

COURSE PRESENTATION

# AI Bootcamp: a gentle introduction to AI

15-19 and 22-26 June 2026

TEACHER(S)

Matteo Matteucci

Giacomo Boracchi



# Course teachers

Matteo Matteucci

- Computer Science and Engineering (Politecnico di Milano)
- PhD in Information and Automation Engineering (Politecnico di Milano)
- Full Professor at DEIB, Politecnico di Milano (Computer Science)

Research Interests: Robotics & Autonomous Systems, Machine Learning, pattern Recognition, Computer Vision and perception in autonomous physical agents ... in the real world!



# Course teachers

Giacomo Boracchi

- Mathematician (Università Statale degli Studi di Milano)
- PhD in Information Technology (Politecnico di Milano)
- Associate Professor at DEIB, Politecnico di Milano (Computer Science)

Research Interests: mathematical and statistical methods for Machine Learning (particular unsupervised learning, change and anomaly detection), image analysis and processing ... and the two combined



# Deep Learning Revolution

Image processing today

- Object detection

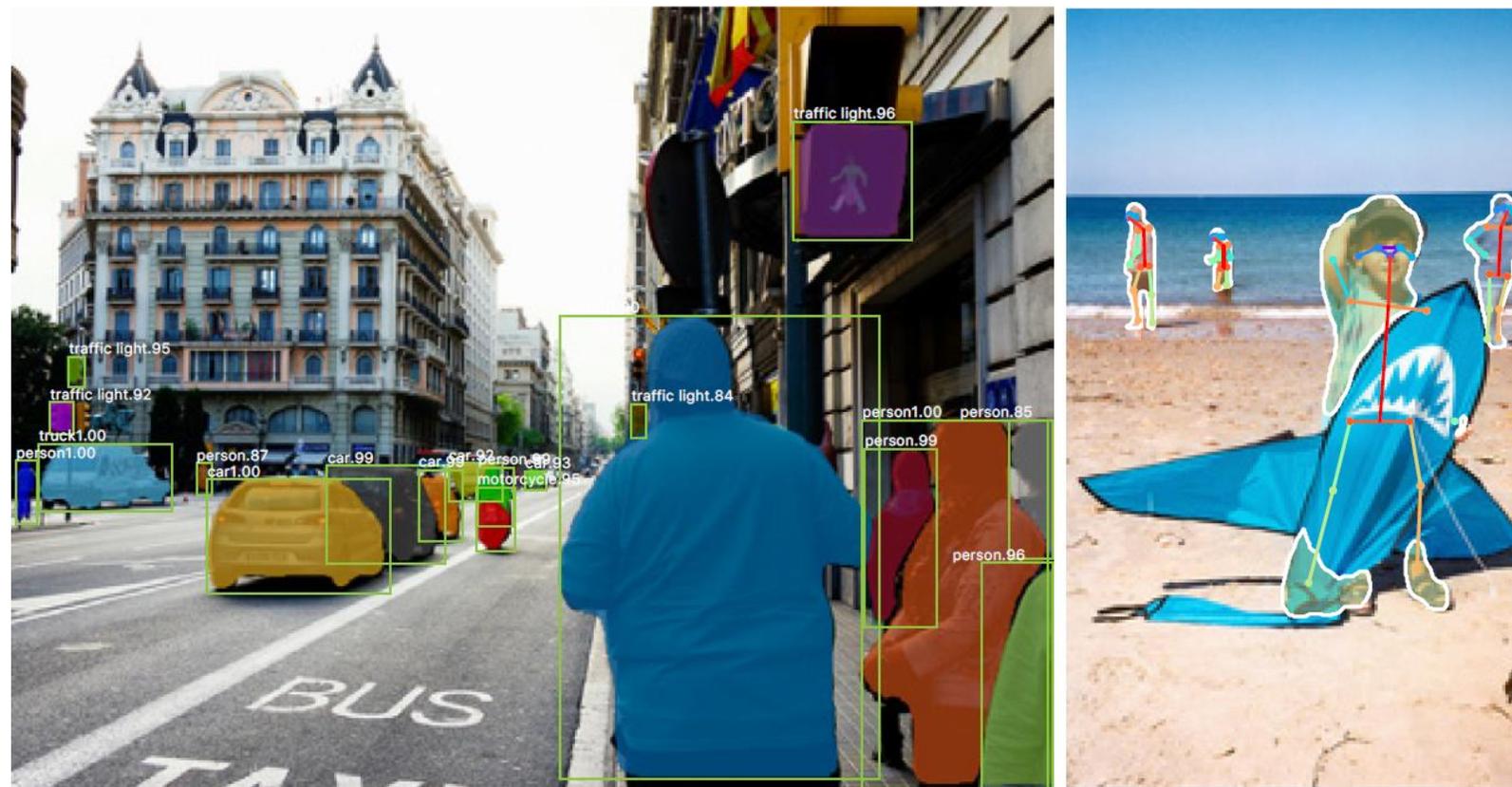


Object Detection (Redmon et al. 2015)

# Deep Learning Revolution

Image processing today

- Object detection
- Segmentation



Instance Segmentation / Human Pose (He et al 2017)

# Deep Learning Revolution

Image processing today

- Object detection
- Segmentation
- Image generation
- ...



Image generation



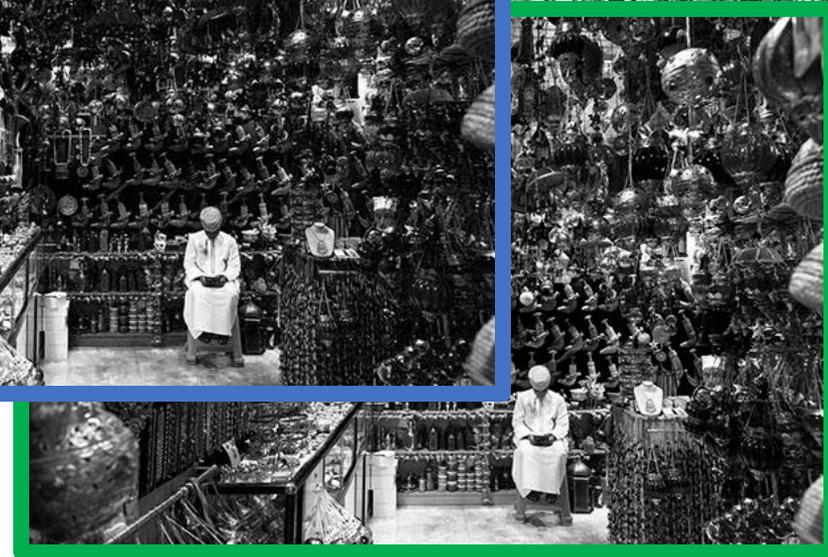
# We are not going to see exactly these models...

... but we will:

