Introduction to Machine Learning

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LM Data Science - Spring 2023

Lecturers

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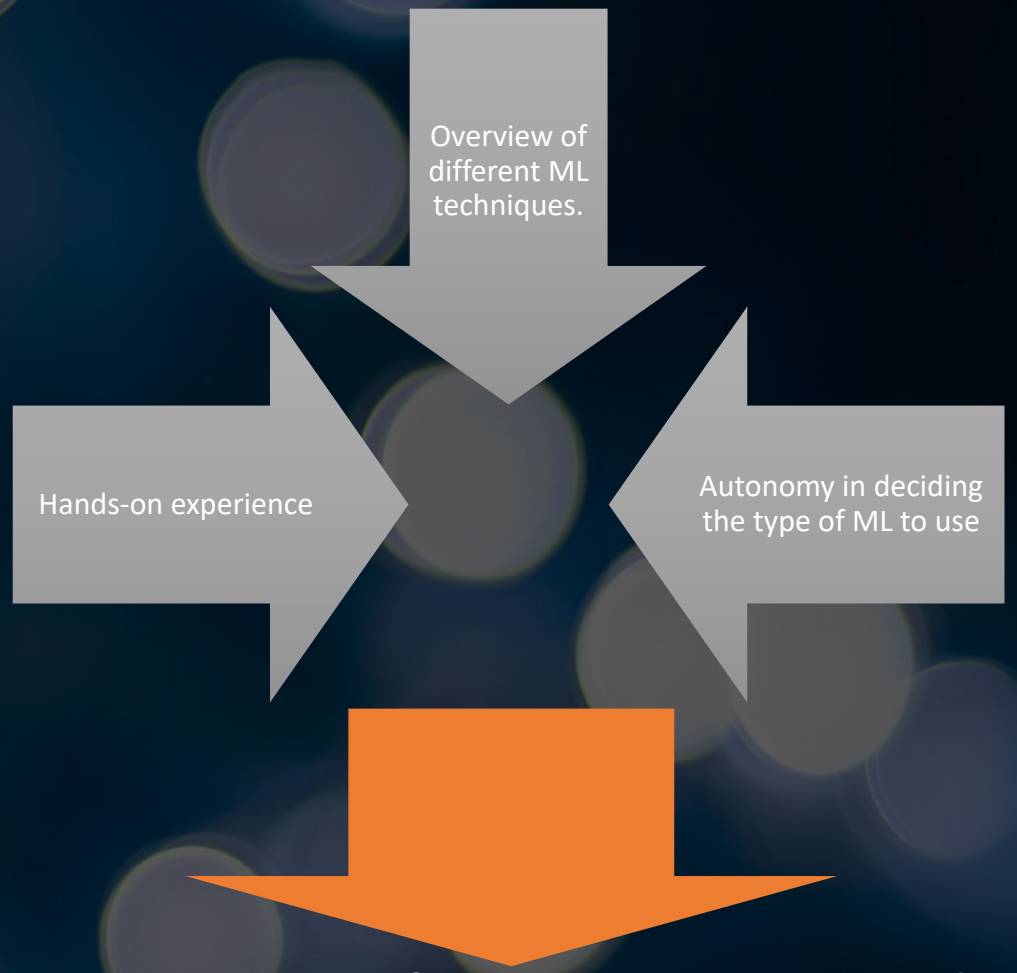
Goals of the course



Teaching methods

Theoretical lessons

Introduction to the problem

Possible approaches

Snippets of code

Practical lessons

Exercises in class

Contents

Basics of Machine Learning

- What is Machine Learning
- A little history
- Why is Machine Learning important

Evaluation protocols

- How can we reach reliable results
- Training/validation/test
- Accuracy, Precision/Recall, ROC

