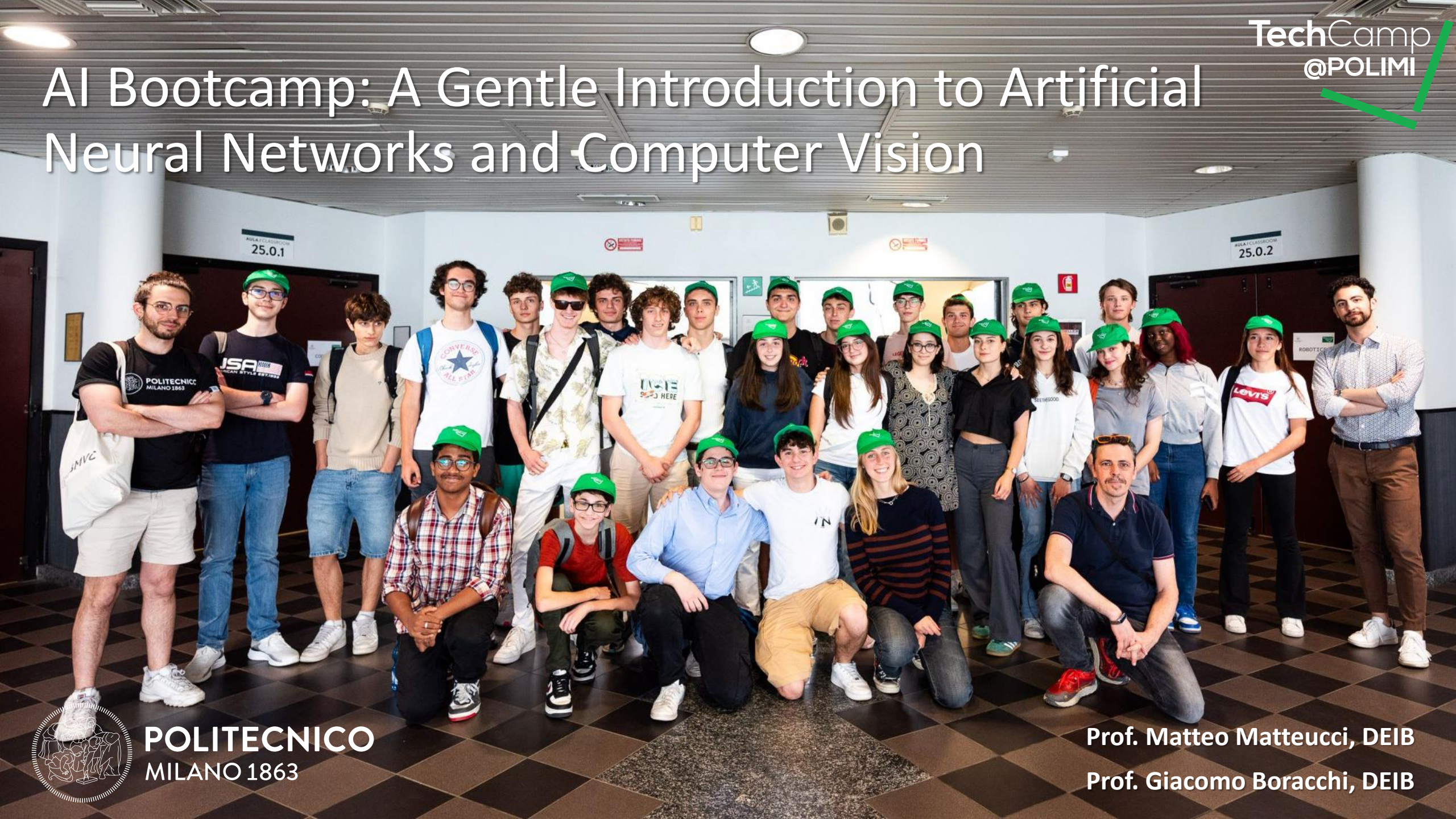
AI Bootcamp: A Gentle Introduction to Artificial Neural Networks and Computer Vision



