

Statistics 265 Causal Inference

Instructor: Professor Hal Stern
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When: MW 11am-12:20pm

Where: Bren Hall 1423

Course goals: The course will consider various approaches to causal inference focusing on the potential outcomes framework (Rubin causal model). Topics include randomized experiments, observational studies, ignorable and non-ignorable treatment assignment, matching, linear models and instrumental variables, graphical models and sensitivity analysis.

Prerequisites: Statistics 200ABC (graduate level statistical theory), Statistics 210 (linear models). Statistics 211 and 212 wouldn't hurt but they are not listed as prerequisites in the catalogue!

CAVEAT: I have never taught this course before. This syllabus is tentative. We should all keep our expectations low!

Grading and Course Requirements: (1) There will be approximately 4 homework assignments during the quarter; (2) Each registered student will be required to type up class notes from one of the lectures; (3) There will likely be a single exam about $\frac{3}{4}$ of the way through the course, say February 24, 2010; (4) Students will be expected to do a project (solo or in groups of size 2 or 3). The projects will be presented in short papers and in 30 minute talks during the last week of class and finals week (Mar 8-12, Mar 15-19). Projects can focus on relevant methods or interesting subjects (climate change, discrimination, second-hand smoke) and the role that statistical ideas associated with causal inference play in the debate. The grade is determined by performance on this work as follows: homework (25%), project (30-40%), exam (35-45%).

Software: Assignments may require computation; if so any software is OK but I will focus on R.

Topical Outline for Lectures:

Weeks 1-2 – Introduction to causal modeling and counterfactuals; causal inference in randomized trials

Weeks 3-5 – Matching and causal inference

Weeks 6-7 – Linear Models and causal inference

Weeks 8-9 – Sensitivity analysis and causal inference

Week 10 – Project presentations

References:

Primary text: *Causal Inference in Statistics* – book in progress by Guido Imbens and Don Rubin Chapters will be posted on the course website as available/needed.

Other texts:

Mostly Harmless Econometrics – Joshua Angrist and Jorn-Steffen Pischke; Princeton University Press, 2008.

Counterfactuals and Causal Inference – Stephen L. Morgan and Christopher Winship; Cambridge University Press, 2007.

Causality: Models, Reasoning and Inference – Judea Pearl; Cambridge University Press, 2009 (2nd edition)

Observational Studies – Paul R. Rosenbaum; Springer-Verlag, 1995.

Matched Sampling for Causal Effects – Donald B. Rubin; Cambridge University Press, 2006.

We will also read selected papers. This will generally be provided as PDFs as we go.