UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# SYLLABUS DEL CORSO

# Advanced Computational Techniques for Big Imaging and Signal Data

**2425-1-F9102Q015**

## Aims

The aim of the course is to provide practical notions of deep learning through hands-on laboratories. In particular, the student will learn several frameworks related to deep learning that cover all the aspects from the design to the deployment of the neural system.

## Contents

The course consists of a set of theoretical lectures complemented by hands-on laboratory sessions. The course aims to get in touch with the bleeding-edge technologies related to deep learning. Four main parts will be covered: the design, the training of the neural architecture, the parameter search, the distributed training and the deployment of the system. During the laboratory several case-studies and practical applications will be analyzed.

## Detailed program

- Neural Networks (NNs)
- Data collection and representation
- Regression and classification with Pytorch
- Analysis of monodimensional signals
- Convolutional Neural Networks (CNNs)
- Semantic Segmentation
- Single Image Super Resolution
- Generative Adversarial Networks (GANs)

- Stable Diffusion Models
- Visual Transformers (ViTs)
- Audio analysis (speaker recognition and verification)

## Prerequisites

Programming basics, machine learning basics, linear algebra

## Teaching form

The course will be delivered through face-to-face lectures. Lectures will be recorded and uploaded to the course page for those who cannot attend but still want to take the course on a delayed basis. It is still highly recommended to attend the lectures.

## Textbook and teaching resource

Slides and material will be published on the course page.

## Semester

Second

## Assessment method

A project on a data-driven task using the knowledges acquired during the course.

Three aspects will be evaluated:
1 - the presentation (slides + oral presentation)
2 - the quality of the code
3 - the dashboard of your system

## Office hours

After the lesson and on appointment. The meeting can be done online or in my office, room 1048 building U-14.

## Sustainable Development Goals

QUALITY EDUCATION