

## INTENSIVE POSTGRADUATE PROGRAMME

### AI IN LEGAL PRACTICE AND ITS REGULATION

Curricular unit

Basics of AI

Responsible Academic staff and respective workload in the curricular unit

Daniel McNamee/Gonzalo de Polavieja/Il Memming Park

Syllabus

#### Part 1: Introduction to AI and Machine Learning (Il Memming Park)

We will discuss how the research of artificial intelligence has evolved throughout the history. In particular, we will zoom into the interaction with the fields of neuroscience and statistics that started artificial neural networks and machine learning. In the tutorial, we will explore the fundamental concepts of probabilistic reasoning and making the “best” decisions.

- History of AI, Neuroscience, and Machine Learning (2hr, lecture)
- References:
  - NeuroMatchAcademy refresher on differentiation: [https://compneuro.neuromatch.io/tutorials/WOD4\\_Calculus/student/WOD4\\_Tutorial1.html](https://compneuro.neuromatch.io/tutorials/WOD4_Calculus/student/WOD4_Tutorial1.html)
  - Tutorial on Bayesian modeling by Wei Ji Ma: [https://www.youtube.com/watch?v=f7RH\\_E8yG6g](https://www.youtube.com/watch?v=f7RH_E8yG6g)

Sayed, A. H. (2023). *Inference and learning from data: Volume 1-3*. Cambridge University Press.

#### Part 2: Artificial Neural Networks, including language models (Gonzalo de Polavieja)

We will explain what Artificial Neural Networks do, and discuss their different architectures. In tutorials, we will train neural networks and discuss how to make them work best.

- Multilayer Perceptron, Convolutional Neural Networks and Transformers (2hr lecture)
- References:
  - Prince, S. (2023). *Understanding deep learning*. MIT Press. [https://github.com/udlbook/udlbook/releases/download/v4.0.2/UnderstandingDeepLearning\\_07\\_02\\_24\\_C.pdf](https://github.com/udlbook/udlbook/releases/download/v4.0.2/UnderstandingDeepLearning_07_02_24_C.pdf)
  - Open AI API, <https://platform.openai.com/docs/api-reference/introduction>

#### Part 3: Reinforcement Learning (RL) (Daniel McNamee)

- RL part 1 (2hr lecture)
  - Classical conditioning, temporal difference learning, explore-exploit trade-off
- Reference:
  - Sutton, R. S., & Barto, A. G. (2018). *Reinforcement Learning: An Introduction* (2nd ed.). MIT Press.

Teaching methodologies

Main Bibliography