MEDTEC SHOOL

Course: Machine Learning and Artificial Intelligence

Year (1st-2nd-3rd-4th-5th-6th): 4th

Period (1st-2nd semester – annual): 2nd semester

Credits: 5 CFU

Objectives

The course aims to introduce students to Machine Learning (ML) and Artificial Intelligence (AI) methods and their possible application to problems arising from medicine and clinical practice.

The expected learning outcomes are:

Knowledge and understanding	Students will become acquainted to: • principles and foundations of the most important ML/AI algorithms • problems and tasks that are tackled in ML and AI • differences and similarities between ML/AI approaches
Ability to apply knowledge and understanding	Students will be able to: • analyze and model problems according to different ML/AI approaches • properly assess the performance of ML/AI approaches • choose the most appropriate ML/AI approach for a specific problem
Making judgements	Students will understand the challenges and limitations of ML/AI approaches. Students will learn to interpret and compare the results of different ML/AI solutions.
Communication	Students will be able to: • analyze the design choices that an ML/AI solution entails • present and critically discuss the results of ML/AI approach
Lifelong learning skills	Students will become able to appreciate the relevance and possibility of developing and applying ML/AI methods to different problems and task in the medical field. Students will be able to understand and critically evaluate ML/AI systems deployed in different

	application scenarios.

Prerequisites

Students are expected to have a good grasp of the knowledge and skill provided by the following courses:

- Mathematics
- Statistics
- Computer Science

Contents

The course will cover the following topics:

- Introduction to AI and ML
- Data representation and preparation
- Unsupervised learning
- Regression
- Classification
- Model assessment and regularization
- Neural Networks and Deep Learning
- Ensemble Learning
- Agents and Reinforcement Learning
- Search and Optimization
- Explainability

Teaching Methods

The course is organized as follows. Frontal lectures will be used to teach key concepts and to present major applications. Practical sessions, mainly organized as computer lab with Python, will be used to teach how to apply in practice the theoretical concepts learned. Finally, a group project activity will allow to learn how to apply what learned during the course in a real-world problem.

Assessment

The course assessment will consist of two parts.
The first part will consist of an individual written test with both open and closed (max grade 20/30).
The second part will consist of a project to be completed by a team of 4-5 students (max grade 10/30).
The available topics for the project will be presented during the course and they will involve real-world applications of ML and AI methods to the medical field.

Texts

- Stuart Russell and Peter Norvig*: Artificial Intelligence: A Modern Approach,* Pearson 2021

Further readings and alternative references will be suggested during the course by the teacher.