Machine Learning

FIB, Master in Innovation and Research in Informatics

Marta Arias, Computer Science @ UPC

Course information

Instructors

Mario Martin (temporally substituting Marta Arias) (theory)

- mmartin@cs.upc.edu
- no office hours; if you want to talk, email me and we'll set a time

Raquel Pérez

- raquel.perez@bsc.es

Bernat Coma

- bcoma@cs.upc.edu

Class logistics

- Course material (lecture slides, lab notebooks, project info) placed at `www.cs.upc.edu/~mmartin/ml-mds.html`
- Announcements and submissions through the racó
- Theory lectures (Wednesdays 18-20pm)
  - face to face [A6001]
  - materials in
- Lab sessions (Tuesdays 2-4pm and 4-6pm)
  - in person
  - will use notebooks in `python`
  - notebooks will implement and illustrate concepts from theory and introduce libraries as well
  - maybe use labs to do some examples in depth
  - may propose exercises and examples to solve *in your own time*, not graded

Evaluation

- Final grade = 35% **exam** + 50% **project** + 15% **poster**
- The project includes the skill "Reasoning" – *competencia transversal* – graded on the basis on how well your project is presented in the poster

Capacity for critical, logical and mathematical reasoning. Capability to solve problems in their area of study. Capacity for abstraction: the capability to create and use models that reflect real situations. Capability to design and implement simple experiments, and analyze and interpret their results. Capacity for analysis, synthesis and evaluation.

Project

- Done in **pairs** (singles not allowed)
- Topic of your choice (with some limits)
- Intended to start early and grow mature over time
- A final **written report** (along with the code) and an accompanying **poster** should be carefully prepared
- All posters will be put online for everyone to see

Delivery of project report, code and poster towards the **end of June**; exact date will be announced in the coming weeks

Mission statement

The aim of this course is to introduce you to important ***concepts*** *in machine learning and some key machine learning methods; it is not intended to cover the latests developments in the area (which come every second) but rather to give you a solid basis that will allow you to understand new developments in the field.*

Contents[1]

- Linear methods:
  - Linear methods for regression
  - Linear methods for classification
- Clustering
- Non-linear methods:
  - Kernel methods (support vector machines)
  - Artificial Neural Networks
  - Random Forests and other ensemble methods

[1] *Disclaimer: the topics and/or their order may change (slightly)*

Main bibliography

- Pattern Recognition and Machine Learning
  Christopher M. Bishop, Springer, 2006
- The Elements of Statistical Learning
  Hastie, Tibshirani and Friedman (2009). Springer-Verlag.
- Machine Learning: a Probabilistic Perspective
  Kevin P. Murphy, MIT Press 2012; new edition drafts here
- Introduction to Machine Learning
  Ethem Alpaydin (3rd Ed.), The MIT Press, 2015
- . . . There's a whole web out there