PSYCH 258 Syllabus
Mediation, Moderation, and Conditional Process Analysis
Winter 2019

Instructor: Amanda Kay Montoya
Office: LSB 5324
Office Hours: M (11am – 12pm), W (1pm – 2pm)
Email: akmontoya@ucla.edu
Phone: 310-794-5069
Website: akmontoya.com

Course Description

This is an interactive course on data analysis focused on the application of linear modeling using linear regression analysis to explore questions about mediated (i.e., indirect) effects and moderated (i.e., interaction) effects. Mediation, moderation, and conditional process models map well onto the way that scientists explore questions like “How did this happen?”, “When does this happen?”, and “When does this happen this way?” Applications of mediation, moderation, and conditional process analysis can be found across areas of psychology, business, marketing, consumer behavior, sociology, communications, etc.

We will spend much of the course talking about partitioning effects into direct and indirect components and how to quantify and test hypotheses about these effects, particularly indirect effects. We will spend part of the course talking about estimating, testing, and probing interactions in linear models. The final part of the course integrates mediation and moderation as “conditional process analysis” by discussing how to conceptualize and test contingent mechanisms. We will focus on the practical skills of implementing, interpreting, writing, and critiquing these different models.

Computer applications will focus on SPSS and SAS using built in functions and the PROCESS macro available through CCLE and processmacro.org. It is assumed that you have taken a course in multiple regression (e.g., PSYCH 250C) and have done well or are otherwise comfortable with the principles of multiple regression analysis. No knowledge of matrix algebra is required or assumed.

Prerequisites: This course is designed for students with previous experience with regression analysis (completion of PSYCH 250C or equivalent). Courses from other departments I’ve considered equivalent include EDU 230B, STAT 201B, STAT 402, STAT 412. If you have not taken the prerequisite or equivalent courses listed above, please reach out to me to assess if you have previous experience which would prepare you for success in the course.

Course Materials

- UCLA Library has the 2nd edition of the book in hard copy and e-book. To access the book from off campus you’ll need to configure your computer for access [instructions here].
- You can purchase the book through Guilford Press for $55.25. Guilford has a 40% discount for students which runs through January 7th.
- Amazon typically has the book for a similar price as Guilford, and they also offer it for rent.
- UCLA bookstore should have copies of the book available for a similar price.

- You will need a laptop computer with a version of SPSS or SAS installed. Bring this to class everyday as it will be needed for in-class activities and interactive lectures. Make sure you charge your laptop before class as there will not be outlets available for everyone.
  - You can get access to SAS and SPSS...
    - By purchasing it through the UCLA bookstore.
    - Via the software shortcut.
    - Check out a laptop from the library with SAS or SPSS installed (up to 6 hour per checkout)
  - Students have the opportunity to use other programming languages (e.g., R). I will not provide support for those languages during class, so I only recommend that students who are very comfortable with their other programming language to use it for the course. I will be happy to provide support to students using alternative languages during office hours.
  - If you cannot get regular access to a laptop, please see me.

- CCLE course site and other online resources.
  - Datasets used in class will be available on CCLE, but are also downloadable from Andrew Hayes’ webpage.
  - The PROCESS macro as well as any other macros we use in the class will be made available on CCLE but are also available at processmacro.org, afhayes.com, akmontoya.com, or njrockwood.com.
  - Various supplementary readings will be available through CCLE.

### Learning Outcomes

By the end of this course you will be able to...

1. Identify, apply, and interpret statistical models which correspond to research hypotheses about how and when effects occur.
2. Translate among path diagrams, regression equations, and computer code to estimate corresponding models.
3. Create data visualizations to aid interpretation of statistical models described in this course.
4. Identify and critique common malpractices in examples of mediation, moderation, and conditional process analysis.
5. Generate written reports which utilize mediation, moderation, and conditional process analysis in novel datasets to test hypotheses in your field of study.

