PLSC 598: Causal Inference Final Practice

Spring 2023

April 26, 2023

This is the format for the midterm on March 1. During class on February 22, I published this long-ish list of possible terms and possible questions; you will thus have a week to review these general kind of questions. On the day of the midterm, I will reveal which of these terms you need to define and then work with throughout. You will have the three hours from 2pm to 5pm to complete the midterm, open book (including whatever materials you want to use: internet, class notes, GPT3, prayer), but *no consultation or group work*.

- **Concepts, terms:** These are all of the terms you'll need to be familiar with. I'm going to ask you to define some of them, to apply some of them to conceptual arguments, and to use others for applications in *R*.
  - (Causal) Identification
  - Potential Outcomes
  - Agnostic statistics
  - Parametric/Non-Parametric
  - Manipulability
  - Fundamental Problem of Causal Inference
  - Research design
  - Estimation
  - Inference
  - Bias
  - Consistency
  - Efficiency
  - Asymptotic
  - Finite samples
  - Block randomization
  - Conditional Expectation Function
  - ATE
  - CATE
  - SATE
  - PATE

- ATT
- ATC
- Directed Acyclic Graphs
- Backdoor Paths
- Sharp null
- Randomization inference
- Partial Regression
- Residual
- Leverage (from OLS)
- Causal Regression Weights (from OLS)
- Effective sample size
- Conditioning
- Confounding
- Conditional independence
- Selection Bias
- Collider Bias
- Post-treatment bias
- Model dependence/extrapolation bias
- Common support
- Matching
- Weighting
- Propensity score matching
- Inverse propensity score weighting
- Coarsened exact matching
- Robust inference
- Clustering
- Degrees of freedom
- Variance inflation
- Coverage
- Bootstrapping

POST-MIDTERM

- Instrumental variables
- First stage
- Exclusion restriction
- Reduced Form
- Principal strata
- IV placebo tests

- Local Average Treatment Effect (LATE)
- Non-compliance
- Intention to treat (ITT)
- Encouragement experimental design
- Regression discontinuity
- Bandwidth
- Mean Squared Error (MSE)
- Kernel
- RDD placebo tests
- Natural experiment
- Difference-in-differences
- Parellel trends
- No anticipation
- SUTVA
- Compositional changes
- DiD placebo tests
- Event study
- "Bite"
- Mediators
- Moderators
- Natural Direct Effect
- Natural Media Effect
- Controlled Direct Effect
- Missing data
- Potential response
- Missing completely at random
- Manski bounds
- Lee bounds
- "Monotonicity" assumption
- Interference
- Expected Average Treatment Effect (EATE)
- "Split-plot" design
- Machine learning
- Regularization
- Prediction vs causality
- Loss function
- Bias-variance tradeoff
- Cross-validation

  - Double machine learning
  - Heterogenous treatment effects (HTE)
  - Variable importance
  - External Validity
  - Temporal Validity
  - Meta-Analysis
  - Harmonization
  - Random Effects model
  - "Unconfounded location"

- **Research Design:** Using the above terms, I will ask conceptual questions about research design.
- **Literature:** I will ask you to read a brief portion of a published political science article and discuss the research design in the terms defined above.
- **Data Work/Estimation:** With the same article, I will ask you to download the replication data (which I will ensure has been appropriately cleaned and is straightforward to work with) in order to replicate the analysis and perform moderate modifications.