024.** Students are expected to complete the exam individually without discussing the exam materials with other students. Students may ask clarification questions to the instructor.

Late Work

Unless arrangements are made with the instructor in advance, a late assignment will be accepted within two days after the due date but with a 20% of points deduction. There is no makeup assignments for missed work.

Extra Credit

There will be extra credit questions in each assignment and in the final exam.

Grade Breaks

A tentative rubric for assignment of final grades is provided below. The instructor reserves the right to modify the rubric.

Grade	Cutoff
A	93%
A-	90%
B+	87%
B	84%
B-	80%
C+	77%
C	74%
C-	70%
D+	67%
D	64%
D-	60%
F	<60%

Sharing of Course Materials Is Prohibited

No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, homework assignments, exams), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class without the explicit, written permission from the instructor. Unauthorized sharing of materials may facilitate cheating. The University is aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in initiation of the student

conduct process and include charge(s) for academic misconduct, potentially resulting in sanctions, including a grade impact.

Academic Integrity Expectations

Students who violate University rules on academic misconduct are subject to the student conduct process. A student found responsible for academic misconduct may be assigned both a status sanction and a grade impact for the course. The grade impact could range from a zero on the assignment in question up to a failing grade in the course. A status sanction can include a written warning, probation, deferred suspension or dismissal from the University. To learn more about academic integrity standards, tips for avoiding a potential academic misconduct violation, and the overall conduct process, please visit the Student Conduct and Academic Integrity website at: http://deanofstudents.utexas.edu/conduct.

Religious Holy Days

By UT Austin policy, you must notify me of your pending absence for a religious holy day as far in advance as possible of the date of observance. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Course Outline & Tentative Schedule

All instructions, assignments, readings, rubrics and essential information will be on the Canvas website at utexas.instructure.com. Check Canvas regularly. **Changes** to the schedule may be made at my discretion if circumstances require. I will announce any such changes in class and will also communicate them via a Canvas announcement. It is your responsibility to note these changes when announced, and I will do my best to ensure that you are notified of changes with as much advance notice as possible.

Week	Dates	Topics	Readings	Assignments
Week 1	8/27, 8/29	Syllabus, Regression review	Syllabus	
Week 2	9/3, 9/5	Regression review, Introduction to HLM	S & B Chs 1-2	Assignment 1 given on 9/3, due on 9/10
Week 3	9/10, 9/12	Statistical treatment of clustered data	S & B Ch 3, Hox Ch 1, Kreft & de Leeuw Ch 2	Assignment 2 given on 9/10
Week 4	9/17, 9/19	Random intercept models	S & B Ch 4, Hox Ch 2	Assignment 2 due on 9/17
Week 5	9/24, 9/26	Random intercept models (Cont.)	S & B Ch 4, Hox Ch 2	Assignment 3 given on 9/24
Week 6	10/1, 10/3	Random slope models	S & B Ch 5, Hox Ch 2	Assignment 3 due on 10/1

Week	Dates	Topics	Readings	Assignments
Week 7	10/8, 10/10	Three-level models	S & B Chs 4, 5, Hox Ch2	Assignment 4 given on 10/8
Week 8	10/15, 10/17	Mid-semester review, Hypothesis testing	S & B Ch 6, Hox Ch 3	Assignment 4 due on 10/15
Week 9	10/22, 10/24	Hypothesis testing, Model specification	S & B Ch 7 & 10, Hox Ch 13	Assignment 5 given on 10/22
Week 10	10/29, 10/31	Effect sizes, Assumptions of HLM	S & B Ch 15, Hox Ch 5	Assignment 5 due on 10/29
Week 11	11/5, 11/7	Longitudinal data analysis	S & B Ch 15, Hox Ch 5	Assignment 6 given on 11/5
Week 12	11/12, 11/14	Longitudinal data analysis (Cont.)	S & B Ch 15, Hox Ch 5	Assignment 6 due on 11/12
Week 13	11/19, 11/21	Multilevel generalized linear models	S & B Ch 17, Hox Chs 6,7	Assignment 7 given on 11/19
Week 14	11/26, 11/28	Fall break/Thanksgiving; no classes		Assignment 7 due on 12/3
Week 15	12/3, 12/5	Multilevel power analysis	Hox Ch 12	Final given on 12/3 and due on 12/13

How Will You Learn?

Teaching Modality Information

This is a fully in-person course and class meetings will be held in-person throughout the semester. As such, in-person attendance is required, other than normal emergency accommocations. There will be no course recording.

Communication

The course Canvas site can be found at utexas.instructure.com. All the readings, lecture notes, assignments, quizzes, and announcements are posted on Canvas. You are responsible for ensuring that the primary email address you have recorded with the university is the one you will check for course communications because that is the email address that Canvas uses.

Asking for Help

Learn as much as possible. You're welcome to ask questions during class. If there is not enough time, please come to my office hours on Tuesdays and Thursdays 3:30 PM – 4:30 PM. If you can't make it to the office hours, please make arrangements with me in advance.

University Policies and Resources for Students

Disability & Access (D&A)

The university is committed to creating an accessible learning environment consistent with university policy and federal and state law. Please let your instructors know if you experience any barriers to

learning so they can work with you to ensure you have equal opportunity to participate fully in your courses. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Disability & Access (D&A). Please refer to the D&A website for more information. If you are already registered with D&A, please deliver your Accommodation Letter to your instructors as early as possible in the semester so you can discuss together your approved accommodations and needs in your courses.

Title IX Reporting and Support Disclosure

The Title IX Office uses information provided in reports to reach out to individuals in need, provide them with support and resources, and discuss options available to them related to a formal grievance process. For students, examples of support include academic accommodations, safety support, and connection with other campus and community resources.