Prof. Matteo Matteucci, DEIB
Prof. Giacomo Boracchi, DEIB

The Teachers

Prof. Matteo Matteucci

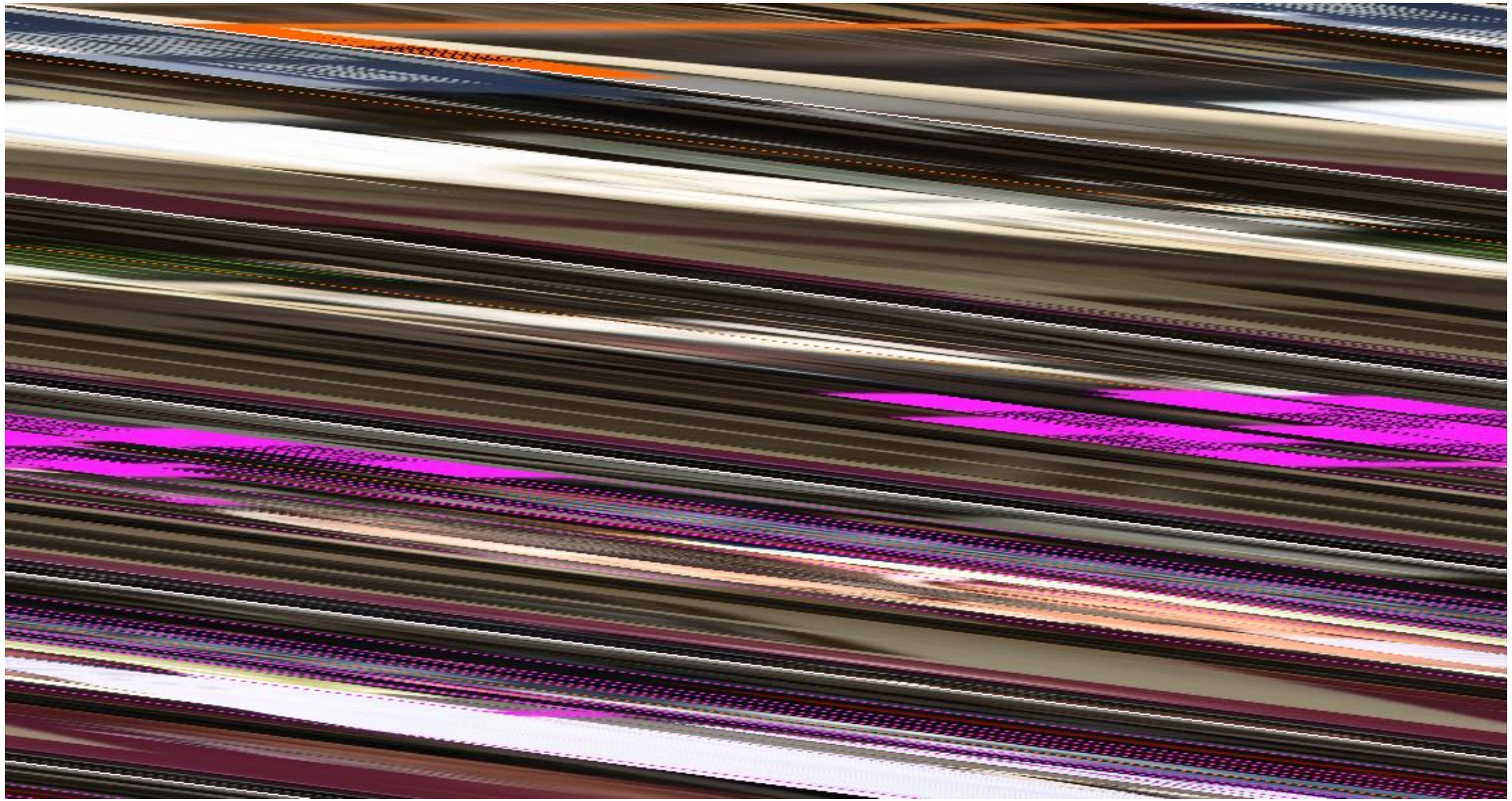
- Computer Engineer (POLIMI)
- PhD in Computer Engineering and Automation (POLIMI)
- Full Professor at DEIB, Polimi (Computer Science)

