



POLITECNICO
MILANO 1863

Artificial Neural Networks and Deep Learning

- Introduction to the course -

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Course Objectives

"The course major goal is to provide students with the theoretical background and the practical skills to understand and use Neural Networks, and, at the same time, become familiar and with Deep Learning for solving complex engineering problems ... especially in vision tasks"



This is the just the 2nd 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!

The Teachers

Prof. Matteo Matteucci

- Neural Networks
- Deep Learning
- Sequence Learning



Prof. Giacomo Boracchi

- Computer vision
- Deep models for vision

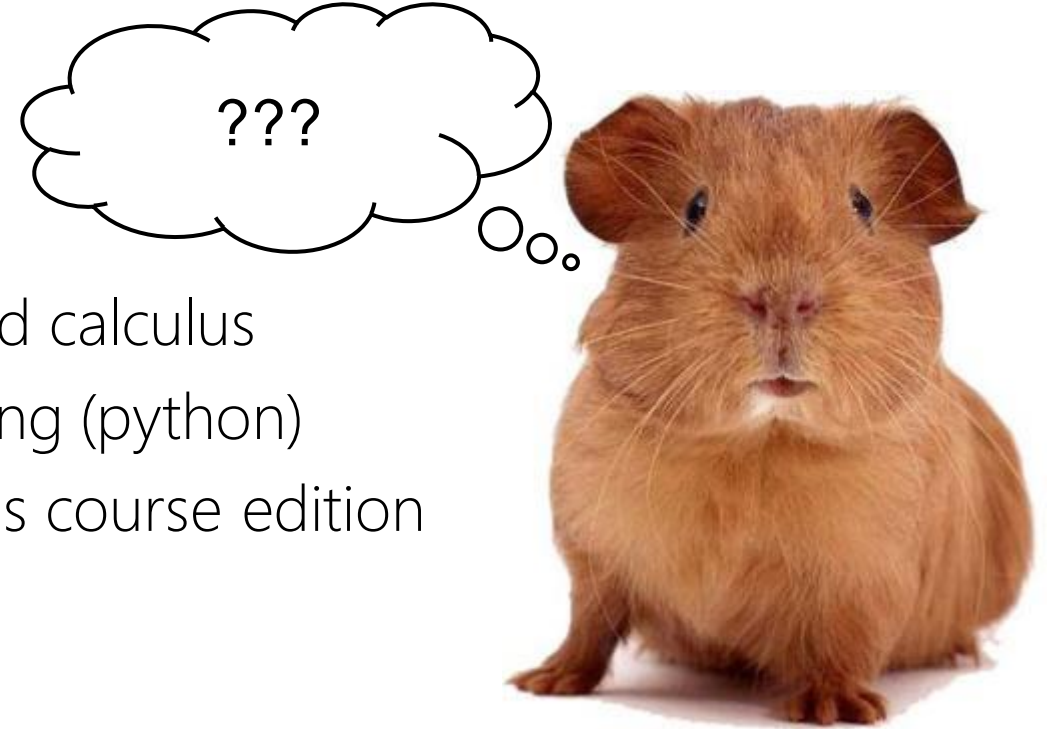


Eng. Francesco Lattari

- Programming with Keras (python)

Official teacher, please refer to me for bureaucratic stuff!

The Students



Students are expected to:

- Feel comfortable with basic statistics and calculus
- Feel comfortable with basic programming (python)
- Be ready to act as «guinea pigs» for this course edition
- Be curious and willing to learn ...

Students are not expected to:

- Know more than what is usually taught in basic engineering courses
- Knowing already about machine learning (although it doesn't hurt)
- Be hyper-skilled python hackers (although sometimes it hurts)
- ...

Course syllabus

Introduction to Neural Network and Deep Learning

- From the Perceptron to neural networks
- Backpropagation and neural networks training
- Best practices in neural network training
- Recurrent architectures
- Autoencoders and long short-term memories

32h lectures

Image classification with neural networks

- Image classification problem
- Classification by Convolutional Neural Networks
- Data augmentation and other tricks

14h lectures

ANN and Deep Learning Coding (with Keras)

