



MACHINE LEARNING	
Enrollment year	2019/2020
Academic year	2020/2021
Regulations	DM270
Academic discipline	ING-INF/05 (DATA PROCESSING SYSTEMS)
Department	DEPARTMENT OF MATHEMATICS "FELICE CASORATI"
Course	MATHEMATICS
Curriculum	PERCORSO COMUNE
Year of study	2°
Period	2nd semester (01/03/2021 - 11/06/2021)
ECTS	6
Lesson hours	59 lesson hours
Language	English
Activity type	ORAL TEST
Teacher	CUSANO CLAUDIO (titolare) - 6 ECTS
Prerequisites	Students are expected to have a basic knowledge of linear algebra, vector calculus, probability and statistics. They are also expected to be able to design and write simple computer programs.
Learning outcomes	At the end of the course students will be able to understand and discuss the principles of machine learning. They will be able to analyze a problem, and to design and implement a solution. They will be familiar with the most important techniques in the field and will be able to use them to build machine learning systems by using the Python programming language.
Course contents	After a general introduction to machine learning, the first lectures will focus on the main techniques used to tackle the problem of classification by supervised learning. More in detail the following topics will be presented: - logistic regression;

- generalization and regularization;
- the perceptron algorithm;
- linear and non-linear Support Vector Machines;
- multi-class models;
- cross validation and model selection;
- generative models and naive Bayes.

Artificial neural networks will be the main topic of the second part of the course. The lectures will cover:

- the biological inspiration;
- feed forward networks;
- the backpropagation algorithm;
- introduction to deep learning;
- convolutional neural networks;
- recurrent networks.

The last part of the course will present some application domains in which machine learning models are widely used:

- document classification;
- audio processing;
- image recognition.

Teaching methods

About two thirds of the course will be given as lectures in which machine learning principles and techniques will be illustrated, even through the presentation of case studies. One third of the course will take place in a laboratory, in which the students will learn to solve machine learning problems by using the Python programming language.

Reccomended or required readings

The course is based on a set of notes that are supplemented by a selection of articles.

Assessment methods

The exam consists of an interview in which the student will discuss the topics of the course. During the interview the students will be asked to present their implementation of a solution for a specific machine learning problem.

Further information

Sustainable development goals - Agenda 2030

[\\$lbl legenda sviluppo sostenibile](#)