### Mediation Learning Outcomes
1. Define, estimate, and interpret direct effects, indirect effects, total effects.
2. Describe how to statistically partition one variable’s effect on another into its primary pathways of influence, direct and indirect.
3. Identify a mediation model which aligns with a stated hypothesis about how an effect occurs, and translate that model to a path diagram, regression equations, and computer code using the PROCESS macro.
4. Articulate the criteria for causal inference and the difference in conclusions between models which assume causal order and those which evaluate causal order.
5. Describe, compare, and contrast historical and modern approaches to inference on indirect effects (e.g., bootstrapping, Monte Carlo confidence intervals, Sobel tests, causal steps method, and joint significance tests).
6. Summarize the advantages of mediation models which include multiple mediators.
7. Generate written reports which describe the analysis and results of a mediation model used to test and explore a hypothesis.

Moderation Learning Outcomes

1. Define, estimate, and interpret interaction effects and conditional effects.
2. Identify a moderation model which aligns with a stated hypothesis about when an effect occurs, and translate that model to a path diagram, regression equations, and computer code using the PROCESS macro.
4. Create visualizations to aid interpretation of an interaction and probing of that interaction.
5. Summarize the advantages and disadvantages of common practices in moderation, such as dichotomizing continuous variables, using mean centering and standardizing
6. Generate written reports which describe the analysis and results of a moderation model used to test and explore a hypothesis.

Conditional Process Analysis Learning Outcomes

1. Define, estimate, and interpret the index of moderated mediation, conditional indirect effects, and conditional direct effects.
2. Identify a conditional process model which aligns with a stated hypothesis about how an indirect effect is moderated, and translate that model to a path diagram, regression equations, and computer code.
3. Describe and articulate advantages of moderated mediation over mediated moderation.
4. Create visualizations to aid interpretation of moderated indirect effects.
5. Generate written reports which describe the analysis and results of a conditional process model used to test and explore a hypothesis.
Expectations for Students

In this course you will engage in a variety of learning experiences beyond lecture. We will use paired activities, group activities, full class exercises to enhance everyone’s learning, and successful students will participate and engage with each opportunity. You will come to class on time and prepared: having read the assigned reading and completed all assigned homework before class starts. During class, you will support each other in our activities, and you will value the learning of your peers similarly to your own learning. Technology will be used when needed; personal interaction will be used when needed. You will be respectful to other’s opinions and questions, which is to say that you may disagree with your peers (and some activities are designed to elicit disagreement), but you will respect and value their opinion when you disagree. When you have questions and concerns you will seek out me and/or your peers, and continuously feed your curiosity (you are graduate students after all and we’re all here to push the boundaries of knowledge).

Expectations for Instructor

I aim to create an environment in our classroom which is supportive of all students regardless of their identities, experiences, or views. I am committed to creating equity of opportunity for all by eliminating any and all discrimination, harassment, bullying, or victimization. The success of this commitment relies on the support and understanding of all of us in the class. We all have a responsibility not to be offensive to each other, or to participate in, or condone harassment or discrimination of any kind. Students in this class will have a variety of different experiences and backgrounds, particularly in statistics and research methods, and we must all work to be accepting and welcome of all levels of learning and development.

UCLA’s Office for Equity, Diversity, and Inclusion provides resources, events, and information about current initiatives at UCLA to support equality for all members of the UCLA community. I hope that you will communicate with me if you experience anything in this course that does not support an inclusive environment, and you can also report any incidents you may witness or experience on campus to the Office of Equity, Diversity, and Inclusion on their website.