The Teachers

Prof. Giacomo Boracchi

- Mathematician (UNIMI)
- PhD in Information Technology (POLIMI)
- Associate Professor at DEIB, Polimi (Computer Science)

Object Detection (Redmon et al. 2015)



Instance Seg. / Human Pose (He et al 2017)

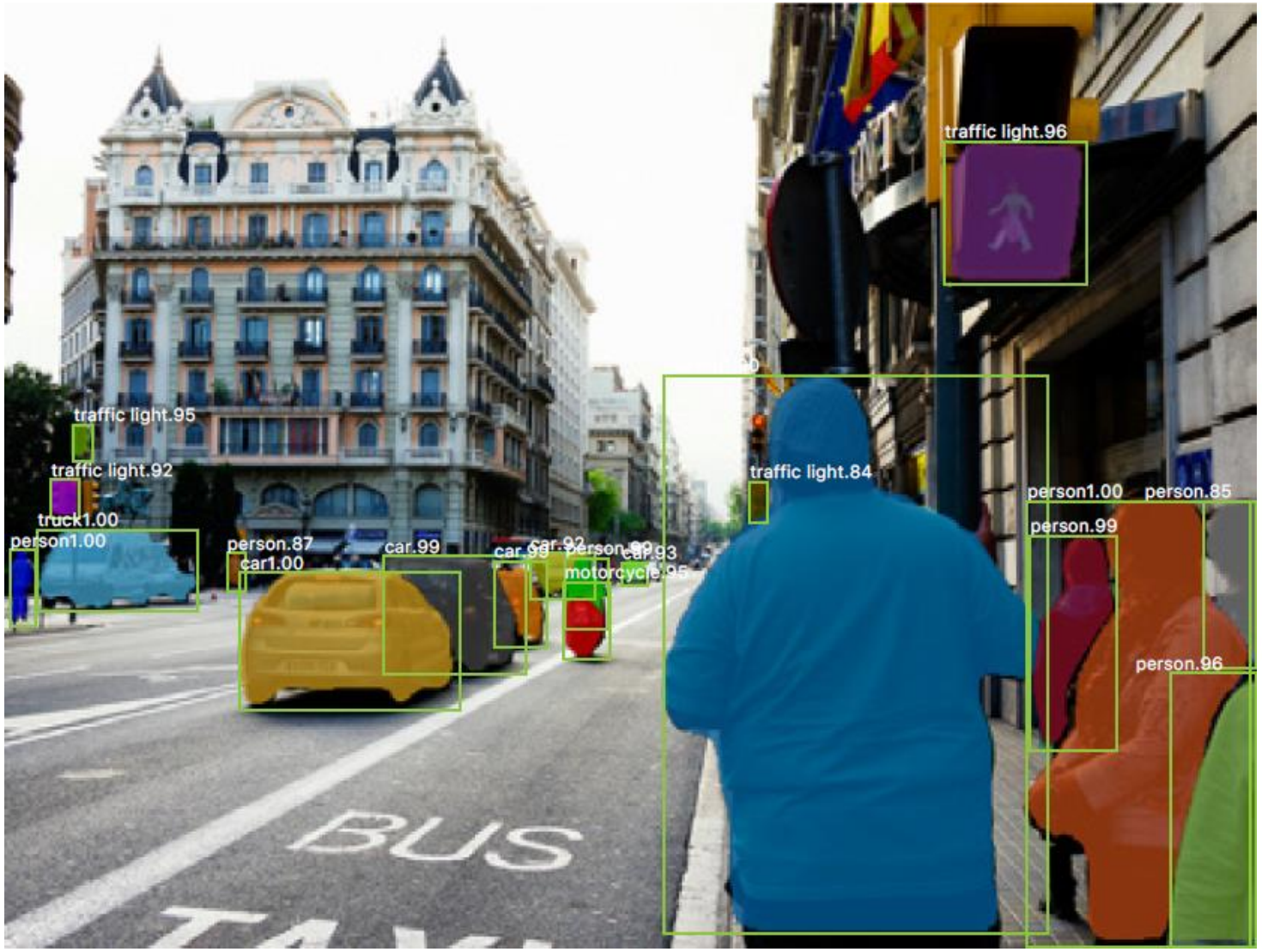


Image Generation

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We are not going to see exactly these models…

