## 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:

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| Knowledge and understanding | Students will become acquainted with:<br>• principles and foundations of the most important ML/AI algorithms<br>• problems and tasks that are tackled in ML and AI<br>• differences and similarities between ML/AI approaches |
| Ability to apply knowledge and understanding | Students will be able to:<br>• analyze and model problems according to different ML/AI approaches<br>• properly assess the performance of ML/AI approaches<br>• choose the most appropriate ML/AI approach for a specific problem |
| Making judgements | Students will understand the challenges and limitations of ML/AI approaches.<br><br>Students will learn to interpret and compare the results of different ML/AI solutions. |
| Communication | Students will be able to:<br>• analyze the design choices that an ML/AI solution entails<br>• 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 tasks in the medical field.<br>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 skills 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
- Reinforcement Learning
- 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 labs with Python, will be used to teach how to apply the theoretical concepts learned in practice. Finally, a group project activity will allow students to learn how to apply what learned during the course to a real-world problem.

## Assessment

The course assessment will involve:
- an individual written test with both open and closed questions (70% of the grade)
- a team project (30% of the grade)

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

References and additional readings for the topics covered will be provided during the course.