Causal Inference Summer Intensive Seminar
Graduate School of Political Science
Waseda University

Ryan T. Moore*

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Course Information

Causal Inference Summer Intensive Seminar
Graduate School of Political Science
Waseda University
20 August - 23 August 2024
Lecture: 10:40-12:20 and 13:10-14:50
Office hours: 15:05-16:45
Waseda Campus Bldg. 3, 9F 909

Instructor Information

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Course Description

This course is an introduction to causal inference and experiments for the social sciences. We will discuss the nature of causal research, how to design research to answer different types of causal questions, how to analyze experimental data, and how to interpret the results of causal analyses. We will show examples, implementation, and analysis using the R statistical language.

Specific topics will include potential outcomes, experiments, blocked designs, and conjoint, list, and multiarm bandit survey experiments, regression and experiments, and intereference in experiments.

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Learning Objectives

By the end of the course, you should be able to

- Identify causal effects using the potential outcomes framework
- Perform design-based inference for randomized experiments
- Create and analyze variety of randomized designs, including for blocked, clustered, conjoint, list, and multiarm bandit experiments
- Relate experiments to regression quantities
- Estimate mediation effects and assess their sensitivity
- Discuss and evaluate designs under interference

Learning Strategies

Readings

Participants are welcome to complete the readings before the course meeting under which they are listed below. Note that the many citations below are provided as references, not as prerequisites for participation in the seminar. The primary textbook for the course is

> Alan S. Gerber and Donald P. Green. *Field Experiments: Design, Analysis, and Interpretation*. WW Norton, New York, NY, 2012.

Software

The primary software in the course is R. See http://j.mp/2swvN0p for help getting started.

Intellectual Property

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Calendar

Day 1: Tuesday, 20 August

Introduction to causal inference. The potential outcomes framework. Estimands. Randomized experiments. Inference.

☐ Chapters 2-3 of

> Alan S. Gerber and Donald P. Green. *Field Experiments: Design, Analysis, and Interpretation*. WW Norton, New York, NY, 2012.

Day 2: Wednesday, 21 August

Blocked designs. Clustered designs. Regression and Experiments. Heterogeneous treatment effects. Exercise in potential outcomes.

- ☐ Chapter 3 of Gerber and Green (end)
- ☐ Chapter 4 of Gerber and Green
- ☐ Moore, Ryan T. "Multivariate Continuous Blocking to Improve Political Science Experiments". *Political Analysis*, 20(4):460–479, Autumn 2012.
- ☐ Moore, Ryan T. and Sally A. Moore. "Blocking for Sequential Political Experiments". *Political Analysis*, 21(4):507–523, 2013.
- ☐ Chapter 9 of Gerber and Green
- ☐ Winston Lin. Agnostic notes on regression adjustments to experimental data: Reexaminig freedman's critique. *Annals of Applied Statistics*, pages 295–318, 2013.

Day 3: Thursday, 22 August

Survey experiments. Conjoints, item counts, lists. Multiarm bandits.

- ☐ Paul M. Sniderman. Some advances in the design of survey experiments. *Annual Review of Political Science*, 21:259–275, May 2018.
- ☐ Jens Hainmueller, Daniel J. Hopkins, and Teppei Yamamoto. Causal inference in conjoint analysis: Understanding multidimensional choices via stated preference experiments. *Political Analysis*, 22(1):1–30, 2014.
- ☐ Scott F Abramson, Korhan Koçak, and Asya Magazinnik. What do we learn about voter preferences from conjoint experiments? *American Journal of Political Science*, 66(4):1008–1020, 2022.
- ☐ Kirk Bansak, Jens Hainmueller, Daniel J. Hopkins, and Teppei Yamamoto. Using conjoint experiments to analyze election outcomes: The essential role of the average marginal component effect. *Political Analysis*, pages 1–19, 2022.
- ☐ Yusaku Horiuchi, Daniel M Smith, and Teppei Yamamoto. Measuring voters' multidimensional policy preferences with conjoint analysis: Application to Japan's 2014 election. *Political Analysis*, 26(2):190–209, 2018.
- ☐ Graeme Blair and Kosuke Imai. Statistical analysis of list experiments. *Political Analysis*, 20(1):47–77, Winter 2012.
- ☐ Graeme Blair, Alexander Coppock, and Margaret Moor. When to worry about sensitivity bias: A social reference theory and evidence from 30 years of list experiments. *American Political Science Review*, 114(4):1297–1315, 2020.
- ☐ Graeme Blair, Kosuke Imai, and Jason Lyall. Comparing and combining list and endorsement experiments: Evidence from Afghanistan. *American Journal of Political Science*, 58(4):1043–1063, 2014.

- ☐ Molly Offer-Westort, Alexander Coppock, and Donald P. Green. Adaptive experimental design: Prospects and applications in political science. *American Journal of Political Science*, 65(4):826–844, October 2021.

- ☐ Neha Gupta, Ole-Christoffer Granmo, and Ashok Agrawala. Thompson sampling for dynamic multi-armed bandits. In *2011 10th International Conference on Machine Learning and Applications Workshops*, pages 484–489. IEEE, 2011.

Day 4: Friday, 23 August

Mediation.

- ☐ Chapter 10 of Gerber and Green

- ☐ Kosuke Imai, Luke Keele, Dustin Tingley, and Teppei Yamamoto. Unpacking the black box of causality: Learning about causal mechanisms from experimental and observational studies. *American Political Science Review*, 105(4):765–789, November 2011.

- ☐ John G. Bullock, Donald P. Green, and Shang E. Ha. Yes, but what's the mechanism? (don't expect an easy answer). *Journal of Personality and Social Psychology*, 98(4):550–558, 2010.

- ☐ Avidit Acharya, Matthew Blackwell, and Maya Sen. Analyzing causal mechanisms in survey experiments. *Political Analysis*, 26(4):357–378, 2018.

- ☐ Graeme Blair, Alexander Coppock, and Margaret Moor. When to worry about sensitivity bias: A social reference theory and evidence from 30 years of list experiments. *American Political Science Review*, 114(4):1297–1315, 2020.

- ☐ Kosuke Imai, Luke Keele, and Teppei Yamamoto. Identification, Inference, and Sensitivity Analysis for Causal Mediation Effects. *Statistical Science*, 25(1):51–71, February 2010.

Interference.

- ☐ Chapter 8 of Gerber and Green

- ☐ Michael G. Hudgens and M. Elizabeth Halloran. Toward Causal Inference With Interference. *Journal of the American Statistical Association*, 103(482):832–842, June 2008.

- ☐ Paul R. Rosenbaum. Interference Between Units in Randomized Experiments. *Journal of the American Statistical Association*, 102(477):191–200, 2007.

- ☐ Michael E. Sobel. What do randomized studies of housing mobility demonstrate?: Causal inference in the face of interference. *Journal of the American Statistical Association*, 101(476):1398–1407, 2006.