…but you 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 the basic principle of Convolutional Neural Networks

Digital Images

How do computers represent & process images

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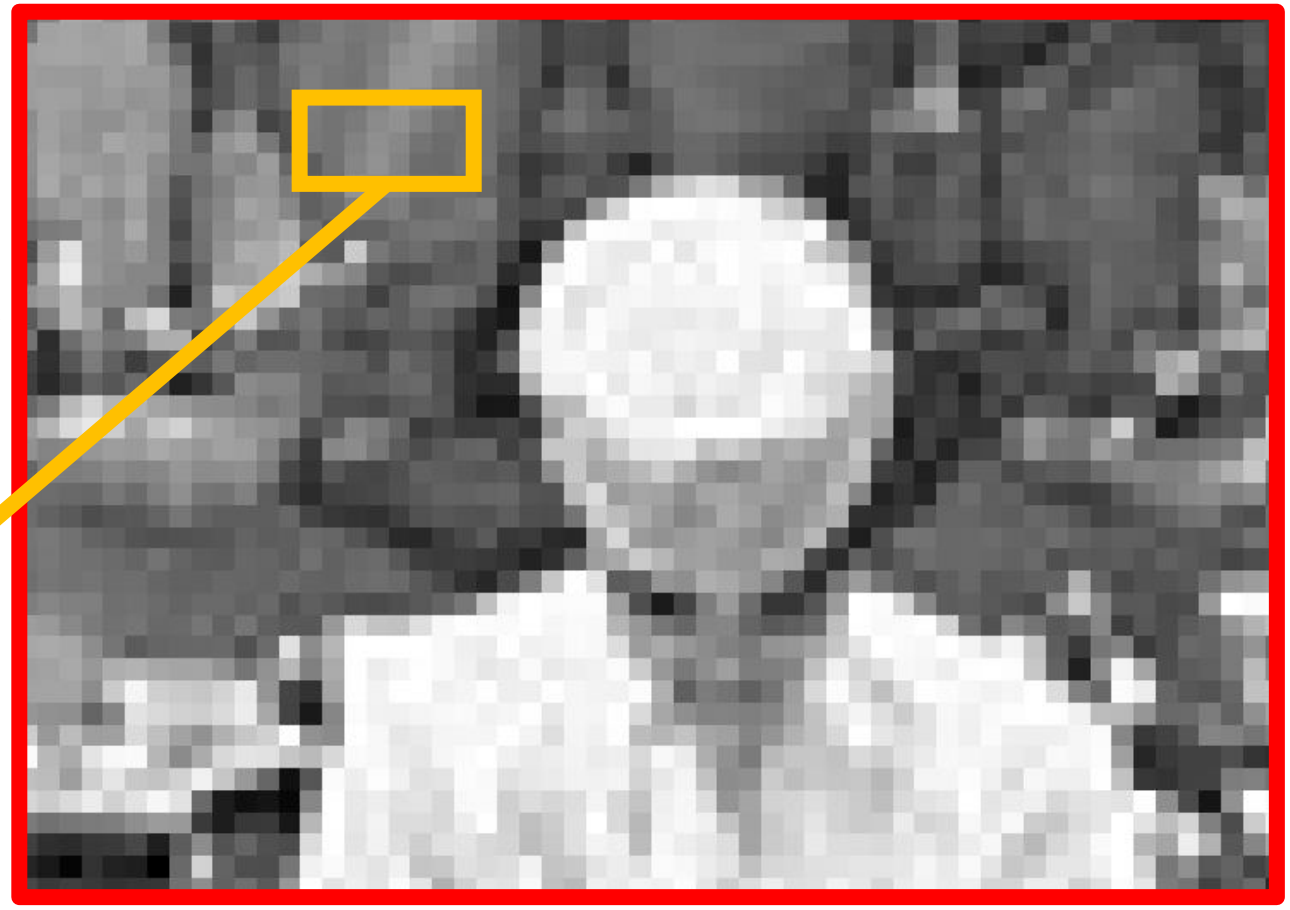
How do computers represent & process images



