# Unsupervised learning

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

## In brief

- **Ametys Code:** M34HOB5T
- **Open to exchange students:** Yes

# Presentation

## Objectives

The objectives of this course are:

· to introduce the concept of unsupervised learning and the various objectives that motivate this approach in most applications;

· to introduce certain classic unsupervised learning techniques, their motivation, interpretation, advantages and disadvantages;

· to introduce more modern techniques based on deep learning models, particularly for data generation.

## Description

The course comprises six lectures introducing several unsupervised learning techniques, and seven practical sessions (including three independent sessions) allowing students to implement these techniques. The first part of the course covers two classic partitioning techniques: the k-means algorithm and probabilistic classification using Gaussian mixture modelling. Next, we introduce autoencoders, and finally four generative models based on deep learning: generative adversarial networks (GANs), normalising flows (NFs), variational autoencoders (VAEs) and diffusion models (DMs).

## Pre-requisites

Introduction to Deep Learning (IATI S8), Multivariate Analysis (IATI S8), Advanced Statistics (IATI-SIA S8), Computational Statistics (IATI-SIA S8).