

Introduction to causal inference with machine learning

Chapter 0: Overview of the course

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Organization of this course

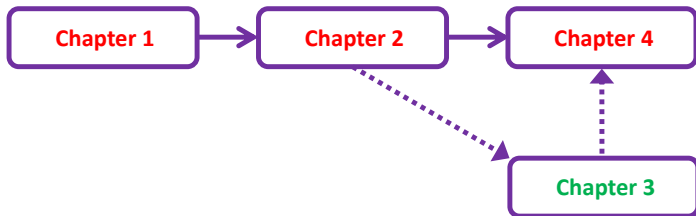
Lecture material:

- 1 Introduction to causal inference
- 2 Basic identification and estimation of an average treatment effect
- 3 Super learning
- 4 Efficient, doubly-robust estimation of an average treatment effect

Extra material (not covered):

- Lab 0: Computing G-computation and IPTW estimators by hand
- Lab 1: Super learning in R
- Lab 2: Doubly-robust inference in R

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LEARNING OBJECTIVES:

At the end of this short course, we expect each student to have an understanding of:

- 1 the role of a causal model in making explicit the available background knowledge;
- 2 the definition of counterfactuals and their role in defining causal effects that address the scientific question of interest;
- 3 the key identification formulas for linking counterfactual and observed data parameters in the context of observational data;
- 4 the various traditional techniques for causal inference and their limitations;
- 5 the benefits of the Super Learner as an optimal, data-driven and pre-specified approach to flexible estimation;
- 6 the benefits of more advanced techniques for causal inference, including the augmented IPTW and TMLE estimators;

We expect that familiarity with the above concepts will allow students to effectively communicate and collaborate with biostatisticians on causal analyses.

Organization of this course

A few guidelines for the day...

- Audience is heterogeneous – we will try to cater to everyone as best we can.
- Slides include more details than strictly needed to understand the material.
- Please feel absolutely free to ask clarification questions at any time, but reserve 'enrichment' questions for later in the day or for one-on-one chats during breaks.
- This course is always evolving, and there is still plenty of room for improvement. Feedback is very welcome.

Interested in more?

We offer a longer version of the course as part of the (online) [Summer Institute in Statistics for Clinical & Epidemiological Research \(SISCER\)](#).

- Tentative dates for institute July 7-30, 2021
- More in-depth coverage of each topic + additional topics and labs