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

Simple Use Case

Industrial Visual Recognition

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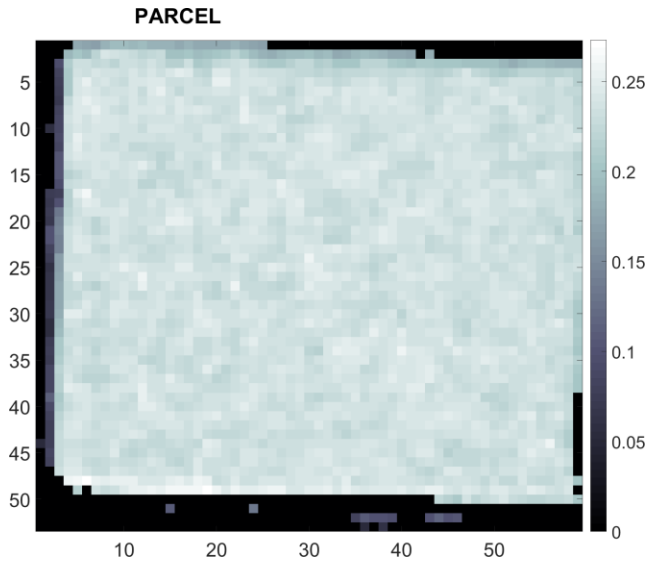
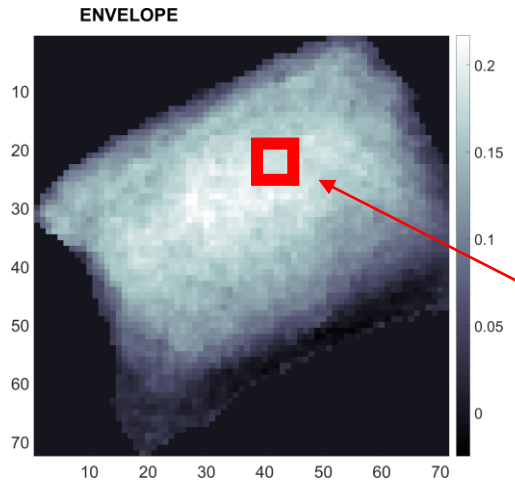
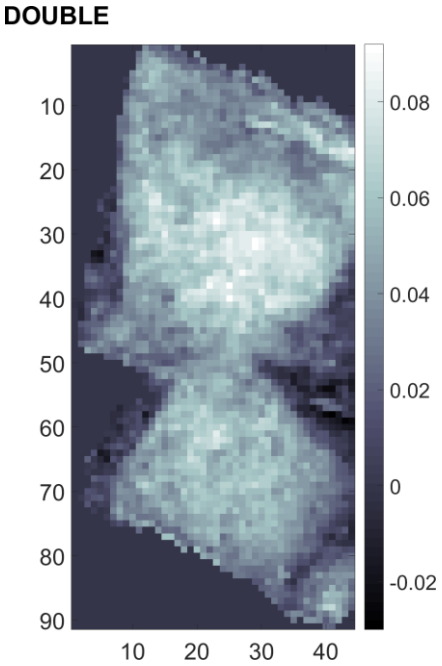
Simple Use Case