Learning Assessment
Grades will be based on:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Project</td>
<td>5%</td>
</tr>
<tr>
<td>In-Class Activities</td>
<td>10%</td>
</tr>
<tr>
<td>Mediation Assignment</td>
<td>25%</td>
</tr>
<tr>
<td>Moderation Assignment</td>
<td>25%</td>
</tr>
<tr>
<td>Final Project</td>
<td>35%</td>
</tr>
<tr>
<td>Poster Presentation</td>
<td>10%</td>
</tr>
<tr>
<td>Final Report</td>
<td>25%</td>
</tr>
</tbody>
</table>

**Why I do not grade on a curve:** In recent years, research into higher education assessment practices have shown that grading on a curve can create unnecessarily competitive environments for students and result in outcomes that disadvantage some groups of students over others. This is true in data collected and analyzed for our students at UCLA as well. For this reason, I do not grade on a curve. Your grade is therefore not based on how you did in comparison to your peers, but instead how successful you are at evidencing that you have mastered the intended learning goals for that specific assessment. However, if I do find that particular assessment questions I gave an assignment or exam were unreasonably challenging, unclear, or unfair for any reason I will provide additional credit as appropriate. If you ever feel that an assignment or specific question is unfair or confusing please come and speak with me (ideally before it is due or during the assessment, but afterwards is also okay) so that we can address this concern as soon as possible. I am committed to making sure the assessment of your learning is comprehensive, fair, and incorporates best practices from education research on assessment design and inclusive practices.

**Grading Scale:**

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>GPA</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>4.0</td>
<td>99-100%</td>
</tr>
<tr>
<td>A</td>
<td>4.0</td>
<td>93%-98.9%</td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
<td>90%-92.9%</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
<td>87%-89.9%</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
<td>83%-86.9%</td>
</tr>
<tr>
<td>B-</td>
<td>2.7</td>
<td>80%-82.9%</td>
</tr>
<tr>
<td>C+</td>
<td>2.3</td>
<td>77%-79.9%</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
<td>73%-76.9%</td>
</tr>
<tr>
<td>C-</td>
<td>1.7</td>
<td>70%-72.9%</td>
</tr>
<tr>
<td>D</td>
<td>1.0</td>
<td>60%-69.9%</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>0%-59%</td>
</tr>
</tbody>
</table>
Course Assignments

Regression Project: During Week 2 there will be no lecture. During this week, students are asked to complete a project and have the option of working with up to three other students (groups of 4 max). Collaboration is encouraged! The project will involve completing a multiple regression analysis, using a dataset provided by the instructor, and writing a 2-page MAX (single-spaced, 12pt Times New Roman, 1 inch margins) report including a description and interpretation of the results. Further information will be provided in class and on CCLE. This project is not meant to take more time than the 2.5 hours of class time during the week, and will be due by the end of class on Thursday of Week 2 (1/17/19 @ 2pm PST). No late projects will be accepted.

In-Class Activities: Throughout the course there will be a variety of in-class activities (e.g., 1-minute papers, debates, concept mapping) designed to help you understand and master the skills in the class. Activities which result in any deliverable will be collected and graded on a completion basis. Each activity will have an equal weight in your final grade, except your lowest activity score will be dropped. Students cannot make up in-class activities.

Unit Assignments: There will be two unit assignments in the course. The first assignment will be at the end of Unit 1 covering the material on mediation. The second assessment will be at the end of Unit 2 covering the material on moderation. Students may work collaboratively on the assignments but should write their answers individually. Assignments grade will be deducted by 10% for each day it is late.

Final Project: By the end of class we will have spent much time examining indirect effects (mediation), interaction effects (moderation), and combinations of these two (conditional process analysis). You will complete a data analysis project using either your own data or data available to you through an adviser or a public archive. The only requirements are that your analysis involves a system of relationships between at least four variables and your analysis illustrates your understanding of the concepts of mediation, moderation, and conditional process analysis including your ability to conduct these analyses and interpret them correctly. The final involves two parts:

1) Poster Presentation: During the last week of the course each student will be required to create and present a poster which describes their plans for their final paper, and can include their analysis and results. Students will be required to review their peer’s work, and I will provide feedback during the class. This is an excellent opportunity to get feedback before preparing your final paper.

