

# 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](mailto: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](mailto:raquel.perez@bsc.es)

Bernat Coma

- ▶ [bcoma@cs.upc.edu](mailto:bcoma@cs.upc.edu)

# Class logistics

- ▶ Course material (lecture slides, lab notebooks, project info) placed at [www.cs.upc.edu/~mmartin/ml-miri.html](http://www.cs.upc.edu/~mmartin/ml-miri.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<sup>1</sup>

- ▶ 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

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<sup>1</sup> *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