Industrial Visual Recognition

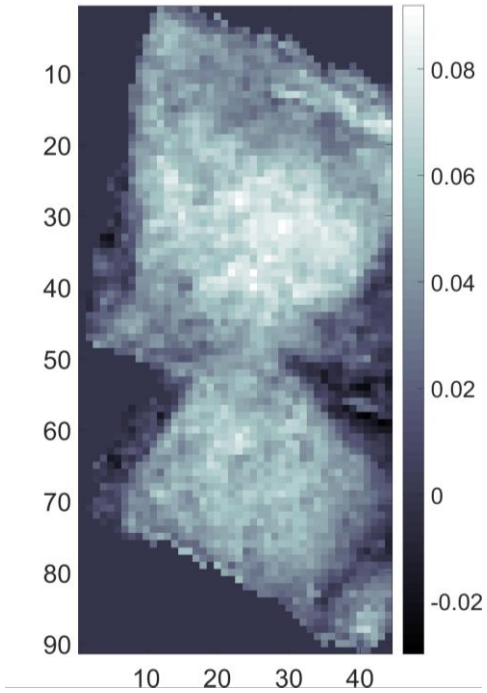






Height

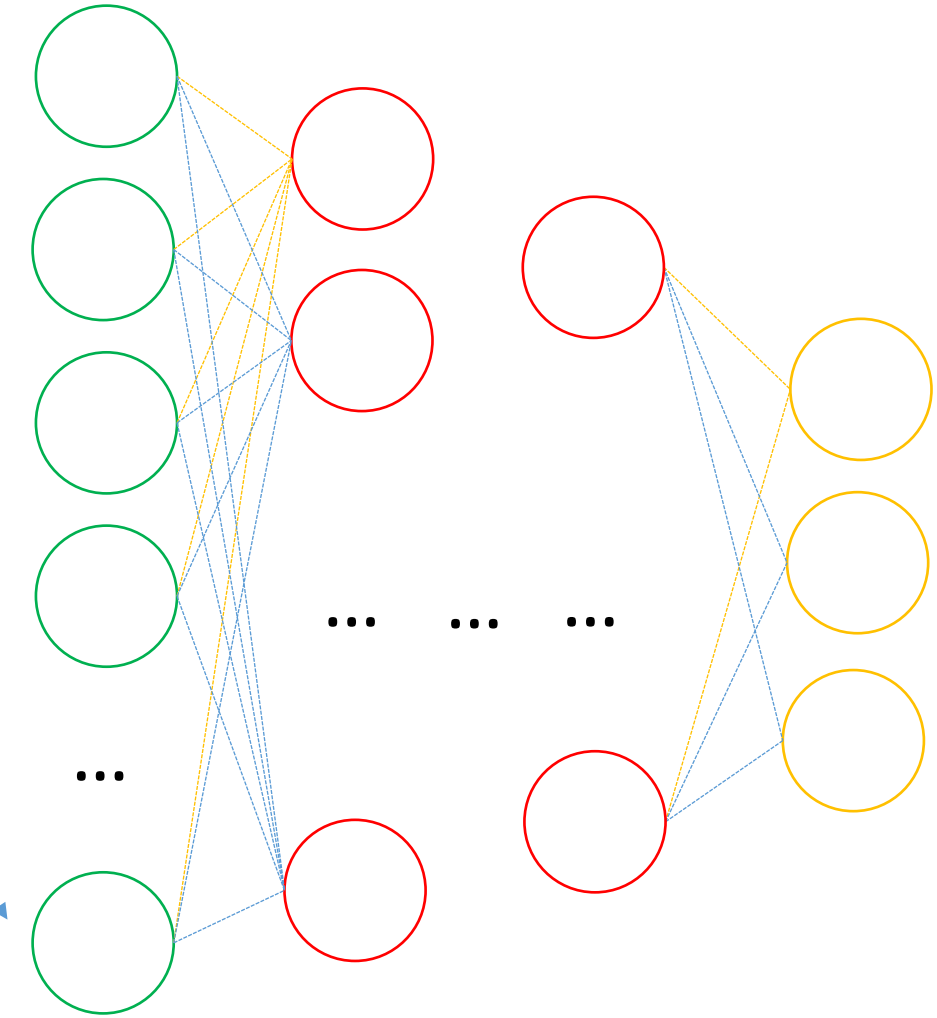
Parcel Classification with Neural Networks



$$I_1 \in \mathbb{R}^{r_1 \times c_1}$$

Feature Extraction

$$\mathbf{x} \in \mathbb{R}^d$$



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Course Organization

Learn AI in five days!

- Basics of Python programming
- Basics in image processing
- Classification and Neural Networks
- Image classification
- Deep Learning and CNNs

Note: You'll develop & test your neural network code, so bring your laptop!

Course Outline

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

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

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

Image classification: major challenges, image classification using hand-crafted features.

Deep Learning and CNNs: the deep learning revolution, Convolutional Neural Networks (CNNs), CNN training and performance assessment

Join the AI Bootcamp !!

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Salmon in River

A photo of a white fur monster standing in a purple room

A hand drawn sketch of a Porsche 911

A handpalm with a tree growing on top of it

https://openai.com/dall-e-2/