

**Course offered for the PhD program  
in Civil, Chemical and Environmental Engineering  
a.a. 2018/2019**

(the course is open for participation of students from other PhD programs)

**1. Title**

Crash Course in Machine Learning

**2. Course Description**

In the last few years, machine learning systems have achieved remarkable results in solving a number of challenging tasks so far considered the exclusive domain of biological systems, such as visual and speech recognition or natural language processing.

Thanks to this success, machine learning is rapidly gaining momentum, playing a key role in a wide range of applications in scientific fields such as bioinformatics, computer vision and economics to name a few.

The goal of this course is to offer an introduction to the methods at the core of machine learning and data analysis, towards the effective and correct adoption of these tools in practice. Classes will be focused on modeling aspects, providing basic knowledge to understand modern machine learning algorithms and implement them on a computer. Laboratory sessions will provide direct experience with real data.

The course aims to introduce students to the key concepts at the core of machine learning. This goal will be pursued as follows:

- Provide students with basic understanding of the main machine learning algorithms in order to choose and adopt them correctly according to the specific problem considered, such as: regression, classification, feature selection, clustering or dimensionality reduction.
- Guide the students through the implementation of elementary machine learning algorithms, endowing them with basic capabilities to translate abstract learning models into actual computer programs.
- Guide the students on real data analysis experiments (on applications related to bioinformatics, recommender systems, computer vision, ecc.), providing them with direct experience of the practical impact of theoretical concepts studied in class, such as *regularization*, *overfitting* or *cross-validation*.

**3. Course Organization**

6 hours of teaching, organized in 2 lectures, with some hands on practical sessions.

**4. Teacher**

Carlo Ciliberto, Imperial College London, London, UK, Department of Electrical and Electronic Engineering.

**5. Duration and credits**

6 hours, 2 CFU.

**6. Activation mode and teaching period**

March 25th and 26th, 9-12 am in classroom A11.

## **7. Deadline for registration**

March 15<sup>th</sup>.

## **8. Final exam**

Students will be asked to work on a project and produce a report that will be marked.