2) Final Report: You will create a report on your final project. This should be in APA style, though it does not need to be a complete research paper. There are no page limits on this paper, and I encourage students to consider their own research and to use this project as an opportunity to analyze their own data and prepare a manuscript which may contribute to a publication or conference presentation. Further details on this project will be provided later in the course. The project will be due at 5pm on the last day of Final Exam Week (3/22 @ 5pm). No late reports will be accepted.

Course Schedule
This is a tentative schedule and subject to change, with schedule adjustments posted on CCLE announcements.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic &amp; Learning Objectives</th>
<th>Complete Before Class</th>
<th>Complete During Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8</td>
<td>Intro, Regression Review</td>
<td>IMMCPA Chpt 1</td>
<td></td>
</tr>
<tr>
<td>1/10</td>
<td>Regression Review</td>
<td>IMMCPA Chpt 2</td>
<td></td>
</tr>
<tr>
<td>1/15</td>
<td><strong>No Lecture</strong></td>
<td>IMMCPA Chpt 2</td>
<td>Regression Project Pt 1</td>
</tr>
<tr>
<td>1/17</td>
<td><strong>No Lecture</strong></td>
<td>IMMCPA Chpt 2</td>
<td>Regression Project due 2pm</td>
</tr>
<tr>
<td>1/22</td>
<td>Mediation</td>
<td>IMMCPA Chpt 3</td>
<td></td>
</tr>
<tr>
<td>1/24</td>
<td>Mediation</td>
<td>IMMCPA Chpt 3</td>
<td>Bootstrapping Exercise</td>
</tr>
<tr>
<td>1/29</td>
<td>Mediation</td>
<td>IMMCPA Chpt 4, Jigsaw Reading</td>
<td>Inference Jigsaw</td>
</tr>
<tr>
<td>1/31</td>
<td>Multiple Mediators: Parallel</td>
<td>IMMCPA Chpt 5</td>
<td></td>
</tr>
<tr>
<td>2/5</td>
<td>Multiple Mediators: Serial</td>
<td>IMMCPA Chpt 5</td>
<td>Causal Order Debate</td>
</tr>
<tr>
<td></td>
<td>2/6 Mediation Assignment Available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/7</td>
<td><strong>No Class</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2/11 Mediation Assignment Due 5pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/12</td>
<td>Moderation</td>
<td>IMMCPA Chpt 7</td>
<td></td>
</tr>
<tr>
<td>2/14</td>
<td>Moderation</td>
<td>IMMCPA Chpt 8</td>
<td></td>
</tr>
<tr>
<td>2/19</td>
<td>Multiple Moderators</td>
<td>IMMCPA Chpt 9</td>
<td></td>
</tr>
<tr>
<td>2/21</td>
<td>Multiple Moderators</td>
<td>IMMCPA Chpt 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2/25 Moderation Assignment Available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/26</td>
<td>Conditional Process Analysis</td>
<td>IMMCPA Chpt 11</td>
<td></td>
</tr>
<tr>
<td>2/28</td>
<td>Conditional Process Analysis</td>
<td>IMMCPA Chpt 11</td>
<td>3-minute paper</td>
</tr>
<tr>
<td></td>
<td>3/4 Moderation Assignment Due 5pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/5</td>
<td>Conditional Process Analysis</td>
<td>IMMCPA Chpt 12</td>
<td></td>
</tr>
<tr>
<td>3/7</td>
<td>Conditional Process Analysis</td>
<td>IMMCPA Chpt 12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3/11 – 3/15 Poster Presentations (Specific Day is TBA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/12</td>
<td>Advanced Topics</td>
<td>Poster</td>
<td>Poster Presentation &amp; Review</td>
</tr>
<tr>
<td>3/14</td>
<td>Advanced Topics, Wrap Up</td>
<td>IMMCPA Chpt 14</td>
<td>Poster Presentation &amp; Review</td>
</tr>
</tbody>
</table>

**Final Project Due 3/22 @ 5pm PST**
Student Resources for Support and Learning

Providing feedback to me: I encourage your feedback at any time throughout the quarter about things that are helping you learn, or things that aren’t helping. Please communicate with me if there are ways that I can improve the course to better support student learning.