Texas Education Code, Section 51.252 requires all employees of Texas universities, including faculty, to report to the Title IX Office any information regarding incidents of sexual harassment, sexual assault, dating violence, or stalking that is disclosed to them. Texas law requires that all employees who witness or receive information about incidents of this nature (including, but not limited to, written forms, applications, one-on-one conversations, class assignments, class discussions, or third-party reports) must report it to the Title IX Coordinator. Before talking with me, or with any faculty or staff member about an incident of this nature, please be aware that I will be required to report this information.

Graduate teaching and research assistants are also designated as mandatory reporters and are required to report behaviors that are considered sexual misconduct, including the types of misconduct described above.
Pregnant and parenting students, faculty and staff are also eligible to receive support and resources from the Title IX Office. Support and resources may include supportive measures, medically necessary periods of leave, and leaves of absence. Case managers from the Title IX Office connect with students, faculty, and staff to provide one-on-one, individualized support. If you would like to speak with a case manager for support, please
email: supportandresources@austin.utexas.edu.
For more information about reporting options and resources, please visit the Title IX website, contact the Title IX Office via email at: titleix@austin.utexas.edu, or call 512-471-0419.

TEXAS
The University of Texas at Austin

Names and Pronouns

Class rosters are provided to the instructor with the student's legal name, unless they have added a chosen name with the registrar's office.

- For instructions on how to add your pronouns to Canvas, visit this site.
- If you would like to update your chosen name with the registrar's office, reference this guide.
- For additional guidelines on changing your name on various campus systems, see the Resources page under UT Resources here.

Counseling and Mental Health Center (CMHC)

We all benefit from support during times of struggle. Remember, you are not alone. If you are experiencing signs of stress, anxiety, depression, academic concerns, loneliness, difficulty sleeping, or any other issues affecting your well-being, we encourage you to contact the Counseling and Mental Health Center. The center is conveniently located on campus and provides a wide range of mental health services to all UT students. These services include support through assessment and referral, group and individual counseling, psychiatry, crisis services, and access to valuable well-being resources. In addition, CARE Counselors available within each academic school and college understand the unique concerns of their respective students and offer tailored assistance. Also, TimelyCare is a virtual mental health platform offering 24/7 support, scheduled counseling, psychiatric services, health coaching and self-care content. For more information, visit the CMHC website.

University Health Services (UHS)

Your physical health and well-being are a priority. University Health Services is the on-campus medical facility providing medical care and patient education to UT students. Services offered include general medicine, specialty clinics including the gynecology clinic, sports medicine, nutrition services, allergy, immunization and travel health, physical therapy, urgent care, a 24/7 nurse advice line; STI screening; and lab, x-ray, and ultrasound services. For additional information, visit the UHS website or call 512-471-4955.

Sanger Learning Center (SLC)

Did you know that over one-third of UT undergraduate students use the Sanger Learning Center yearly to strengthen their academic performance? All students can take advantage of Sanger Center's classes and workshops, private learning specialist appointments, peer academic coaching, public

speaking, and tutoring for more than 70 courses in over 15 subject areas. For more information, please visit the SLC website (JES A332).

Dean of Students - Student Emergency Services (SES)

Our staff help students and their families during difficult or emergency situations. Assistance includes outreach, advocacy, intervention, support, and referrals to relevant campus and community resources. If you need to be absent from class due to a family emergency, medical or mental health concern, or academic difficulty due to crisis/emergency, and your instructor requires confirmation of your absence, we can help. We will document your situation and notify your instructors. Visit the SES wesbite to learn more, or call 512-471-5017 to speak with our staff.

Behavior Concerns and Advice Line (BCAL)

If you have concerns about the safety or behavior of fellow students, TAs, professors, or anyone at UT Austin, BCAL (the Behavior Concerns Advice Line) can help. Anyone can call BCAL (512-232-5050) 24/7 to share a concern about a UT person, or to get advice on how to talk with the person about your concern. More information and an online report form are available on the BCAL website. Callers can remain anonymous, and confidentiality will be maintained as much as possible, however the university may be required to release some information to appropriate parties.

UT Outpost and Student Emergency Fund

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to visit UT Outpost for support. UT Outpost is the free on-campus food pantry and career closet for all currently enrolled UT students. Any student in need is encouraged to visit UT Outpost (2609 University Avenue, 3.108) for free groceries, personal care items, and gently-used professional clothing for interviews, internships, or other needs. To learn more, visit the UT Outpost website.

The Student Emergency fund exists to provide financial support when a verified emergency has impacted a student's health, safety, or wellbeing. An emergency is an urgent, sudden, and serious event that necessitates immediate action to remedy harm to life, health, or property. To learn more about eligibility or apply, visit the Student Emergency Fund website.

Important Safety Information

Carrying of Handguns on Campus

Students in this class should be aware of the following university policies related to Texas' Open Carry Law:

- Students in this class who hold a license to carry are asked to review the university policy regarding campus carry.
- Individuals who hold a license to carry are eligible to carry a concealed handgun on campus, including in most outdoor areas, buildings and spaces that are accessible to the public, and in classrooms.
- It is the responsibility of concealed-carry license holders to carry their handguns on or about their person at all times while on campus. Open carry is NOT permitted, meaning that a license holder may not carry a partially or wholly visible handgun on campus premises or on any university driveway, street, sidewalk or walkway, parking lot, parking garage, or other parking area.

Campus Safety

The following items are recommendations regarding emergency evacuation from the Office of Emergency Management, 512-232-2114:

- Students should sign up for Campus Emergency Text Alerts at the Office of Emergency Management.
- Occupants of buildings on The University of Texas at Austin campus must 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.
- For more information, please visit the Office of Emergency Management.