

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II  
**DOTTORATO DI RICERCA / PHD PROGRAM IN  
INFORMATION TECHNOLOGY AND ELECTRICAL ENGINEERING**

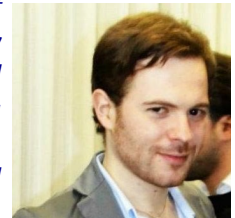
**Ad hoc course announcement**

**Title: Using Deep Learning properly**

**Lecturer: Andrea Apicella, Ph.D.**

*Università degli Studi di Napoli Federico II*  
*Email: [andrea.apicella@unina.it](mailto:andrea.apicella@unina.it)*

*CV: Andrea Apicella received the M.Sc. degree in Computer Science and the Ph.D. degree in Mathematics and Computer Science from University of Naples Federico II, Italy, in 2014 and 2019, respectively. He is currently assistant professor in the Department of Information Technology and Electrical Engineering of University of Naples Federico II, and he is a research associate of the ARHeMLab (Augmented Reality for Health Monitoring Laboratory), and AIPA Lab (Laboratory of Artificial Intelligence, Privacy & Applications) sited in Naples. The current research topics of Andrea Apicella encompass the design, testing, and development of eXplainable Artificial Intelligence (XAI) approaches for explaining AI system decisions. His interests also extend to the validation of Machine Learning techniques, particularly in ensuring the reliability of ML models. Furthermore, Andrea Apicella is actively engaged in biomedical signal processing for healthcare applications, with a particular focus on Brain-Computer Interface (BCI) systems using Electroencephalography (EEG) signals.*



**Credits: 4 CFU**

### Overview

Designing and implementing a Deep Learning system is not an easy task. The process requires several choices regarding model design, data engineering, parameter modification and testing. This process is easily subject to errors that are not easily identifiable and, in some cases, may lead to overestimating the performance of the proposed solution. This course aims to provide a general pipeline for designing and validating a machine learning system, avoiding the most common errors that can easily be made. To this end, it will be shown how to implement the experimental evaluation of simple classification tasks, highlighting their peculiarities and points to pay attention to. The practical part of the course is based on PyTorch, one of the best-known packages for neural networks. An introductory view of it is given.

There will be a final assessment.

## Schedule

Lecture	Date	Time	Topics	Lecturer
1	03/02/2025	10:30 – 12:30	Introduction to reliable Machine Learning	Andrea Apicella
2	06/02/2025	10:30 – 12:30	Python & Numpy for Machine Learning	Andrea Apicella
3	10/02/2025	10:30 – 12:30	Pytorch fundamentals for Deep Learning	Andrea Apicella
4	14/02/2025	10:30 – 12:30	Building and Training Neural Networks with Pytorch	Andrea Apicella
5	17/02/2025	10:30 – 12:30	Going deeply into the learning	Andrea Apicella
6	19/02/2025	10.30 - 12.30	What really gets the credit?	Andrea Apicella

Lessons will be held on 3 February in classroom CL T4 in the biennium building, on 6-10-14-17 and 19 February in classroom C2A building 3 - DIETI, Via Claudio, 21- 80125 Napoli

## Content details

**Lesson 1 – Introduction to reliable Machine Learning.** Machine Learning (ML) basics. Data leakage. Balancing, normalization and standardization of the data. Understanding randomness and nondeterministic factors.

**Lesson 2 – Python and NumPy for Machine Learning.** Numpy fundamentals. Identifying and avoiding common mistakes with NumPy operations.

**Lesson 3 – Pytorch fundamentals.** Common libraries for Deep Learning. Pytorch general description. Main modules. Tensors and basic operations.

**Lesson 4 – Building and Training Neural Networks with PyTorch.** Building a Neural Network. Training of a Neural network. Hyperparameter tuning. Hyperparameter tuning and common pitfalls to avoid.

**Lesson 5 – Going deeply into the learning.** Gradient Descent. The Automatic Differentiation in Pytorch. Possible issues with Automatic Differentiation. Vanishing and exploding gradient.

**Lesson 6 – What really gets the credit?** Validation in ML. The Clever Hans effect. The importance of Ablation studies. The aims of eXplainable Artificial Intelligence (XAI).

*Participants are requested to join the following MS Teams group:*

[https://teams.microsoft.com/l/team/19%3azVfHpFtm15Rpc0XcfmnN6TRN\\_PMoWxygYZl\\_onc80og1%40](https://teams.microsoft.com/l/team/19%3azVfHpFtm15Rpc0XcfmnN6TRN_PMoWxygYZl_onc80og1%40)



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Once accepted in the Teams group, students have to fill the following .xlsx file with their information:

[https://communitystudentiunina-my.sharepoint.com/:x/g/personal/andrea\\_apicella\\_unina\\_it/EdtH5jbZ4qNFjLFq8\\_ch4l8BSF7CCbBl0tV3IPMEb3rdcw?e=Zrzega](https://communitystudentiunina-my.sharepoint.com/:x/g/personal/andrea_apicella_unina_it/EdtH5jbZ4qNFjLFq8_ch4l8BSF7CCbBl0tV3IPMEb3rdcw?e=Zrzega)

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