Traditional Machine Learning models

- Trees/Random forests
- Support Vector Machines

Dimensionality reduction and clustering

- Principal Component Analisys
- K-means

Contents

Neural Networks

- Perceptron
- Multi-layer perceptron
- Backpropagation algorithm

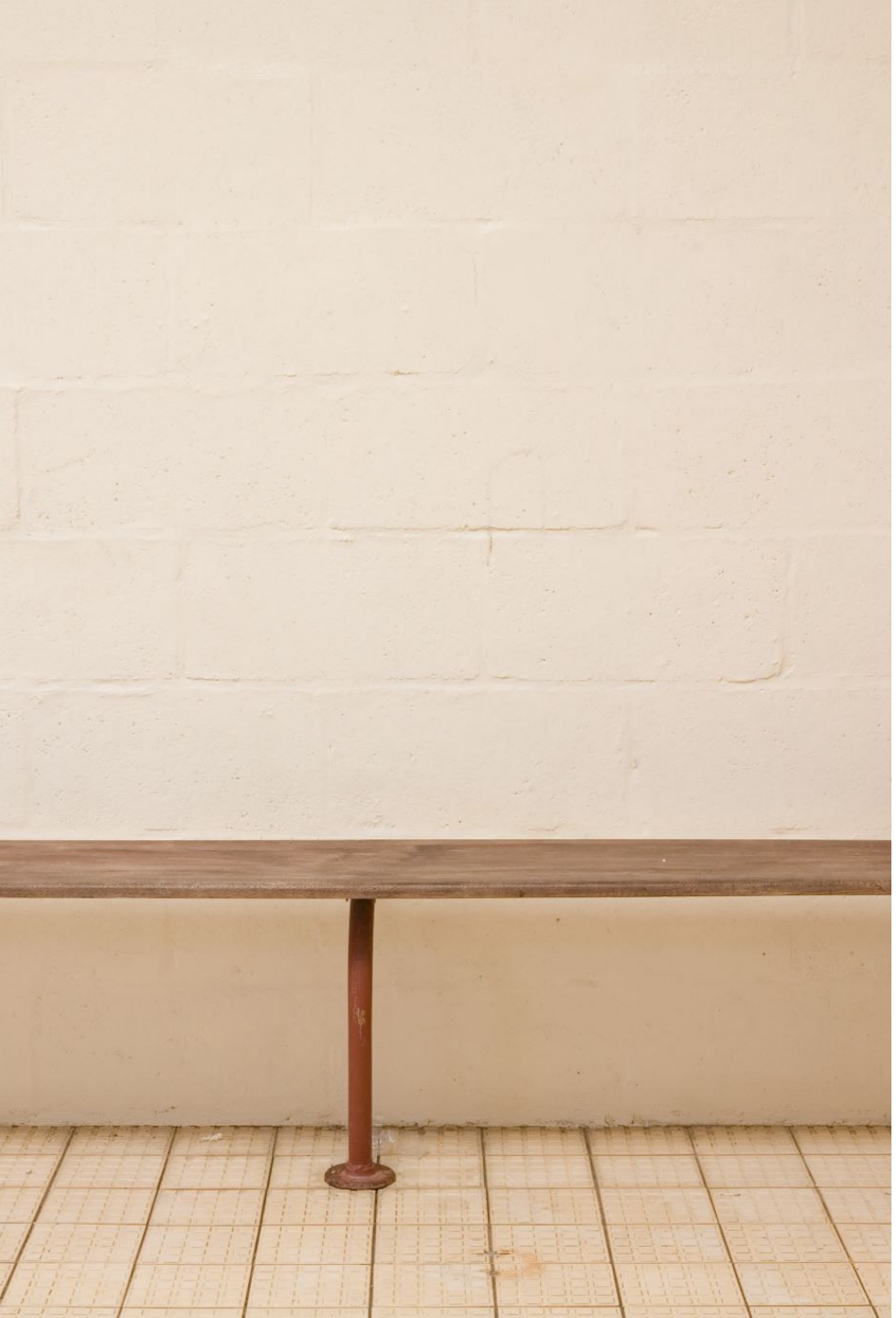
Convolutional Neural Networks

- What is Convolution
- How convolution solve the problem of special locality

Neural Networks for time series

- Recurrent Neural Networks
- Transformers

Contents



Practice

- Snippets of code during theory
- Exercise in class during practice

Hardware Resources

- Azure machines
  - 50 hours processing each offered by DISI
- Google Colaboratory
  - Free but limited

Agenda

- 9:30-11:30 – Povo (aula 109)
- 11:00-13:00 – Sociologia (aula 16)

Exam

Oral Exam (60% of the final grade)

- Questions about the theoretical program.

Project (40% of the final grade)

