UNIVERSITY OF COPENHAGEN

# Introduction to causal discovery

Anne Helby Petersen

# Program

- Welcome + introduction to DAGs
- Human generated DAG
- Causal discovery: PC algorithm and CPDAGs
- Work with PC in R
- TPC and TPDAGs
- Work with TPC in R
- LUNCH (11.00 - 11.45)

# Program

- Welcome + introduction to DAGs
- Human generated DAG
- Causal discovery: PC algorithm and CPDAGs
- Work with PC in R
- TPC and TPDAGs
- Work with TPC in R
- LUNCH (11.00 - 11.45)
- More on TPC
- Human generated DAG with latents
- Introduction to PAGs, FCI algorithm and TFCI algorithm
- Work with (T)FCI in R
- Final remarks + further perspectives

# Program

- Welcome + introduction to DAGs
- Human generated DAG
- Causal discovery: PC algorithm and CPDAGs
- Work with PC in R
- TPC and TPDAGs
- Work with TPC in R
- LUNCH (11.00 - 11.45)
- More on TPC
- Human generated DAG with latents
- Introduction to PAGs, FCI algorithm and TFCI algorithm
- Work with (T)FCI in R
- Final remarks + further perspectives

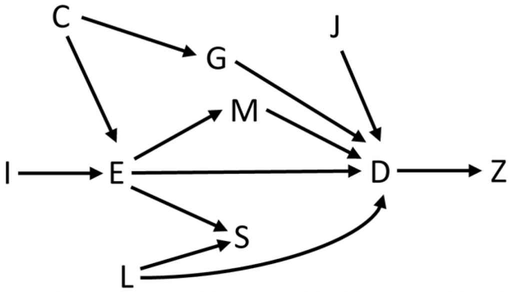
Manage your own breaks during exercise bits.

# Program

- Welcome + introduction to DAGs
- Human generated DAG
- Causal discovery: PC algorithm and CPDAGs
- Work with PC in R
- TPC and TPDAGs
- Work with TPC in R
- LUNCH (11.00 - 11.45)
- More on TPC
- Human generated DAG with latents
- Introduction to PAGs, FCI algorithm and TFCI algorithm
- Work with (T)FCI in R
- Final remarks + further perspectives

Manage your own breaks during exercise bits.

# Directed acyclic graphs (DAGs) 101




- **DAG interpretation:** $X \rightarrow Y$ means that $X$ is a **direct cause** of $Y$ relative to the other variables in the DAG:

  **Cause:** Manipulating $X$ affects $Y$, but not vice versa

  **Direct cause:** There is no mediator variable $M$ in the DAG such that if $M$ is held constant, $Y$ is no longer affected by changes in $X$.

- Assumes **no cycles**, i.e., no directed paths $X \rightarrow Y \rightarrow \ldots \rightarrow X$.

# Why DAGs?

- Tool used for visualizing and summarizing causal assumptions and their implications
- Mathematically neat: A lot of mathematical theory exists, e.g., d-separation, results for equivalence classes, ...
- Useful for guiding causal inference (effect identifiability, adjustment sets)
- But note: (Almost) always a crude simplification of the real world!

# Exercise 1: Human generated DAG

Go to the course website and find Exercise: Human Generated DAG.

Follow the instructions to create a DAG individually – we will follow up with a plenary discussion.