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

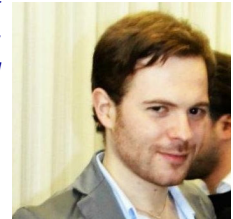
Ad hoc course announcement

Title: Using Deep Learning properly

Lecturer: Andrea Apicella, Ph.D.

Università degli Studi di Napoli Federico II
Email: andrea.apicella@unina.it

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 cover design, testing and development of Trustworthy AI and eXplainable Artificial Intelligence (XAI) approaches for explaining the AI system's decisions, together with EEG signal processing for Emotion Recognition and Attention Monitoring using Artificial Intelligence methods.



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	23/01/2024	10:30 - 12:30	Introduction and first examples	Andrea Apicella
2	25/01/2024	10:30 - 12:30	Python & Numpy fundamentals for Machine Learning	Andrea Apicella
3	30/01/2024	10:30 - 12:30	Pytorch fundamentals	Andrea Apicella
4	01/02/2024	10:30 - 12:30	Pytorch and Neural Networks	Andrea Apicella
5	06/02/2024	10:30 - 12:30	Going deeply into the learning	Andrea Apicella
6	08/02/2024	15.00 - 17.00	What really gets the credit?	Andrea Apicella

Content details

Lesson 1 – Introduction and first examples.

Machine Learning basics. Data leakage. Balancing, normalization and standardization of the data. Randomness and nondeterministic factors.

Lesson 2 – Python & Numpy fundamentals for Machine Learning. Preparing the environment. Numpy fundamentals. Common errors with Numpy.

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

Lesson 4 – Pytorch and Neural Networks. Building a Neural Network. Training of a Neural network. Hyperparameter tuning. Common errors.

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%3a083S27sneGGzE6FysYhB3P7OpTu-49maT0JT0RNwL_U1%40thread.tacv2/conversations?groupId=dc321d84-072e-4965-95e3-0f0ddc872860&tenantId=2fcfe26a-bb62-46b0-b1e3-28f9da0c45fd

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/ERYITFguH7JKr99o2XVA7z4B216wzWt0fnKFS_BJ8jOlg?e=dendtT

For information: Andrea Apicella, Ph.D. (DIETI, UniNA) – andrea.apicella@unina.it