IG.2313 – Deep Learning

General information

Title: Deep Learning
Module ID: IG.2413
Module leader: Patricia CONDE-CESPEDES
ECTS: 5
Average amount of work per student: from 100 to 150 hours, of which 42 hours are supervised
Teamwork: yes
Keywords: neural networks, machine learning, AI

Presentation

Deep learning methods in particular are now ubiquitous in industry and research and can be applied to many tasks: image analysis and processing, predictive analysis in medicine, natural language analysis and processing, translation, speech recognition, financial market analysis, etc.

The good mastery and understanding of these methods is therefore essential to work and evolve in the field of artificial intelligence.

Educational objectives

The objective of this course is to introduce students to deep learning methods through different types of neural networks and applications. The different stages of use of Deep Learning methods will be addressed: the design or choice of the neural network according to the type of application, training, prediction and performance analysis.

Prerequisite

- Python Programming
- Notions of optimization, bases of classification

Content/Program

Concepts

- Reminders
  - Classification indices
  - Gradient descent
  - Cross-validation
- Neural network bases:
  - Perceptron, MLP
  - Backpropagation
  - Simple autoencoders: example in Word2Vec
  - RNN
  - Convolution Basics
- Convolutional neural networks:
  - Simple CNNs
  - Common networks: U-Nets, W-Nets, YOLO

Pedagogical methods

Learning methods

For the 3 components, the theoretical course is followed/accompanied by tutorials and practical work on a machine in Python. In such a way that students can assimilate the theoretical knowledge of the S.A.

This module is based on a problem-based approach, through the systematic use of contextualized problems, particularly in the dimension to improve skills "Ensuring the quality and safety of a system (availability, reliability, maintainability, security, confidentiality – integrity)".

Evaluation methods

Tabletop and project reviews.

Language of work

- English.

Bibliography, Webography, Other sources

- Goodfellow, Ian; Bengio, Yoshua and Aaron Courville (2016). "Deep Learning (Adaptive Computation and Machine Learning series). In preparation for MIT Press.
  Website: http://www.deeplearningbook.org
- Coursera MOOC "Deep learnin specialization"
- https://www.deeplearning.ai/deep-learning-specialization/ Murphy, K. P. (2012). Machine Learning: a Probabilistic Perspective. MIT Press, Cambridge, MA, USA.
- Leskovec, Juror; Rajaraman, Anand and Ullman, Jeffrey D. (2014). "Mining of Massive Datasets, 2nd edition". Cambridge University Press.
  Website: http://www.mmds.org
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https://www.deeplearning.ai/deep-learning-specialization/