Advanced Deep Learning

Prof. Matteo Matteucci – *matteo.matteucci@polimi.it*
Prof. Giacomo Boracchi – *giacomo.boracchi@polimi.it*
Dr. Simone Mentasti – *simone.mentasti@polimi.it*
Dr. Matteo Papini – *matteo.papini@polimi.it*
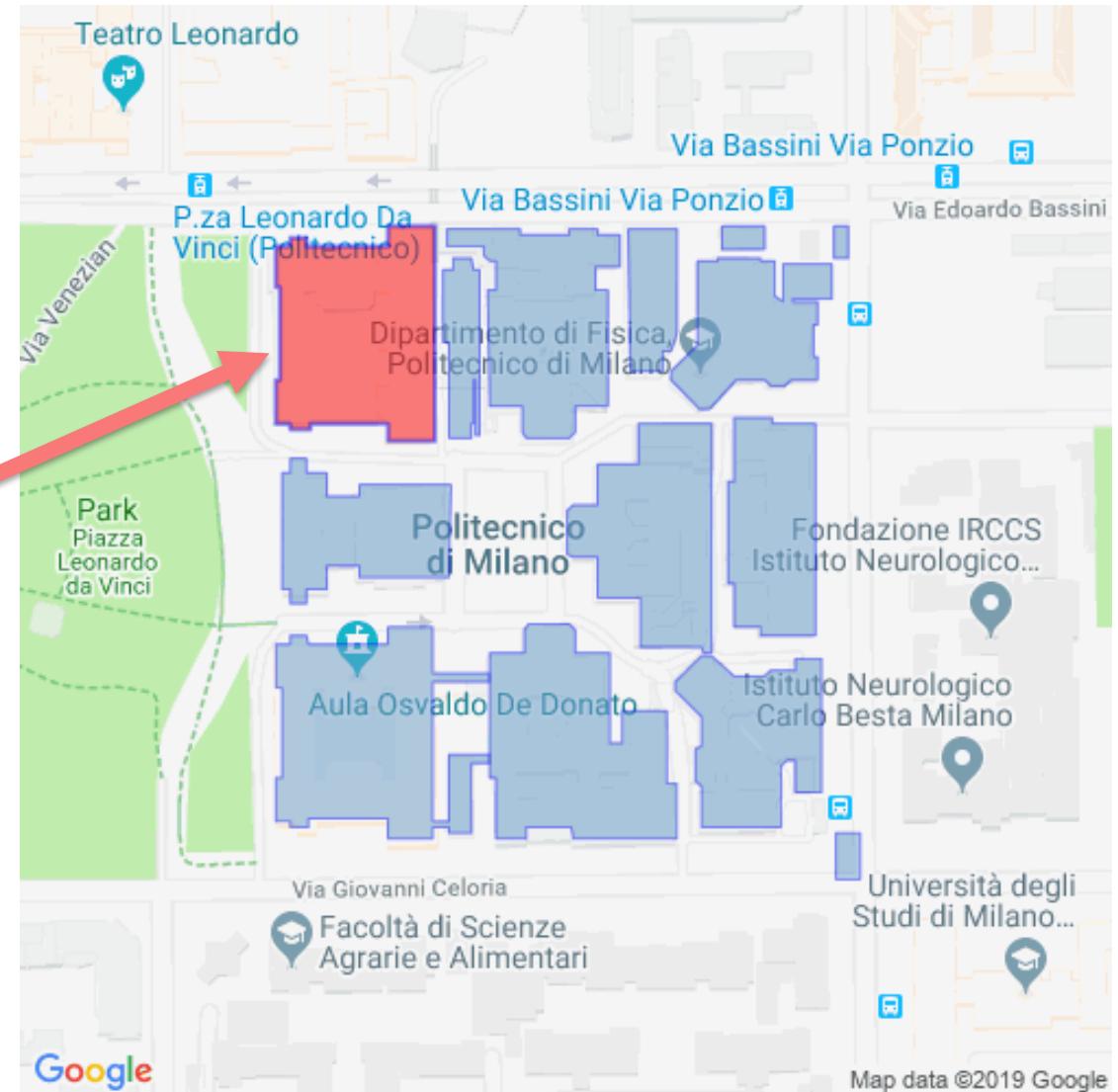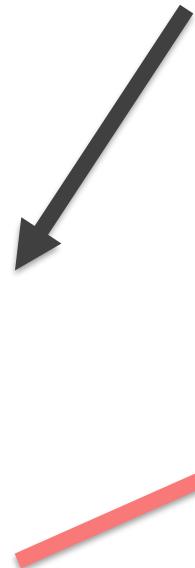