

# Causal Inference using Pyro

# Probabilistic Programming for Causal Inference

- How do they connect?
  - PP can help us reason about the uncertainty of causal effects

# Previous Work: Causal Effect VAE

- Goal: understanding individual-level causal effects from observational data
- VAEs good at handling uncertain and hidden relationships
- Robust against hidden confounding

# Idea: Variational Contrastive Divergence

- Combine Markov chain monte carlo and VI
- Shown improved performance on VAEs
  - Balance of performance w computational complexity
  - Ensures tractable optimization -> useful for causal models
- Advantage of use in Pyro
  - Customizable variational inference

# Dataset Evaluation

- Original VAE paper evaluated on:
  - Infant Health and Development Program (IHDP)
  - Jobs

# Goals

- Learn how to use Pyro framework
- Understand probabilistic causal inference
- Learn how to implement custom VI in Pyro
- Evaluate VCD, does it actually improve performance and what is the computational cost?

# Workplan

- Currently: lit review
- Next steps:
  - Finish lit review this week
  - Implementing VAE
  - Implementing VCD
  - Evaluation
  - Report