Personal Problems: I understand that sometimes life makes it difficult to focus on schoolwork. If you are having a personal problem that affects your participation in this course, please talk to me to create a plan. Please do not wait until the end of the quarter to share any challenges that have negatively impacted your engagement and academic performance. The sooner we meet, the more options we will have available to us to support your overall academic success. If you are not comfortable speaking with me directly, please utilize the other student resources provided below in order to understand how to best approach success in this course given your personal needs as soon as possible.

Academic Accommodations Based on a Disability: Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310)825-1501 or in person at Murphy Hall A255. When possible, students should contact the CAE within the first two weeks of the term as reasonable notice is needed to coordinate accommodations. For more information visit www.cae.ucla.edu.

Campus Resources and Support Services around UCLA Available to Students:

- Academic Achievement Program: AAP advocates and facilitates the access, academic success, and graduation of students who have been historically underrepresented in higher education; informs and prepares students for graduate and professional schools; and develops the academic, scientific, political, economic, and community leadership necessary to transform society. Learn more at http://www.aap.ucla.edu/
- Academics in the Commons at Covel Commons: (310) 825-9315 free workshops on a wide variety of issues relating to academic & personal success www.orl.ucla.edu (click on “academics”)
- Bruin Resource Center: Includes services for transfer students, undocumented students, veterans, and students with dependents. http://www.brc.ucla.edu/
- Career Center: Don’t wait until your senior year – visit the career center today! http://www.career.ucla.edu/
- Center for Accessible Education (Formerly Office for Students with Disabilities): A255 Murphy Hall: (310) 825-1501, TDD (310) 206-6083; http://www.cae.ucla.edu/
- College Tutorials at Covel Commons: (310) 825-9315 free tutoring for ESL/math & science/composition/and more! www.college.ucla.edu/up/ct/
- Counseling and Psychological Services Wooden Center West: (310) 825-0768 www.caps.ucla.edu
- Dashew Center for International Students and Scholars 106 Bradley Hall: (310) 825-1681 www.internationalcenter.ucla.edu
- Dean of Students Office; 1206 Murphy Hall: (310) 825-3871; www.deanofstudents.ucla.edu
- Lesbian, Gay, Bisexual and Transgender Resource Center Student Activities Center, B36: (310) 206-3628 www.lgbt.ucla.edu
- Letters & Science Counseling Service: A316 Murphy Hall: (310) 825-1965 www.college.ucla.edu
- Library: Get help with your research, find study spaces, attend a workshop, rent a laptop, and more. Learn more: http://www.library.ucla.edu/
- **Students in Crisis:** From the Office of the Dean of Students: Faculty and Staff 911 Guide for Students, commonly known as the “Red Folder.” This tool is intended to provide you with quick access to important resources for assisting students in need.
- **Student Legal Services; A239 Murphy Hall:** (310) 825-9894; [www.studentlegal.ucla.edu](http://www.studentlegal.ucla.edu)
- **UCLAONE.com:** UCLA ONE is UCLA’s interactive, online gateway for mentorship, professional networking, peer driven career advice and exclusive job leads. (Similar to LinkedIn for the UCLA community)
**Additional Course Policies and UCLA Policies**

**Use of Laptops, Tablets or Phones in Class:** You will need to use your laptop during class to follow along with your lectures. Please limit your use of tablets or phones in class which are unrelated to course content. Research finds that technological multitasking is likely to hinder not only your own learning, but also the learning of anyone who can see your screen. For the sake of your peers’ learning, I therefore ask that when you use an electronic device during class, either only have course content showing or sit in the back row.