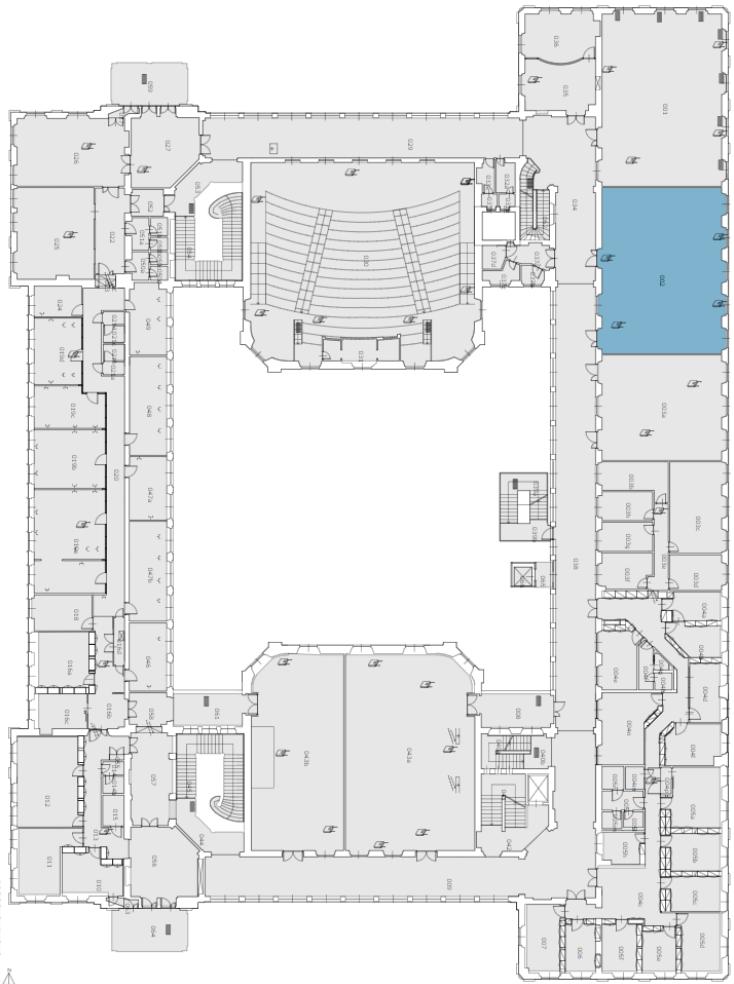
Department of Electronics, Information and Bioengineering
Artificial Intelligence and Robotics Lab - Politecnico di Milano
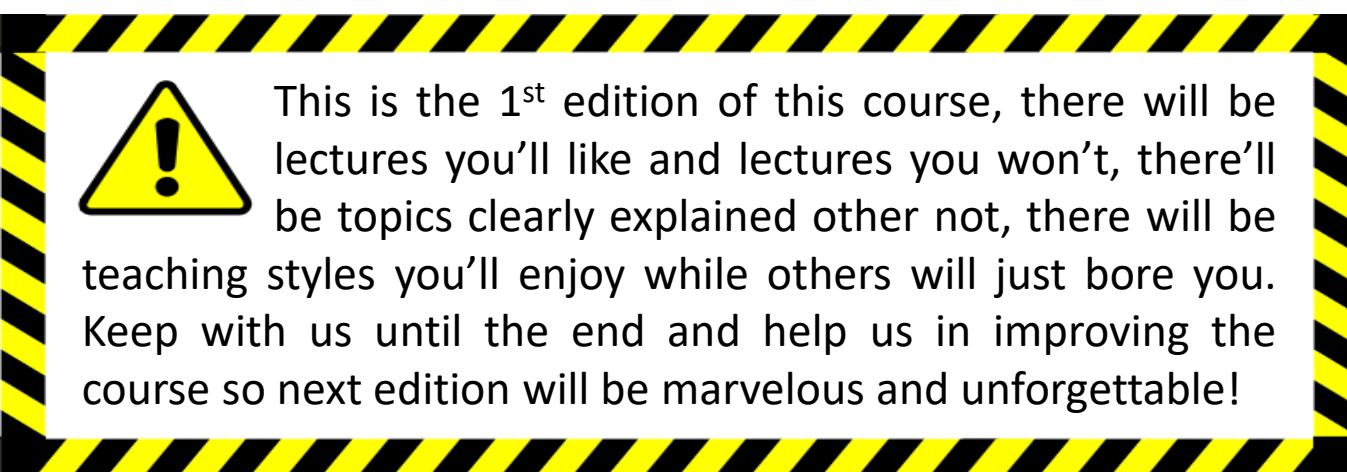
Advanced Deep Learning Classroom (so far)

COURSE IN ROOM **2.1.2** !!!!

