

# Machine Learning

PhD course  
University of Bologna  
April 2016

<b>Instructors and Affiliation</b>	Marco Lippi DISI – University of Bologna marco.lippi3@unibo.it
<b>Time Span</b>	20 hours
<b>Final Exam</b>	Research project or technical report on a specific topic

## Course Outline

The course will present some relevant research topics in the area of machine learning, with a specific emphasis on deep learning.

## Objectives

After a brief introduction to basic principles and techniques of machine learning, the course will introduce students to advanced, state-of-the-art methodologies. At the end of the course, students are expected to have developed skills to use and implement machine learning software for solving practical problems, and to evaluate the performance of such systems.

## Prerequisites

Basics concepts in probability and statistics.

## Program

- Introduction and basic principles: supervised vs. unsupervised learning; classical tasks; symbolic vs. connectionist approaches; performance measurements; applications.
- Neural networks and deep learning: introduction, backpropagation algorithm, early stopping and overfitting. Deep learning models: energy-based models, auto-encoders, convolutional neural networks, recurrent neural networks.
- Kernel machines: support vector machines, structured input/output predictions.
- Statistical relational learning: merging logic and probabilistic models.

## Learning and assessment modalities

The course will be organized in six lectures (3-4 hours each). It will be taught in either Italian or English at the preference of the convenors. The final assessment consists of a project or a technical report on one of the course topics.

## Materials

All the course material is in English. A copy of slides and references will be provided to students.

## Schedule

- Mon 4/4, 9.00-12.00 (room 1.4)
- Wed 6/4, 11.00-14.00 (room 5.1)
- Mon 11/4, 9.00-12.00 (room 1.4)
- Wed 13/4, 11.00-14.00 (room 5.1)
- Thu 14/4, 11.00-14.00 (room 5.1)
- Mon 18/4, 9.00-12.00 (room 1.4)
- Thu 21/4, 11.00-13.00 (room 1.5)