Machine Learning 2020/21

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Machine Learning 2020/21

Who is attending this course

- Artificial Intelligence and Robotics (MARR)   **9 CFU**
- Computer Engineering (MINR)
- Control Engineering (MCER)
- Other   **6 CFU**
- Phd students
- Erasmus students

Organization

ML 6 CFU (all students)

- Group 1 (MARR)
- Group 2 (all others)

RL 3 CFU (only for MARR)

Communication Resources

Web site

https://sites.google.com/diag.uniroma1.it/machine-learning

Google Classroom

- Slides of the lectures
- Exercises
- Assignment & homeworks
- Exams (information and results)
- News
- Q&A of general interest for the class

Communication Resources

Lecture modalities

https://www.uniroma1.it/it/notizia/covid-19-fase-3-lezioni-esami-e-lauree-presenza-e-distanza

On-line lectures

Zoom

Off-line lectures

YouTube

Links will be communicated in Classroom

Teachers

ML 6 CFU

- Luca Iocchi   ML Group 1 (MARR)
- Fabio Patrizi   ML Group 2 (all others)
- Lorenzo Brigato   ML exercises (all groups)

RL 3 CFU

- Roberto Capobianco

ML (6 CFU) Syllabus

Classification - Basic concepts and evaluation, Decision Trees, Bayes Learning, Linear Models, Support Vector Machines, Kernels, Multiple classifiers

Regression - Linear and logistic regression, Instance based (K-NN), Perceptron, Neural networks, Deep neural networks (CNN)

Unsupervised learning - Clustering (k-Means), Latent variables (EM),

Reinforcement learning - MDP, Q-learning

ML (6 CFU) Exercises

- Exercises described during the classes,
  new tests and/or variations proposed for the students.

- Weekly office-hours to discuss exercises

- Google Colab notebooks https://colab.research.google.com/
  - Tutorials to familiarize with the environment
    - https://www.youtube.com/watch?v=Y8C1yP8pEgY
    - https://www.youtube.com/watch?v=rISnUXnd5xE

- Python 3.x + some libraries Numpy, Pandas, Scikit-learn, Tensorflow 2.x, Keras …

ML (6 CFU) Exam

- Written test at any exam session
- 2 Homeworks during the course (deadlines in November and December)
- 1 Homework right after the course (deadline in January)

Written test will grant up to 30 points (including Lode if answers clearly indicate a deep understanding of the topics)

Each homework submitted within the deadline can give up to 2 bonus points (max 4 points in any case) that will be added to the score of the written test

Maximum score ML = 34, Lode with score >=32

For 9 CFU, final score = (6 * ML + 3 * RL) / 9, Lode with score >=32

RL (3 CFU) Organization

Office hours (only remote):
Check http://robertocapobianco.com/
and book an appointment
https://www.picktime.com/e0f537cc-220a-42d7-8374-666a613a7c91

Class organization:

- Theory: videos uploaded on Youtube & linked on Classroom (3-4 days before class)
- Question collection (during the days before the in-person class):
  - https://www.sli.do/ (code provided in the video)
  - Questions, doubts, polls, etc.
- In-person class:
  - Question answering
  - Practical examples (coding)
  - Exercises
  - Deeper seminars
- Books:
  - Reinforcement Learning: Reinforcement Learning - An Introduction, II ed. Sutton & Barto, http://incompleteideas.net/book/RLbook2018.pdf

  - Probabilistic Reasoning: Artificial Intelligence: A Modern Approach, Russell & Norvig

RL (3 CFU) Organization

Class organization:

- Extra class on Tuesdays 4-6pm (3-4 times in total)

Topics:

- Probabilistic reasoning
- Probabilistic reasoning over time
- MDPs
- Model-free reinforcement learning (Monte-Carlo, TD, etc.)
- Notions of model-based reinforcement learning

Coding:

- Python 3+, Tensorflow 2/Pytorch/Mxnet, numpy, OpenAI gym

RL (3 CFU) Exam

- Max score: 34 (weighted on 3 credits for total exam)
- Optional homework in November: 3 points bonus (can't exceed max score anyway)
- Exam:
  - Until February: Project (will be announced)
  - After: only oral exam