Introduction to Deep Learning

Component
École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

In brief

- **Ametys Code:** M34HLG5B
- **Open to exchange students:** Yes

Presentation

Objectives

This course aims to introduce the fundamental concepts underlying machine learning, and more specifically deep learning. A second objective is to familiarize students with the Python libraries numpy and pytorch, which are widely used in academia and industry for machine learning.

Description

This subject is taught in the form of a lecture (CM) followed by three practical sessions (CTP) combining the presentation of concepts with practical examples on Jupyter. The lecture provides the basics for understanding machine learning (data, assumptions, statistical risk, empirical risk, loss function, etc.), and in particular the supervised learning paradigm, which is the focus of this course. The first CTP session then introduces numpy with the implementation of a classic layer (MLP) of a deep learning model (neural network) and its training. The second CTP focuses on training a deep model, regularization techniques, and their link to the model's generalization capacity. In the third CTP, we introduce convolutional neural networks (CNNs) and their motivation, as well as their implementation in pytorch.

Pre-requisites

- Linear algebra and matrix analysis (derivatives of a multivariate function)
- Optimization (gradient descent)
- Probability and statistics
- Signal processing (convolution, linear filters)
- Python programming