POLITECNICO
MILANO 1863

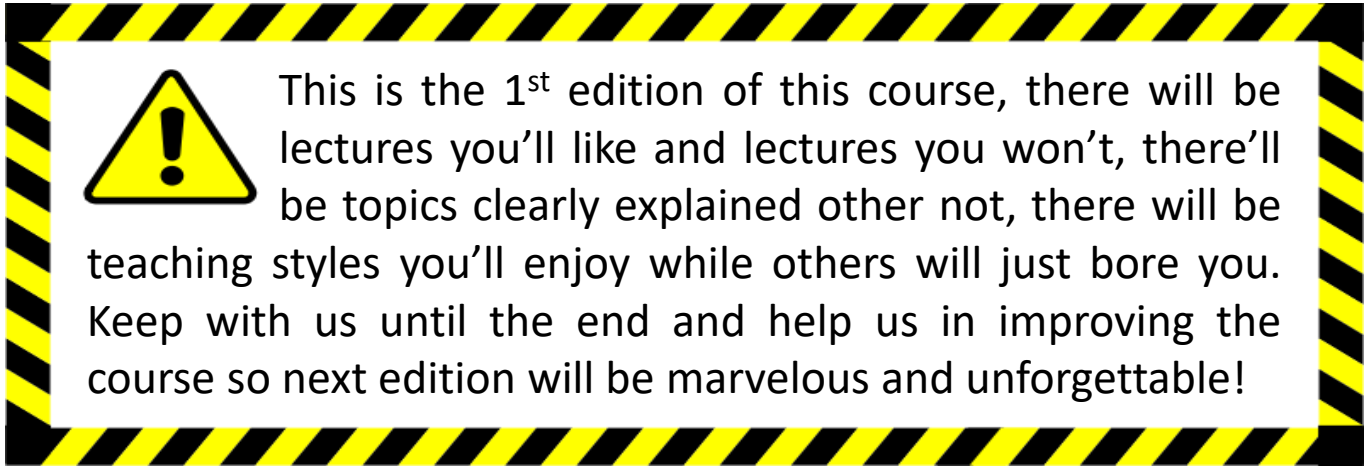
Artificial Neural Networks and Deep Learning

- Introduction to the course -

Prof. Matteo Matteucci – *matteo.matteucci@polimi.it*
Prof. Giacomo Boracchi – *giacomo.boracchi@polimi.it*
Eng. Francesco Lattari – francesco.lattari@polimi.it

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"



The Teachers

Prof. Matteo Matteucci

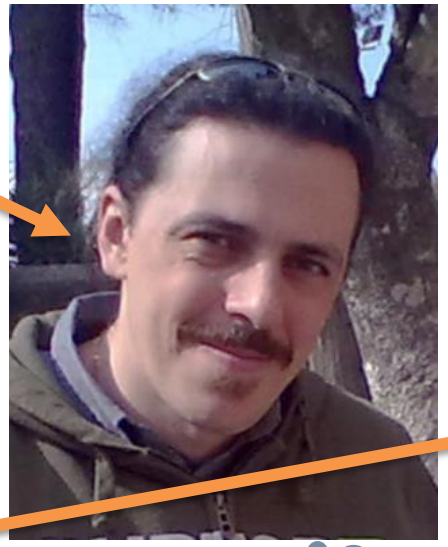
- Neural Networks
- Deep Learning
- Sequence Learning