10h practicals

Course Website and Detailed Schedule

All details and info are on the course website

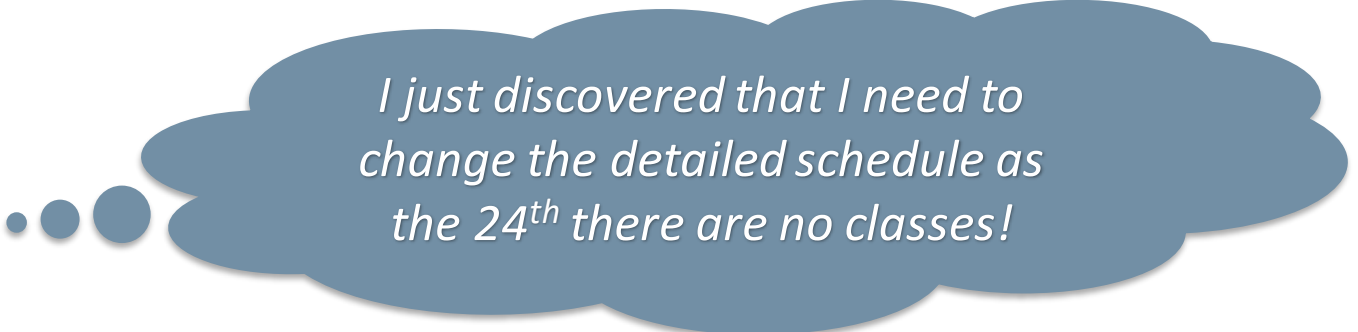
https://chrome.deib.polimi.it/index.php?title=Artificial_Neural_Networks_and_Deep_Learning

How to get there?

- Goto <https://chrome.deib.polimi.it>
- Select “Artificial Neural Network and Deep Learning” on the left

What do you find there:

- Detailed schedule !!!
- Last minute announcements
- Slides, notes, references and all sort of material
- ...



I just discovered that I need to change the detailed schedule as the 24th there are no classes!

Course Organization and Rules

Let's talk about this!

Classes (there is no distinction between lecture and exercises).

- Wednesday, 15:15 – 17:15, in 2.0.2 (starts at 15:15) Team 1
- Wednesday, 17:15 – 19:15, in 2.1.2 (starts at 17:30) Team 2
- Thursday, 16:15 – 19:15, on webex (starts at 16:30 some weeks could be 2h only)

Grading policy:

- Written examination covering the whole program up to 26/32 +
- Home project in the form of kaggle competition up to 06/32 =
- Final score will be the sum of the grades of the two 32/32

Competition is graded based on what you do, not based on the position in the rank!

Synergies with Other Courses

AN2DL is a course on machine learning, but it has been compared with other courses on the same topic, but it has been found that:

Even taking them all the overlap ends up to be at most 10h (<20%)

- Machine Learning: there you see classical machine learning tools, some concepts such as generalization, overfitting, and crossvalidation might be similar ...
← **Machine Learning: up 4-5h out of 50h (< 10%)**
- Soft Computing: since last year neural networks have been removed from this course and they have been replaced by Bayesian Networks and Graphical Models ...
← **Soft Computing: up 0h out of 50h (0%)**
- Image Analysis and Computer Vision: since last year the feature learning part has been removed and the course only discusses classical hand-crafted features for classification ...
← **Image Analysis: up 2h out of 50h (< 4%)**
- Data Mining and text Mining: does not cover neural networks and it is mostly based on unsupervised methods
← **Data Mining and Text Mining: up to 4-5h out of 50h (< 10%)**

Ironing out the kinks ...

Some details have not been sorted out yet, we are working on those ..

- Projects/Competitions:
 - How many people per group (?)
 - When the competition will be out (?)
- Practical evaluation:
 - Not doing it scores up to 0 points (?)
 - Doing it with basic tools present in class up to 3 points (?)
 - Doing it with passion and in a propositive manner up to 6 points (?)
- ...



Frequently Asked Question (up to now)

I cannot attend all classes, do you follow a book?

You can find all covered topics on the Deep Learning book, but we are going to present the course in a personalized manner. We suggest you to attend and follow our material then check the book to complete your preparation

I am not a computer scientist (e.g., automation engineer or physics engineer), will I be able to do the competition?

We are going to use simple libraries, we expect with basic competencies in programming you should be able to do it autonomously at least to a minimum level

I have overlaps can I attend a different team?

Teams have been defined as to balance the classes and do a sort of contact tracing. It is not up to me to check who should not be there, but it is my responsibility to check class capacity. Right now please attend with your team, we might do some rebalancing or room exchange in case we manage.

Other questions?