Course Objectives

*"Provide the students with the skills to understand, become familiar, and use for their research the most successful architectural patterns in deep neural networks. **This is intended as an advanced course**, thus proficiency in neural networks and basic notions of non linear optimization, i.e., backpropagation, and image/signal processing are assumed as pre-requirement to the participant."*

> ⚠ This is the 1st edition of this course, there will be lectures you'll like and lectures you won't, there'll be topics clearly explained other not, there will be teaching styles you'll enjoy while others will just bore you. Keep with us until the end and help us in improving the course so next edition will be marvelous and unforgettable!

Some Statistics …

How many of you are PhD Students?

How many of you are from CS/AUT/TEL/… ?

How many of you are MS Students?

How many of you have already attended the AN2DL course?

…

The Course Program

Date	Deep Learnig Classes	Time	Classroom / Teacher
28/02/25	Course Intro + Unsupervised Deep Learning	14:15 - 19:15	2.1.2 / Boracchi + Mentasti
07/03/25	Anomaly Detection	14:15 - 19:15	2.1.2 / Boracchi + Mentasti
14/03/25	Attention and Transformers	14:15 - 19:15	2.1.2 / Matteucci + Mentasti
21/03/25	Vision Transformers + CLIP	14:15 - 19:15	2.1.2 / Boracchi + Papini
28/03/25	GenAI: Diffusion Models	14:15 - 19:15	2.1.2 / Matteucci + Papini
04/04/25	Graph Neural Networks	14:15 - 19:15	2.1.2 / Matteucci + Papini

Course Logistics

All course information about the course is available on webeep

- https://webeep.polimi.it/course/view.php?id=16195 (or at least we try)

No streaming, nevertheless lectures are recorded and distributed via webeep.

Slides will be made available few minutes before the lecture.

Attendance for PhDs is mandatory, checked with signatures and final evaluation tests:

- PhDs are committed to attend 70% lectures from the course lectures.
  - In practice you can skip only one lecture
- Master students do not have such strict requirement, so no signature and no test
- If you need just an attendance certificates we will issue it based on the attendance signatures we take during the lectures

Course Evaluation for PhDs

The course is evaluated with a set of open book questions and coding exercises at the end of each lecture regarding the lecture just finished:

- Questions (and answers) are managed via the remoteexams platform
- Questions regards both theory and coding and they score up to 5
- We have 6 days 5 points, if you score perfectly you get 30
- As it is a pass or fail exam if you get at least 18 (or 16?) you pass the exam
- You need to perform the test in presence at the end of the lecture
- No special Safe Exam Browser will be used so just a web interface

Master students are invited to leave the room during the written exam, but are welcome to use these to double check their understanding. They are evaluated differently.

DRAFT

Course Evaluation for MS Students

The course is evaluated with a project using Pytorch discussed with the teachers.

- You have to chose a dataset or a problem
- Design/develop the model in pytorch
- Train, tune, evaluate the model
- Compare the result against the state of the art or a baseline
- Write a short paper about your work (up to 4 pages double column)
- Send the paper to the teacher and book
- Share a working codalab notebook with the teachers with lots of comments
- Present the project with an oral interview to the teacher. No slides, just a thorough and healthy technical discussion at the whiteboard
- **Project overview / title needs to be agreed with us before starting.**

You can also try to replicate an existing paper and compare your solution against it

Ironing out the kinks ...

Some details have not been sorted out yet, we are working on it, stay tuned!

- What is the tipical lecture break-out?
  - 14:15 - 16:00: Theory
  - 16:15 - 18:00: Coding
  - 18:15 - 18:45: Quiz
- Projects in groups? Yes
- How many people per group? 2/3
- Computing will be provided? No / Let's see whether your project is mature enough
- Can we use colab? Yes
- Can we use Kaggle? Yes
- …