Prof. Giacomo Boracchi

- Computer vision
- Deep models for vision

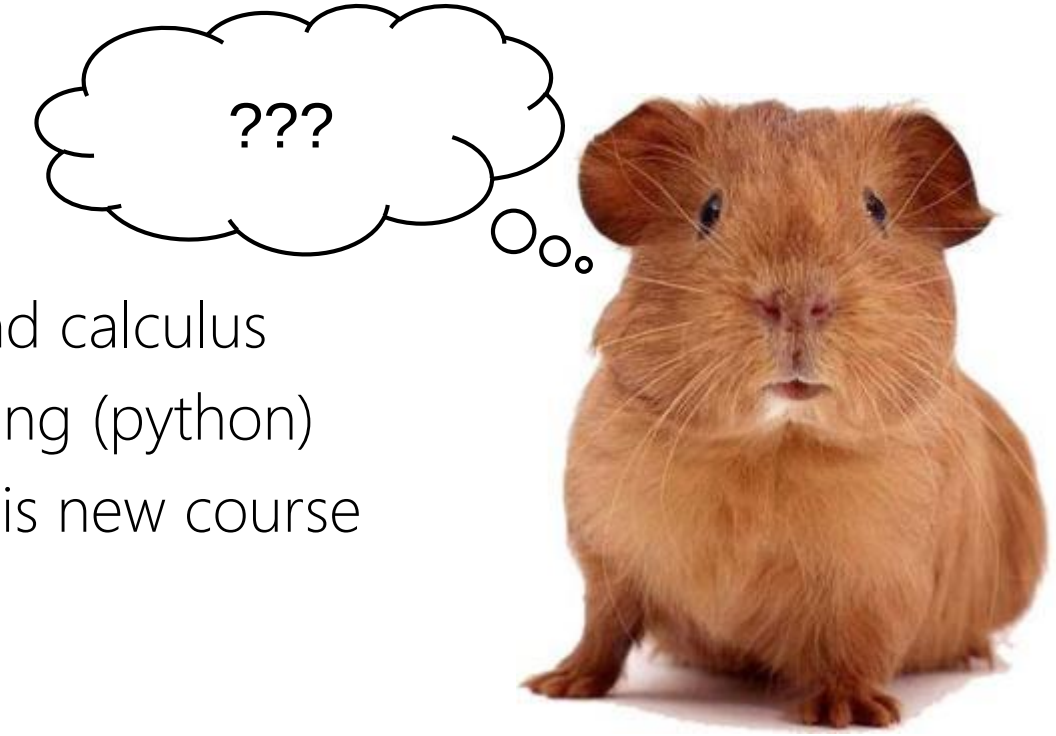
Eng. Francesco Lattari

- Programming with Keras (python)



Official teacher, please refer to me for bureaucratic stuff!

The Students



Students are expected to:

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

Students are not expected to:

- Know more than what is usually tought in basic engineerig courses
- Knowing already about machine learning (althought it doesn't hurt)
- Be hyper-skilled python hackers (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

Image classification with neural networks

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

ANN and Deep Learning Coding (with Keras)

32h lectures

14h lectures

6-9h 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
- …

Let's check it out now and discover that tomorrow, 27/09/2019, there is no lecture!

Course Organization and Rules

Classes (there is no distinction between lecture and exercise):

- Thursday, 16:15 – 18:15, in L26.12 (starts at 16:30)
- Friday, 14:15 – 17:15, in 6.0.1 (starts at 14:30 some weeks could be 2 hours only)

Grading policy:

- Written examination covering the whole program up to 27/32
- Home project in the form of kaggle competition up to 05/32
- 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

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

AN2DL is a course on machine learning [illegible] with other courses on the same topic, but it has been designed not to overlaps with:

- *Machine Learnig*: there you see classical machine learning tools, some concepts such as generalization, overfitting, and crossvalidation might be similar …
- *Soft Computing*: from this year neural networks have been moved to this course and they have been replaced by Bayesian Networks and Graphical Models
- *Image Analysis and Computer Vision*: from this year the feature learning part has been removed and the course only discusses classical had-crafted features for classification
- *Data Mining and text Mining*: does not cover neural networks and it is mostly based on unsupervised methods

Machine Learnig: up 4-5h out of 50h (< 10%)

Soft Computing: up 2h out of 50h (< 4%)

Image Analysis: up 2h out of 50h (< 4%)

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 (?)
  - Computing will be provided (?)
- 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 5 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 attended Soft Computing last year, should I attend this class?

The basic part on neural networks will be quite similar while the part on image classification and deep learning will be brand new … up to 20% overlap is expected in this case, but only if you took it in the past, no overlap with the current edition

Other questions?