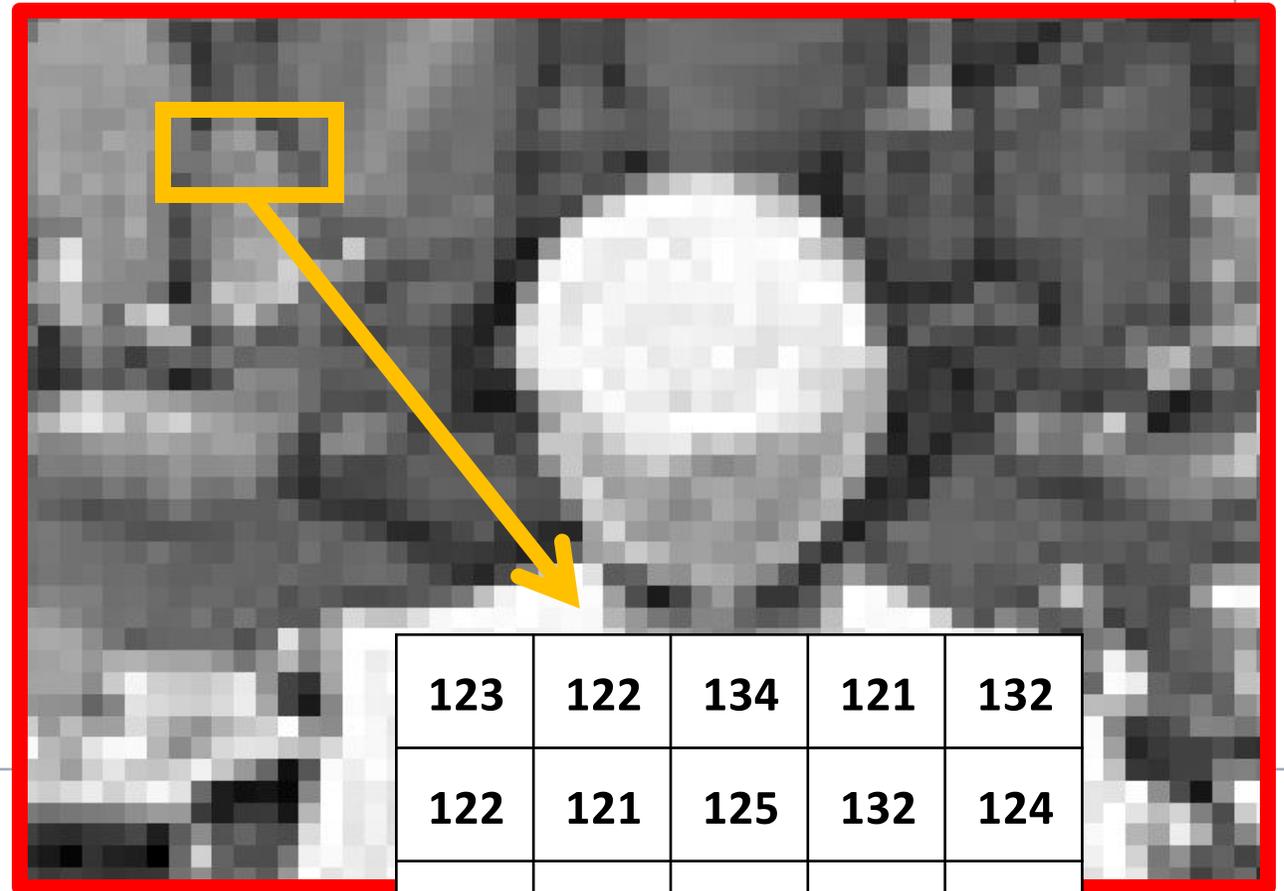
- learn how process digital images
- learn how neural networks for image classification work in simple settings
- have a direct experience on image classification with practical sessions
- learn basic principle of convolutional neural networks



# Digital images and their representations



# Digital images and their representations



123	122	134	121	132
122	121	125	132	124
119	127	137	119	139

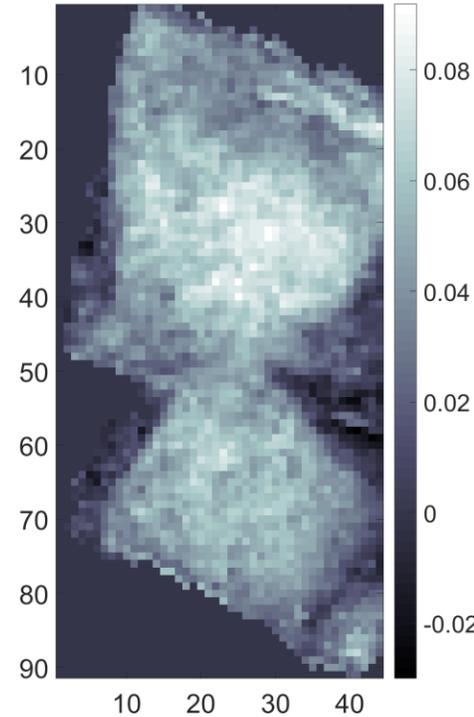
# An Illustrative Example: Parcel Classification



