Machine Learning for econometrics

Causal perspective

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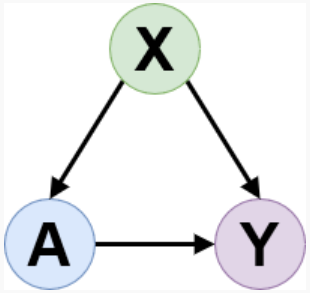
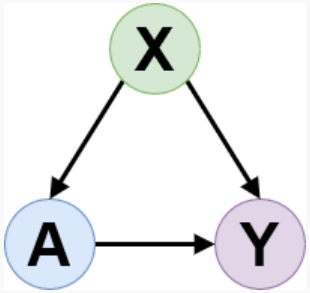
Introduction

Causal inference: subfield of statistics dealing with “why questions”.



At the center of epidemiology, econometrics, social sciences…

Causal inference: subfield of statistics dealing with “why questions”.



At the center of epidemiology, econometrics, social sciences…

Now, bridging with Machine Learning (Kaddour, Lynch, Liu, Kusner, & Silva, 2022)

Asking a sound causal question: PICO framework

Identify the target trial

What would be the ideal **randomized experiment** to answer the question?

(Hernán & Robins, 2016)

PICO framework

- Population : Who are we interested in?
- Intervention : What treatment/intervention do we study?
- Comparison : What are we comparing it to?
- Outcome : What are we interested in?

Causal graphs

How to ask a sound causal question

What is a why question ?

- Economics: How does supply and demand (causally) depend on price?
- Policy: Are job training programmes actually effective?
- Epidemiology: How does this threatment affect the patient's health?
- Public health : Is this prevention campaign effective?
- Psychology: What is the effect of family structure on children's outcome?
- Sociology: What is the effect of social media on political opinions?

This is different from a predictive question

- What will be the weather tomorrow?
- What will be the outcome of the next election?
- How many people will get infected by flue next season?
- What is the cardio-vacular risk of this patient?
- How much will the price of a stock be tomorrow?

Why is prediction different from causation?

- Prediction assumes stability between train and test data

Why is prediction different from causation?

- Prediction assumes stability between train and test data
- Causal inference search the effect of an intervention

How to ask a sound causal question

- Define the population of interest
- Define the intervention
- Define the outcome
- Define the counterfactual
- Define the causal effect

Different steps : identification, estimation, inference

Identification: what can we learn from the data?

Identification: what can we learn from the data?

Causal graphs

Potential outcomes

Related concepts

Structural equations.

Hello world

Resources

- https://web.stanford.edu/~swager/stats361.pdf
- https://www.mixtapesessions.io/
- https://alejandroschuler.github.io/mci/

Bibliography

Hernán, M. A., & Robins, J. M. (2016). Using big data to emulate a target trial when a randomized trial is not available. American Journal of Epidemiology, 183(8), 758–764.

Kaddour, J., Lynch, A., Liu, Q., Kusner, M. J., & Silva, R. (2022). Causal machine learning: A survey and open problems. Arxiv Preprint Arxiv:2206.15475.