# Artificial Intelligence and Machine learning

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***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

Artificial Intelligence and, in particular, Machine Learning techniques are nowadays applied to solve complex data analysis problems. The objective of this course is twofold: to provide the theorical background of the basic techniques as well as some application scenarios using the state-of-the-art frameworks. In details, about 50% of lectures will be dedicated to the analysis of AI applications based on python packages.

At the end of the course students are expected to understand the principal learning approaches applied to AI and to design and perform data analyses using popular frameworks such as, scikit-learn and keras (from the tensorflow package).

***COURSE CONTENT***

* Artificial Intelligence and Machine Learning approaches
* Liner regression and learning approaches
* Regularization methods
* Logistic regression
* Probabilistic models and Bayesian networks
* Optimization techniques (analytical and numerical)
* Gradient Descent methods (mini batch and stochastic)
* Artificial Neural Networks for classification and regression problems
* Deep Neural Network and their application for image processing
* Introduction to Recurrent/Reinforcement Neural Networks
* Tensorflow and keras applications

***READING LIST***

* Textbooks will be recommended at the begin of the course
* Lecture notes and online contents

***TEACHING METHOD***

The course will include lectures and class exercises based on traditional teaching and teach by example principles. It is strongly advised to attend to lectures for working on case studies and examples, and for revising materials.

The course also involves lectures and exercise sessions using PC-labs. Active participation, and ongoing personal study are required.

***ASSESSMENT METHOD AND CRITERIA***

An oral interview aimed at assessing students' understanding of data analysis techniques and tools.

The assessment will also consider the active participation in the course, as well as a brief dissertation about an assigned project that accounts for 6/30 of the final grade.

The project topic has to discussed with the instructor in the second half of the course and can be elaborated boh indivudually or by teams of two or three students. Before taking the exam, studends are requested to send to the instructor a copy of the project report discussing achieved results and the methodological approach.

The project assessment will take into account:

* originality of the project;
* methodological approch to the project;
* students' ability to work in a team;
* project dissertation.

***NOTES AND PREREQUISITES***

Basic knowledge on statistical techniques and python programming language skills.

Attendance is strongly recommended.