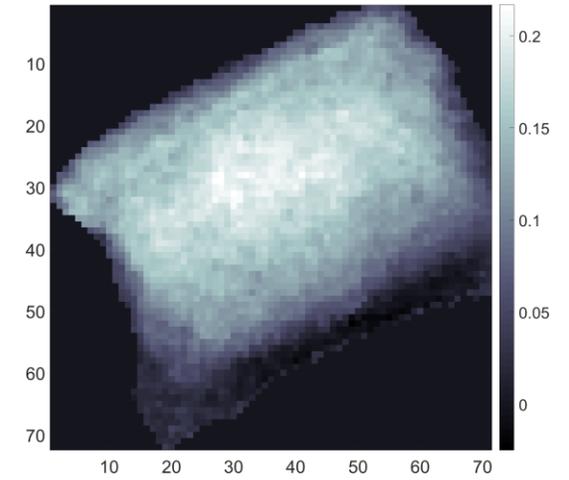
# An Illustrative Example: Parcel Classification



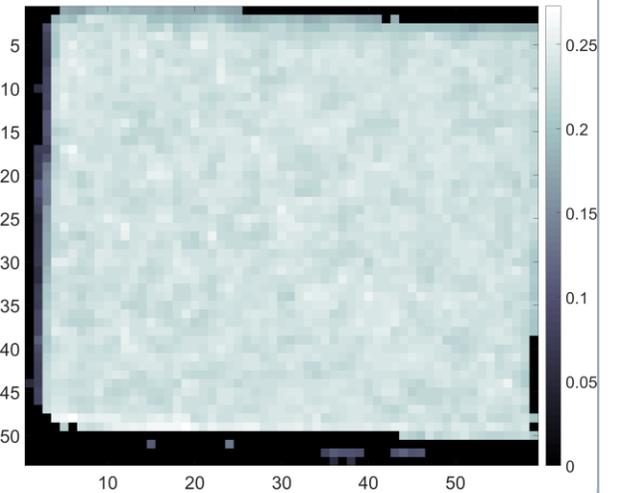
DOUBLE



ENVELOPE

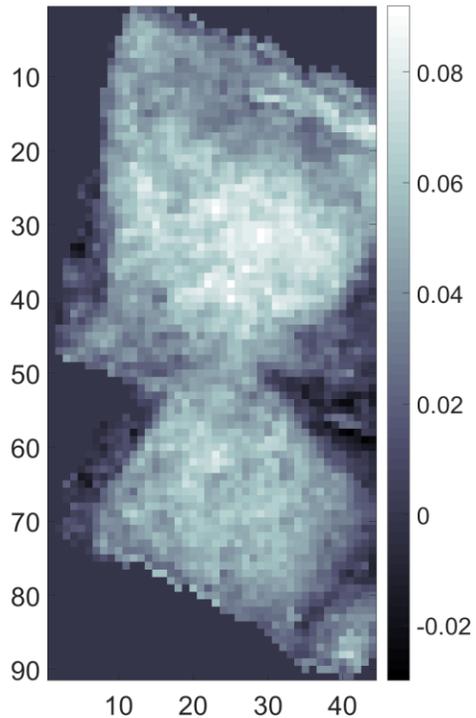


PARCEL

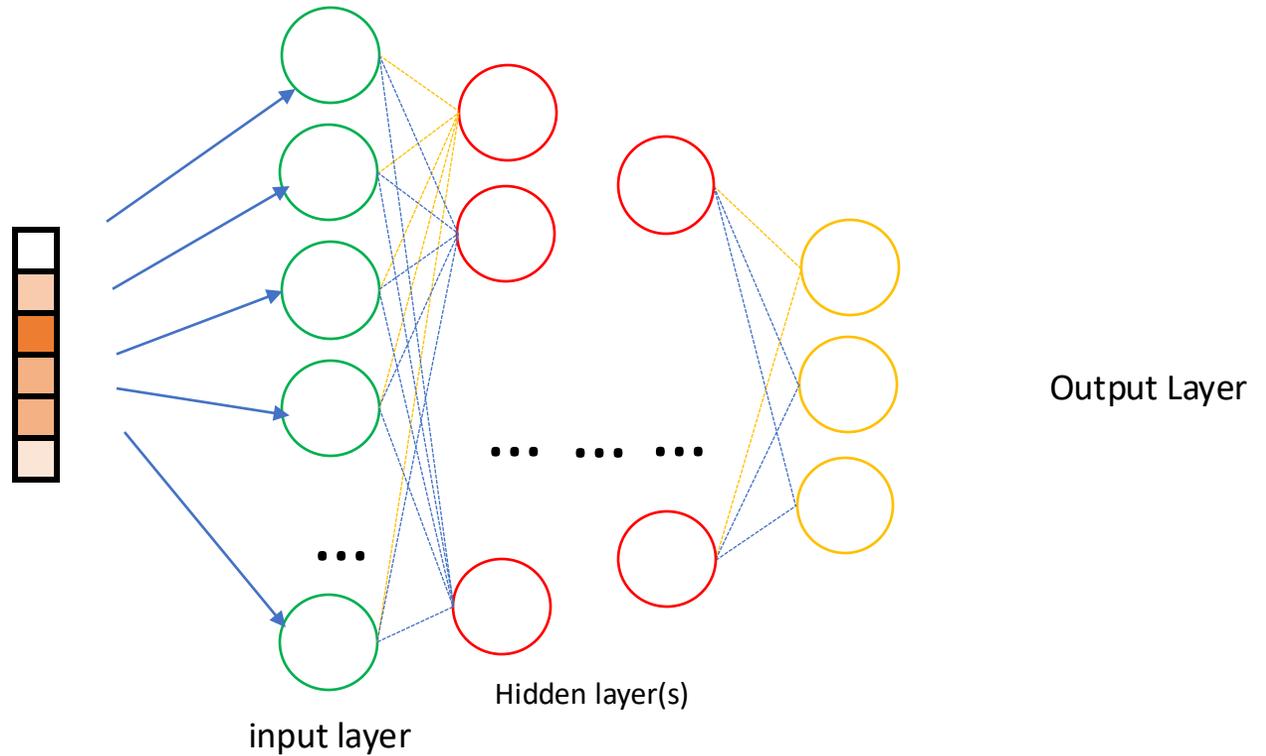


# An Illustrative Example: Parcel Classification

DOUBLE

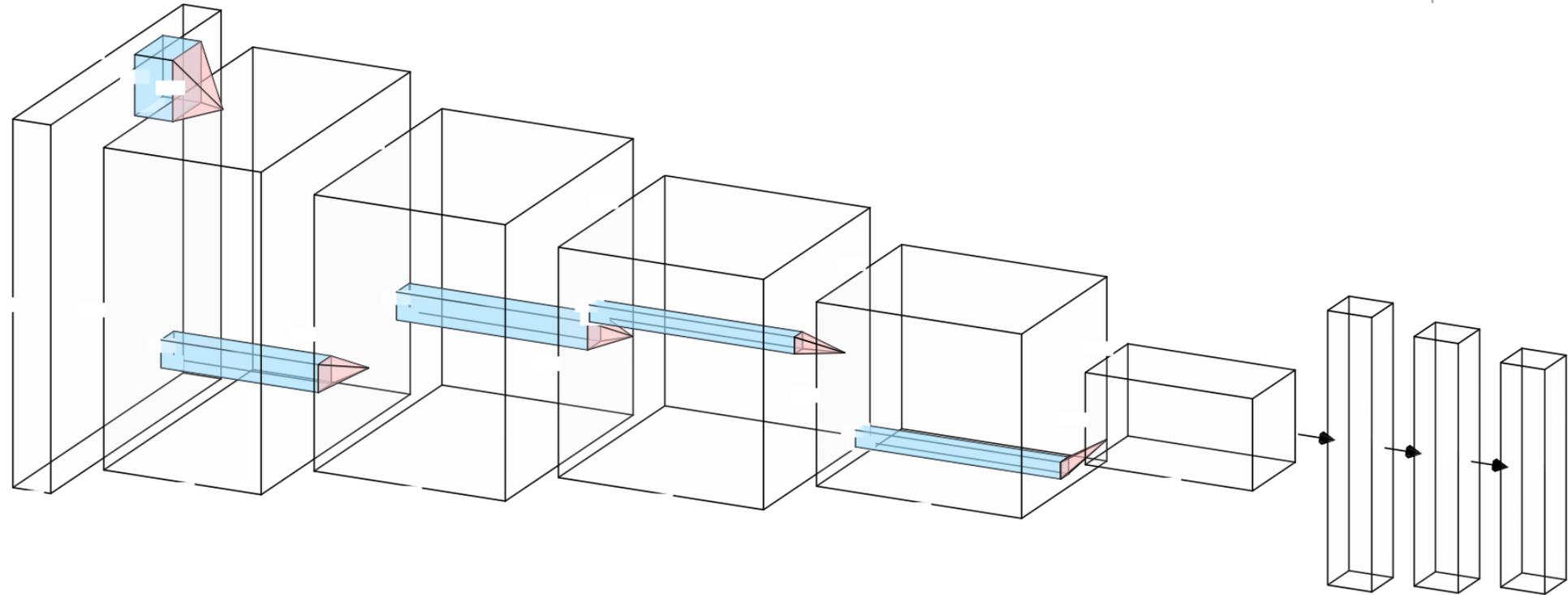
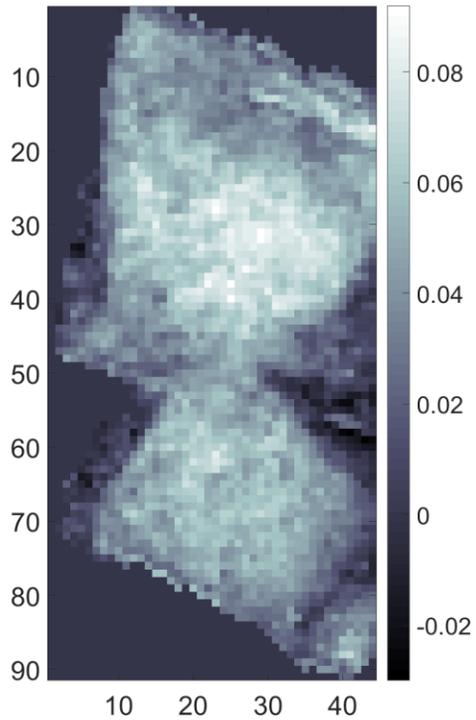


Feature Extraction



# An Illustrative Example: Parcel Classification

DOUBLE



# Course Outline

Basics of Python: Google Colaboratory programming environment, basic Python programming, basics of vectors, matrices, and tensors

Basics in image processing: Image representation, image manipulation, convolution, and morphological operations for feature extraction.

Classification & Neural Networks: Classification problem, from perceptron to feed-forward neural networks, network training and performance assessment.

Image Classification: Image classification using hand-crafted features.

Deep Learning and CNNs: Convolutional Neural Networks (CNNs)



*Salmon in river*

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