**Message about Academic Integrity to all UCLA Students from UCLA Dean of Students:** UCLA is a community of scholars. In this community, all members including faculty, staff and students alike are responsible for maintaining standards of academic honesty. As a student and member of the University community, you are here to get an education and are, therefore, expected to demonstrate integrity in your academic endeavors. You are evaluated on your own merits. Cheating, plagiarism, collaborative work, multiple submissions without the permission of the professor, or other kinds of academic dishonesty are considered unacceptable behavior and will result in formal disciplinary proceedings usually resulting in suspension or dismissal.

**Forms of Academic Dishonesty:** As specified in the UCLA Student Conduct Code, violations or attempted violations of academic dishonesty include, but are not limited to, cheating, fabrication, plagiarism, multiple submissions or facilitating academic dishonesty:

- **Cheating:** Unauthorized acquiring of knowledge of an examination or part of an examination
  - Allowing another person to take a quiz, exam, or similar evaluation for you
  - Using unauthorized material, information, or study aids in any academic exercise or examination – textbook, notes, formula list, calculator, etc.
  - Unauthorized collaboration in providing or requesting assistance, such as sharing information
  - Unauthorized use of someone else’s data in completing a computer exercise
  - Altering a graded exam or assignment and requesting that it be regraded

- **Plagiarism:** Presenting another’s words or ideas as if they were one’s own
  - Submitting as your own through purchase or otherwise, part of or an entire work produced verbatim by someone else
  - Paraphrasing ideas, data or writing without properly acknowledging the source
  - Unauthorized transfer and use of someone else’s computer file as your own
  - Unauthorized use of someone else’s data in completing a computer exercise

- **Multiple Submissions:** Submitting the same work (with exact or similar content) in more than one class without permission from the instructor to do so. This includes courses you are currently taking, as well as courses you might take in another quarter.

- **Facilitating Academic Dishonesty:** Participating in any action that compromises the integrity if the academic standards of the University; assisting another to commit an act of academic dishonesty
  - Taking a quiz, exam, or similar evaluation in place of another person
  - Allowing another student to copy from you
• Providing material or other information to another student with knowledge that such assistance could be used in any of the violations stated above (e.g., giving test information to students in other discussion sections of the same course)

**Fabrication:** Falsification or invention of any information in an academic exercise

• Altering data to support research
• Presenting results from research that was not performed
• Crediting source material that was not used for research

If after reviewing the information above, you are still unclear about any of the items – **don’t take chances**, don’t just take your well-intentioned friend’s advice – **ASK your Professor.** Know the rules - Ignorance is NO defense. In addition, avoid placing yourself in situations which might lead your Professor to **suspect you of cheating.** For example, during an exam don’t sit next to someone with whom you studied in case your answers end up looking “too similar.”

**Alternatives to Academic Dishonesty**

• **Seek out help** – meet with your Professor, ask if there is special tutoring available.
• **Drop the course** – can you take it next quarter when you might feel more prepared and less pressured?
• **Ask for an extension** – if you explain your situation to your Professor, they might grant you an extended deadline.
• **See a counselor** at Student Psychological Services, and/or your school, college or department – UCLA has many resources for students who are feeling the stresses of academic and personal pressures.

Remember, **getting caught cheating affects more than just your GPA.** How will you explain to your parents, family and friends that you have been suspended or dismissed? How will it affect your financial aid award and/or scholarship money? Will you be required to, and be able to pay back that money if you are no longer a student? If you live in the university housing, where will you go if you are told you can no longer live there?

You have worked very hard to get here, so don’t cheat! If you would like more information, please come see us at the Dean of Students’ Office in 1206 Murphy Hall, call us at (310) 825-3871 or visit their website at [www.deanofstudents.ucla.edu](http://www.deanofstudents.ucla.edu).

**Please keep this syllabus easily accessible so that you can refer to it throughout the quarter. Contact me with any clarifying questions in advance of the quarter or within the first week. I look forward to getting to know you and supporting your learning in this course.**