# Causality
# Course Overview

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# Course overview

Session 1 Wednesday 13 September - course (C. Assaad)
*History and motivation*
*Introduction to causal graphical models*

Session 2 Wednesday 20 September - lab + course (C. Assaad)
*Lab on graphs*
*Causal discovery: constraint-based methods*

Session 3 Thursday 21 September - lab + course (E. Devijver)
*Lab on constraint-based causal discovery* (0.25)
*Causal discovery: noise-based methods*

Session 4 Wednesday 4 October - course (E. Gaussier)
*Causal discovery: score-based and other methods*
*Intervention and identifiability (back-door and front-door)*

Session 5 Wednesday 11 October - course (C. Assaad)
*do-calculus*
*Exercices*

# Course overview

Session 6 Wednesday 18 October - course (E. Gaussier)
*Estimation (ATE, double ML)*
*Counterfactual reasoning (ITE, propensity score, mediation)*

Session 7 Wednesday 25 October - lab + course (E. Gaussier)
*Lab on Simpson paradox* (0.25)
*Reading article of an applied domain*

Session 8 Wednesday 8 November - lab + course (E. Devijver)
*Causal representation*
*What about LLMs?*

Session 9 Wednesday 15 November - final exam
*Presentation of articles* (0.5)

Elements (labs + final exam) in orange are graded (the coefficient is given in parentheses)

Dot not forget your laptops for lab sessions!

# Requirements for labs

- Python3
- Jupyter Notebook

- Packages
  - numpy
  - pandas
  - scipy
  - networkx
  - matplotlib
  - itertools

# Research opportunities about causal inference

Internships

- Causal discovery
- Causal reasoning
- Counterfactual reasoning
- Root cause analysis
- ...

PhD proposals:

- Causal structures and representations for complex data tasks
- Causal inference in uncertain environments
- ...