Causal Inference in R

Malcolm Barrett, Lucy D'Agostino McGowan, Travis Gerke

2021-09-23

Contents

Preface

Welcome! In this book, we will...

Part 1: Asking Causal Questions

- Chapter 1: What is a causal question?
  - Description, prediction, and explanation
  - Causal assumptions
  - Whole game example
- Chapter 2: Expressing causal questions as DAGs
  - Visualizing causal assumptions
  - DAGs in R: ggdag and dagitty
- Chapter 3: Preparing data to answer causal questions
  - Data wrangling with dplyr
  - Recognizing missing data: visdat, tidyr, mice
  - Working with multiple data sources
- Chapter 4: Observational data as causes and effects
  - Exploring and visualizing data and assumptions: skimr, ggplot2
  - Calculating summary statistics: gtsummary, tableone

Part 2: The counterfactual framework

- Chapter 5: Estimating counterfactuals
  - What is a counterfactual?
  - Target trials

  - Estimating the average treatment effect
  - Estimating treatment effects with other targets in mind
- Chapter 6 Building a propensity score models
  - Logistic regression
  - Choosing variables to include
  - Continuous and categorical exposures
- Chapter 7: Using the propensity score
  - Matching
  - Weighting
  - Weighting and matching with more complex exposures
- Chapter 8: Evaluating your propensity score model
  - Calculating the standardized mean difference
  - Visualizing balance via Love Plots, boxplots, and eCDF plots
  - Pruning, trimming, and stabilizing propensity scores

Part 3. Estimating causal effects

- Chapter 9: Incorporating propensity scores in generalized linear models
  - Using matched data sets
  - Using weights in outcome models
  - Estimating uncertainty
  - Estimating causal effects for complex exposures
- Chapter 10: Incorporating propensity scores in survival models
  - Preparing data for survival analysis
  - Pooled logistic regression
  - Confidence intervals for causal survival models
- Chapter 11: Sensitivity analyses
  - Quantitative bias analyses
  - Tipping point analyses: tipr, EValue
- Chapter 12: Other approaches to causal inference
  - G-computation
  - Targeted Learning
  - Instrumental variable analysis
  - Regression discontinuity
  - Difference-in-Difference

1 What is a causal question?

Text for chapter 1.

```
rnorm(5)
```

```
## [1]  0.2211654 -1.5659638  0.4990233 -0.5110215  0.2827447
```

2 Expressing causal questions as DAGs

Text for chapter 2.

```
x <- 1
```

3 Preparing data to answer causal questions

Text for chapter 3.

```
x <- 1:5
x
```

```
## [1] 1 2 3 4 5
```