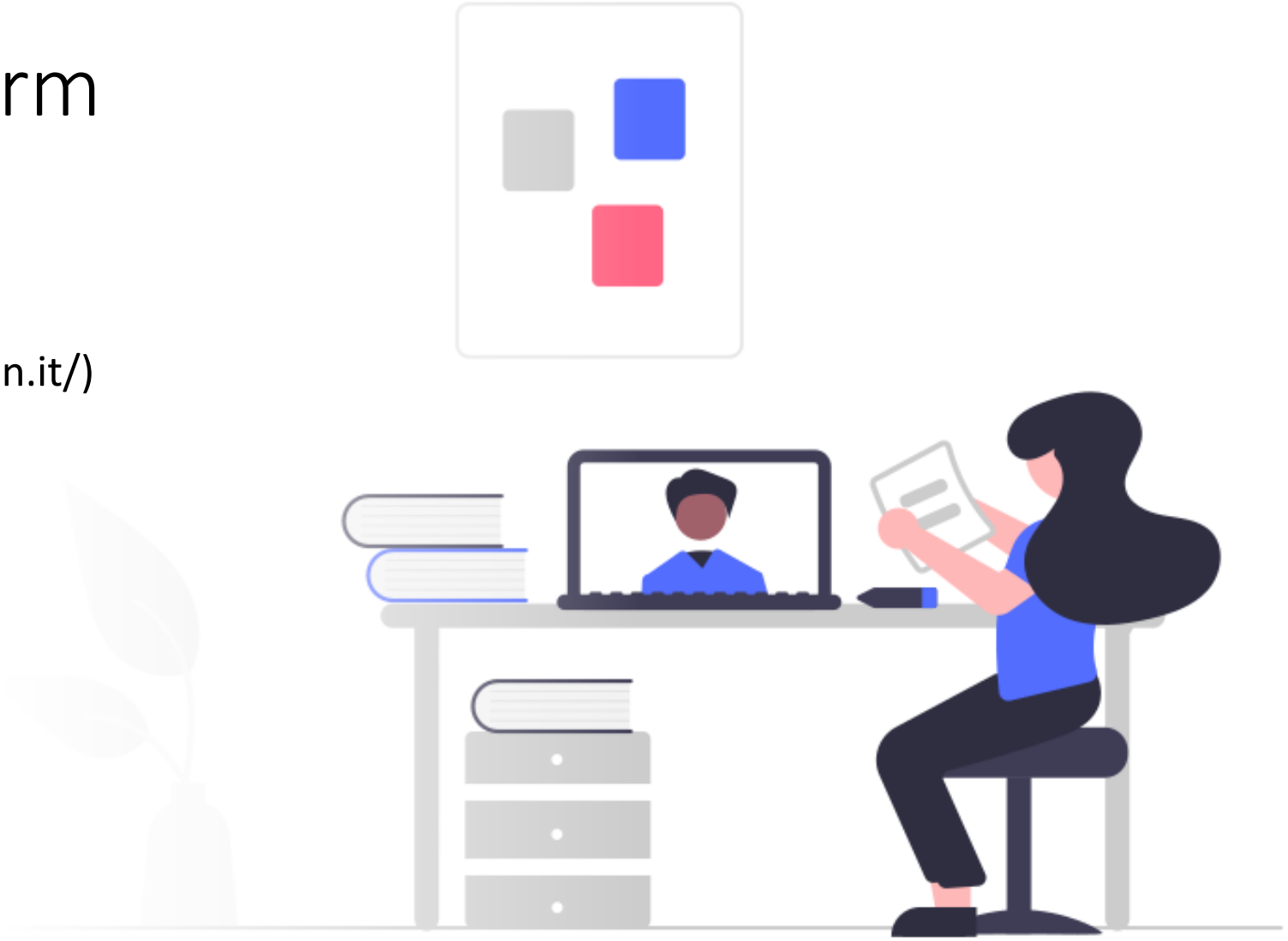
a. Ongoing project
   - Competition
   - Report

b. Individual project assigned at the end of the course
   - Discussion + Report

Contact platform

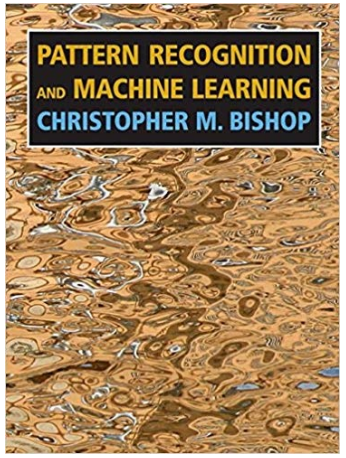
UNITN Moodle
(https://didatticaonline.unitn.it/)

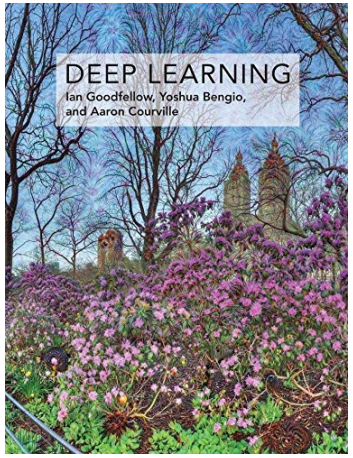
- Material
- Forum
- Announcements

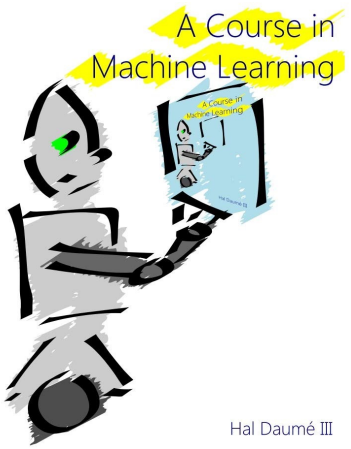


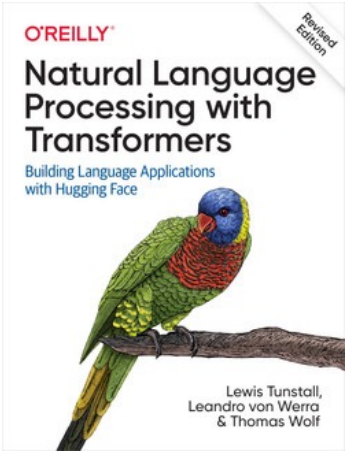
Books

- C. Bishop, Pattern Recognition and Machine Learning, Springer, 2006
- H. Daume. A Course in Machine Learning
  http://ciml.info/
- I. Goodfellow, Y. Bengio, A. Courville, Deep Learning, MIT Press, 2016.
  http://www.deeplearningbook.org
- Lewis Tunstall, Leandro von Werra, Thomas Wolf, (2022) Natural Language Processing with Transformers, Revised Edition









- Additional resources for each topic covered in the course.