UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Applicazioni di Machine Learning

2223-1-F1701Q141

Aims

The aim of the course is to provide the theoretical concepts and basic programming exercises of the application of machine learning methods to data, signals and images of particle physics, space, biomedical, environmental, and in other applications.

Contents

Machine learning methods: principles and software applications to data, signals and images of particle physics, space, biomedical, environmental, and other applications.

Detailed program

-Pattern, task (classification / localization / detection / segmentation / improvement of image quality), learning methods, parameters, objective function

-Training / validation / testing, performance measurement metrics, convergence, generalization, unbalanced classes, underfitting / overfitting

- Pattern size reduction methods: Principal Component Analysis / Linear Discriminant Analysis

-Linear regression (simple / multiple)

-Clustering: criteria / algorithms, centroid-based clustering (k-means, fuzzy k-means, Expectation Maximization)

-Support Vector machines

- Multiple classifiers

-Decision trees / Random forests

- Neural networks

-Deep learning

-Transfer learning

- Exercises using software-applications to data, signals and images measured by particle physics, space physics, biomedical, environmental, and cultural heritage devices for classification / localization / detection / segmentation / image quality improvement tasks.

Prerequisites

Good knowledge of Matlab programming languages

Mandatory attendance with group programming exercises on laptops

Teaching form

Lectures and exercises using programming codes.

Textbook and teaching resource

Videos, data, programming codes and scientific articles provided to students during the course (lectures and laboratory activities).

Semester

Second semester

Assessment method

The exam consists of an oral interview aimed at verifying the student's level of knowledge of the topics covered during the course and in a project for the development of a programming code based on the machine learning methods presented during the course. A study reported by the student above those available from the scientific

literature will be part of the final assessment

During the Covid-19 emergency period, oral exams will only be telematic. They will be carried out using the WebEx platform and on the e-learning page of the course a public link will be shown for access to the exam of possible virtual spectators.

Office hours

Normally Tuesday from 11.30 to 12.30, at the request of students.

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE