

# UE Learning, Probabilities and Causality



Niveau d'étude  
Bac +5



ECTS  
6 crédits



Crédits ECTS  
Exchange  
6.0



Composante  
UFR IM2AG  
(informatique,  
mathématiques  
et  
mathématiques  
appliquées)



Période de  
l'année  
Automne (sept.  
à dec./janv.)

- > **Langue(s) d'enseignement:** Anglais
- > **Ouvert aux étudiants en échange:** Oui
- > **Crédits ECTS Exchange:** 6.0
- > **Code d'export Apogée:** GBX9AM77

## Présentation

### Description

Causality is at the core of our vision of the world and of the way we reason. It has long been recognized as an important concept and was already mentioned in the ancient Hindu scriptures: "Cause is the effect concealed, effect is the cause revealed". Even Democritus famously proclaimed that he would rather discover a causal relation than be the king of presumably the wealthiest empire of his time. Nowadays, causality is seen as an ideal way to explain observed phenomena and to provide tools to reason on possible outcomes of interventions and what-if experiments, which are central to counterfactual reasoning, as "what if this patient had been given this particular treatment?"

### Objectifs

The main aim of this course is to provide the principles and tools to understand and master learning models based on probabilities and causality.

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## Heures d'enseignement

CM	CM	36h
TP	TP	18h

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## Pré-requis recommandés

Probability and statistics background.

**Période** : Semestre 9

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## Bibliographie

Pattern Recognition and Machine Learning, by C. Bishop, 2005. [link].

An introduction to variational autoencoders, by D. P. Kingma and M. Welling [link].

The matrix cook book.

Dynamical Variational Autoencoders: A Comprehensive Review, by Laurent Girin et. al. 2021

The Book of Why: The New Science of Cause and Effect, by Pearl and Mackenzie, 2018

Probabilistic Reasoning in Intelligent Systems: Networks of Plausible Inference, by Pearl, 1988

Causation, Prediction, and Search, by Spirtes, Glamour and Scheines, 2000

Elements of Causal Inference: Foundations and Learning Algorithms, by Peters, Janzing and Scholkopf, 2017

Causality: Models, Reasoning and Inference, by Pearl, 2009

## Infos pratiques

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### Contacts

Responsable pédagogique

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## Campus

› Grenoble - Domaine universitaire