**Causal Inference**

Correlation versus Causation

Potential Outcomes

Fundamental Problem of Causal Inference

Estimands

* ATE, ATT, ATU

Bias: Estimation versus Identification

Identifiability: what is it?

Identifying the ATE

* Counterfactual Consistency
* No Interference
* Exchangeability
* Conditional Exchangeability
* Positivity
  + Diagnosing Violations
    - PS Overlap
    - Distribution of SW
    - Covariate Balance
    - Weighted and Unweighted eCDFs

**Probability and Statistical Inference**

* What is Probability?
* Direct versus Inverse Problems
* Bernoulli’s Fallacy
* What is a Probability?
  + Mathematical versus Philosophical
  + Classical, Subjective, and Frequentist
* P Value (One versus Two Sided)
  + Lindley’s Paradox
* P Value Functions
* S Values
* Fisher versus Neyman Pearson
  + Divergence versus Decision Formulations
  + Fundamental Problems with NP Testing
  + Specific Problems with NP Testing
  + Choosing alpha and beta
* Confidence Intervals
  + Coverage Property
  + Conservative versus Anticonservative
  + Honest versus Dishonest
* Compatibility Intervals

**Regression**

* Marginal and Conditional Effects
* Marginal and Conditional Adjustment
* Collapsibility and Noncollapsibility
  + Strictly Collapsible
  + Collapsible
  + Noncollapsible
* Conditionally Adjusted Regression
  + GLMs: Distributions and Link Functions
  + Risk Difference, Risk Ratio, Odds Ratio
    - Deriving via Link Functions
  + Model Based, Robust, and Bootstrap SE
  + Interactions in Conditionally Adjusted Models
* Marginal Standardization & IP Weighting
  + ATE, ATT, and ATU
* IP Weighting for Categorical & Continuous Exposure
* Variable Coding in Regression
  + Target Function versus Nuisance Function
  + Z-Score
  + Dummy Variables
  + Splines

**Missing Data**

* MCAR, MAR, MNAR
* Relations to Exchangeability
* IP Weighting
* MICE in R
  + Selecting Methods
  + Modifying p Matrix
  + Implementing with:
    - Conditional Regression
    - IP Weighting
    - Marginal Standardization (with Bootstrap)

**Longitudinal Data**

* Clustering in Data
* Robust Variance and Clustered Bootstrap
* Generalized Estimating Equations
* (IP weighting and g Computation for Time-Dependent Confounding)

**(Variance Estimation)**

* Model-Based SEs
* Robust (Sandwich) SEs
* Bootstrapping
  + Normal Interval (Wald)
  + Percentile
  + BCa Intervals