

Intelligent digital architecture and data sharing/re-use for predictive medicine

Introduction to Artificial Intelligence

22h cours + 8h Training courses

Responsible : R. VanRullen

Course in English. UE (3 ECTS) planned for ANITI labeling in the framework of the M2 NCI (UPS). All or part of the courses below can be shared with other courses.

Courses : No prerequisites for this Introduction (M2 level), except as specifically mentioned for each course.

Python labs (Jupyter or Colab notebooks with GPU access); prerequisite: basic Python programming

- Symbolic AI: history and foundations (2h - IRIT: Emiliano Lorini)
 - Introduction: symbolic AI vs subsymbolic AI
 - Chronological view of symbolic AI
 - Formal methods for symbolic AI
 - Logic-based modeling in AI
 - Integration of symbolic and subsymbolic approaches...
- Neural networks : history and foundations (2h cours + 1h TP - VanRullen chair/PhD/post-doc)
 - History of neural networks
 - Artificial neurons - Perceptrons
 - Multi-layer perceptrons (MLPs), CNNs and RNNs
 - Objective functions, Gradient descent and Back-propagation
 - Loss functions, optimization, regularization and hyperparameters
- Deep learning in Computer Vision (6h cours + 2h TP - VanRullen or Serre chairs/PhD/post-doc)
 - image classification
 - object detection, semantic segmentation, U-nets
 - zero-shot and few-shot learning
 - self-supervised and unsupervised learning, auto-encoders, GANs
 - visual reasoning
- Natural Language Processing (NLP) (4h cours + 2h TP - IRIT: Chloe Braud, ANITI: Romain Bielawski)
 - Word embeddings
 - LSTMs and recurrent neural networks for NLP
 - Neural machine translation
 - Transformers
- Deep learning for sound processing, speech recognition (1h cours + 1h TP - IRIT: Thomas Pellegrini)
 - ...
- (Deep) Reinforcement Learning (3h cours + 2h TP – ISAE: Emmanuel Rachelson/PhD/post-doc)
 - ...
- Deep Learning and Neuroscience (4h – CerCo – prérequis: niveau L3 neuro ou psycho)
 - Homologies (and differences) between conv-nets and the visual pathways (Rufin VanRullen)
 - Spiking neural networks, STDP learning, surrogate gradients (Tim Masquelier)
 - Brain decoding with deep learning (Leila Reddy)