Syllabus SIADS 630: Causal Inference Winter 2021

Course Overview and Prerequisites

This course will introduce basic concepts of causal inference. The experimental ideal, that is, random assignment of the treatment, is often impossible or impractical. Thus, we must look for alternative strategies that allow for causal identification when we do not have control over treatment assignment. In this course, we will explore the five most common methods to identify causal effects in observational data. This includes controlled regression, matching, instrumental variables, regression discontinuity, and differences-in-differences. The aim is to help you to understand modern applied econometric methods and to foster the skills needed to plan and conduct your own data science projects.

Course prerequisites: Students should have completed at least one undergraduate statistics class at the level of Stats 250. Please note by completing the Statistics Entrance assessment, you have waived this prerequisite.

Instructor and Course Assistants

- Instructor: Alain Cohn - adcohn@umich.edu
- Course Assistant: Mohamed Abbadi - meabbadi@umich.edu, Linfeng Li - llinfeng@umich.edu,
- Instructional Aid- Ani Madurkar - amadurka@umich.edu

Communication Expectations

Contacting instructor and course assistants:

- Course channel in Slack (*preferred*) - siads630_wi21_001 (response time: 12 - 24 hours)
- Email - see above (response time: 24 - 48 hours)

Office hours:

See *Course Schedule* below. Questions related to the lecture materials will be discussed during the instructor office hours. Questions related to the concept quizzes or data assignments will be answered during the course assistant office hours. To submit a question, use the appropriate links below.
- Instructor (lecture): https://forms.gle/xHMSrfqtz4M6hZGz6
- Course assistant (assignments): https://forms.gle/4aYUwxSWoEzKNAXS8

Required Textbook

- *Mastering' Metrics: The Path From Cause to Effect*. Princeton University Press, 2014. Joshua D. Angrist and Jörn-Steffen Pischke.
  - You can purchase the book on Amazon (about $24). See the book's website for additional resources.
- We have also put together a Manual for Data Assignments and a series of tutorial videos to aid you in your data assignments. These can be found under "Resources" in the Coursera course.

Technology Requirements (unique to this course)

None

- If you encounter a technical issue with coursera or admin issues with slack, please submit a report to the ticketing system at umsimadshelp@umich.edu and also cc adcohn@umich.edu, meabbadi@umich.edu, and llinfeng@umich.edu .

Accessibility

Screen reader configuration for Jupyter Notebook Content

Learning Outcomes

1. Develop awareness of causal thinking.
2. Understand the problem of selection bias.
3. Understand the basic concepts of ordinary least squares (OLS) regression.
4. Formulate key ideas and assumptions of causal inference methods.
5. Develop awareness of when to apply which method of causal inference.
6. Know how to apply methods of causal inference to simple data analysis problems.

Course Schedule

This course begins on **Wednesday, February 3, 2021 and ends on Tuesday, March 2, 2021**.

Weekly **Concept Quizzes** and **Data Analysis Assignments will be due on Tuesdays at 11:59 pm** (time zone = Ann Arbor, Michigan = Eastern Time).

Schedule of Weekly Office Hours via Zoom (time zone = Ann Arbor, Michigan = Eastern Time):

- **Fridays 4pm - 5pm (Alain Cohn)**
- **Sunday 12pm - 1pm (Mohamed Abbadi)**
- **Mondays 8am - 9am (Linfeng Li)**

Begins on Friday February 5, 2021

Grading

Course Assignment	Percentage of Final Grade
Week 1 Concept Quiz	10%
Week 1 Data Assignment (Randomized Experiments)	15%
Week 2 Concept Quiz	10%
Week 2 Data Assignment (Matching and Controlled Regression)	15%
Week 3 Concept Quiz	10%
Week 3 Data Assignment (Instrumental Variables)	15%
Week 4 Concept Quiz	10%
Week 4 Data Assignment (Regression Discontinuity and Differences-in-Differences)	15%
Total	100%

Note: All assignments are required to earn credit for this course.

Letter Grades, Course Grades, and Late Submission Policy

Refer to the [MADS Assignment Submission and Grading Policies](#) section of the UMSI Student Handbook (access to Student Orientation course required)

Letter Grade	Percentage
A+	[98-100]
A	[95-98)
A-	[90-95)
B+	[85-90)
B	[80-85)
B-	[75-80)
C+	[70-75)
C	[65-70)
C-	[60-65)
D+	[55-60)
D	[50-55)
D-	[45-50)
E	Below 45

For this course, the late-submission policy is 15% daily-recurring reduction in grade for the first three days after the submission deadline. You will receive a zero (0) if your assignment is turned in four or more days late.

Academic Integrity / Code of Conduct

Refer to the [Academic and Professional Integrity](#) section of the UMSI Student Handbook (access to Student Orientation course required).

While we offer a number of discussion channels to support your work, if you are stuck you may not share or receive complete solutions to the assignments. We also encourage you to support your classmates, but again, without sharing completed code (pointing to resources, describing ideas in pseudo-code, etc. is fine).

Accommodations

Refer to the [Accommodations for Students with Disabilities](#) section of the UMSI Student Handbook (access to the Student Orientation course required).

Use the [Student Intake Form](#) to begin the process of working with the University's Office of Services for Students with Disabilities.

Help Desk(s): How to get Help

- If you have questions concerning the degree program, encounter a technical issue with Coursera, or issues using Slack, please submit a report to the ticketing system at umsimadshelp@umich.edu.
- If you have an issue specific to the Coursera environment, you can also begin a live chat session with Coursera Technical Support (24/7) or view Coursera troubleshooting guides through their [Help Center](#) (you may be asked to log in to your Coursera account).
- For questions regarding course content, refer to the Communications Expectations section.

Library Access

Refer to the [U-M Library's information sheet](#) on accessing library resources from off-campus. For more information regarding library support services, please refer to the [U-M Library Resources](#) section of the UMSI Student Handbook (access to the Student Orientation course required).

Student Mental Health

Refer to the University's [Resources for Stress and Mental Health website](#) for a listing of resources for students.

Student Services

Refer to the [Introduction to UMSI Student Life](#) section of the UMSI Student Handbook (access to the Student Orientation course required).

Acknowledgements

In developing this course, I have used many resources from various people. I want to express my deep gratitude to those individuals and thank them for sharing their materials with me (or making them publicly available):

- Joshua Angrist and Jörn-Steffen Pischke for their book "Mastering' Metrics and for providing me with high-resolution tables and graphs.
- Tim Maudlin for allowing me to use his examples.
- Pamela Jakiela and Owen Ozier for allowing me to use their slides.
- Timothy Lin (www.timlrx.com) for sharing data with me.
- Emily Glassberg Sands for allowing me to use her examples.
- Alex Butler for his valuable feedback and paper on "Making Decisions with Data: An Introduction to Causal Inference."
- Scott Cunningham for his book "Causal Inference: The Mixtape."
- Matthew Blackwell for his course materials from "Causal Inference (GOV 2002)."
- Pierce Donovan for sharing his homework assignments.

- Matt Masten for inspiring me with his "Causal Inference Bootcamp" videos (https://mattmasten.github.io/bootcamp/).
- Anyone who I have forgotten to mention.