scm_presentation

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Introduction

Causal assumptions differentiate causal models from association learning methods.

Association-based Concepts	Causal Concepts
Correlation	Randomization
Regression	Confounding
Conditional Independence	Disturbance
Likelihood	Error Terms
Odds Ratio	Structural Coefficients
Propensity Score	Spurious Correlation

Fundamental Differences to begin

SCM:

- is a nonparametric SEM
- has functional form rather than using probabilities
- entails features from the PO framework and graphical representation
- conflict whether to use graphs or not
- A SEM is a parametric specification used in applied sciences (parameters contested)
- A Bayesian causal network is another popular causal model using conditional probabilities and NO functions
- Differences in performance between BCN and SCM

Method	CBN	SCM
Prediction	• Unstable • Volatile to parameter changes • Re-Estimate entire model	• Stable • More Natural Specification • Only estimate Δ CM
Intervention	• Costly for Non-Markovian Models • Unstable(Nature CP) • Only generic estimates(Δ CP)	• Pot. Cyclic Representation • Stable(Nature Eq.) • Context specific(Invariance of Eq.)
Counterfactuals	• **Impossible** • no information on latent factors(ϵ)	• Possible • Inclusion of latent factors

Graphical Illustration

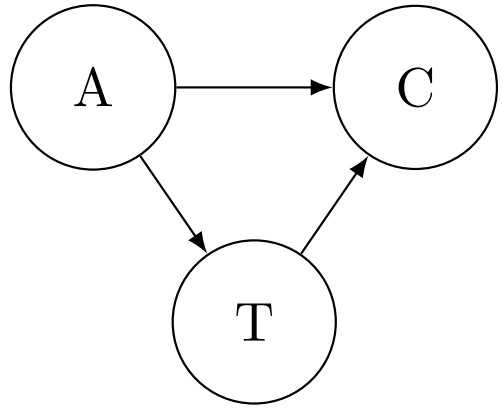

Figure 1: Probabilistic Model

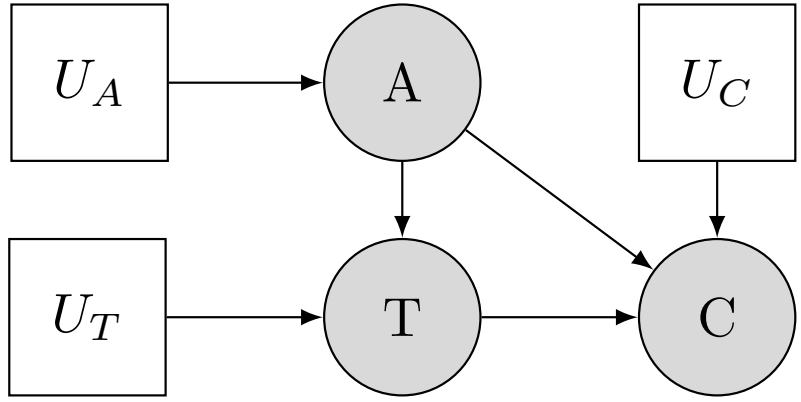

Figure 2: Structural Causal Model

Pearls Causal Hierachy

Table 3: Pearls Hierachy of Causation (2009)

Method	Action	Example	Usage
Association $P(a\|b)$	Co-occurrence	What happened...	(Un-)Supervised ML, BN, Reg.
Intervention $P(a\|do(b), c)$	Do-manipulation	What happens if ...	CBN,MDP,RL
Counterfactual $P(a_b\|a', b')$	Hypotheticals	What would have happened if...	SCM ,PO