

Part 00 - Course objectives

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Course objectives and outcomes

Objectives: to provide students with the fundamental elements of deep learning and demonstrate its application to computer vision.

The course will also give the basis to understand the fundamental concepts, so knowing machine learning is recommended, but not mandatory.

Outcome: An understanding of fundamental concepts and methods of deep learning and its applications, with particular focus on computer vision

Course Outline

1. Introduction to Machine Learning and Deep Learning (1 hour)
2. Machine Learning Foundations (3 hours)
3. Data Representation with Tensors (3 hours)
4. Learning from Tensors: Gradient Descent and Backpropagation (4 hours)
5. Designing and Improving Deep-learning Models for classification (3 hours)
6. Real-Time Object Detection with YOLO (3 hours)
7. Running Scientific Experiments with PyTorch (3 hours)

Material

Reference Books:

- Stevens, Eli, Luca Antiga, and Thomas Viehmann. Deep learning with PyTorch. Manning Publications, 2020.

Other useful references:

- Pattern Recognition and Machine Learning, C. Bishop, Springer, 2007
- Dive into Deep Learning, A. Zhang, Z. C. Lipton, M. Li, A. J. Smola, 2020:
<https://d2l.ai>
- Pattern Classification (2nd ed.), R. O. Duda, P. E. Hart, e D. G. Stork, John Wiley & Sons, 2000
- Website / Repository of the ML course <https://github.com/unica-ml/ml>

Teams Channel:

- Please subscribe to the course Teams channel. The link can be found on the course website

Assessment

For MSc Students

The MSc students can decide to take the exam in two formats (either one or the other):

- 1 CFU: written examination
- 2 CFU: development of a project in teams (max 3 people per team)

For PhD Students

For PhD student, there is only one type of exam:

- 2 CFU* : written examination

* depending on the PhD course, you might get 2.5

Course Calendar

- 8/12/2024 h 9:00-13:00
- 9/12/2024 h 9:00-13:00
- 10/12/2024 h 14:00-18:00
- 11/12/2024 h 14:00-18:00
- 15/12/2024 h 9:00-13:00

All lectures will be held in Room A (Viale Merello)

Course attendance is required (online or in person) for at least 12 hours (3/5 lessons)

Course Assessment

The course assessment will be performed on the last day of the course. If you are not able to attend that day, please let me know so we can schedule a different time.

The projects will be evaluated with online calls.

Alternatively, there are also possible thesis projects (on ML Security) if you are interested. It will already cover the evaluation for this course.

End of the introduction

In the next chapter:

- Introduction to the course main topics

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