# Embedded Solution for Person Identification and Tracking

## Master in Telecommunication Engineering

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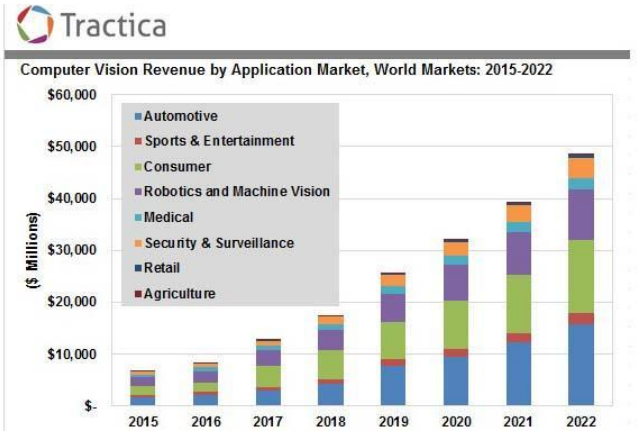
# Motivation

Strong evolution in computer vision research and development.

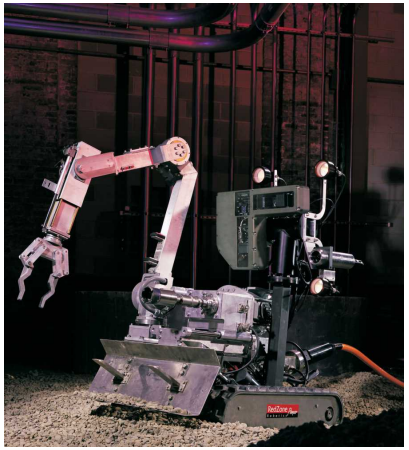
Notable spreading of *deep learning* techniques on computer vision: CNNs (*Convolutional Neural Networks*).




Multiple applications:

- Autonomous driving
- Medical diagnosis
- Surveillance

# Motivation



Powerful applications in robotics as well:

- Remote inspections on hazardousness
- Precision surgery
- Social robotics

# Main goal

These fields can be combined for programming more intelligent robots.

This has been pursued in this research: build an autonomous robot that robustly follows a person.

# Objectives

This goal requires several objectives to be achieved:

- Implement a real-time person following behavior on affordable hardware.
- Use only CNNs for the inference tasks.
- Enhance the robustness combining the CNNs with optical tracking.

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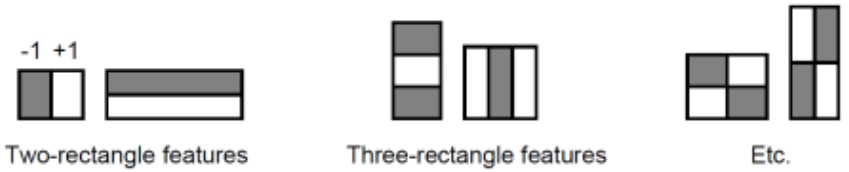
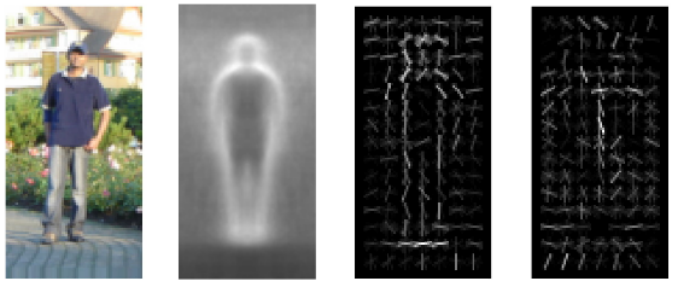
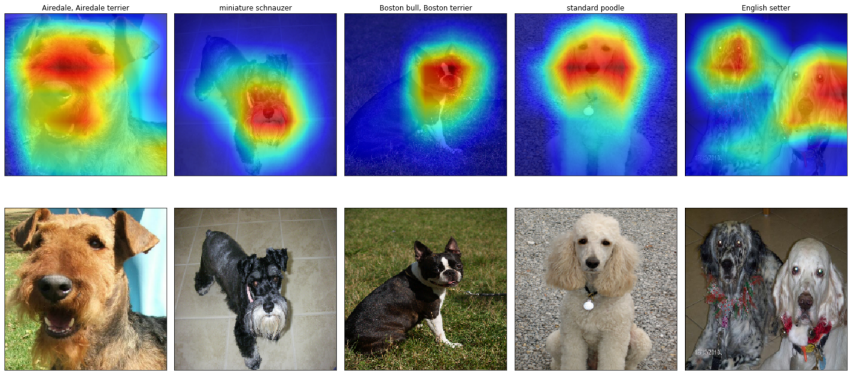
# Person detection

- Viola-Jones detector (adapted from a face detection task) [VJ01].
- HoG (*Histogram of Gradients*) detector [DT05].
- Deep-learning-based detectors: CNNs [KSH12].

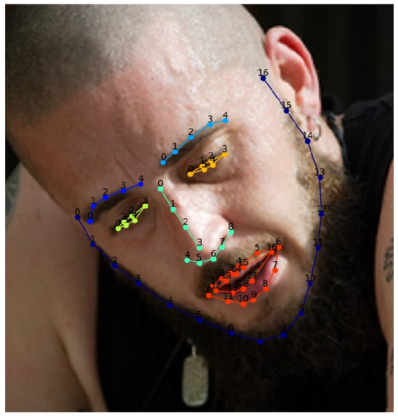




# Person identification

- Facial landmarks detectors [JC18].



- Identification according to the color histogram [LWC15].

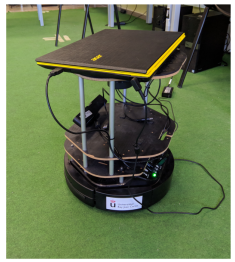
(a) Input image (b) Identification result

- Neural approach: face encoders [SKP15].

# Embedded deployment

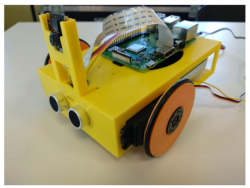
- Mounting a laptop.

(a) Frontal view.

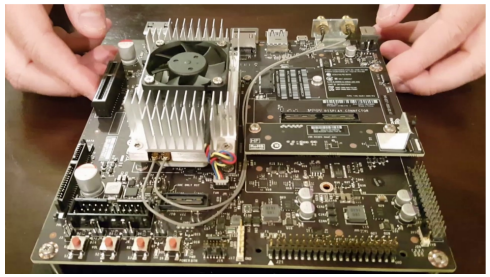


(b) Side view.

- Portable board (Arduino, Raspberry Pi).

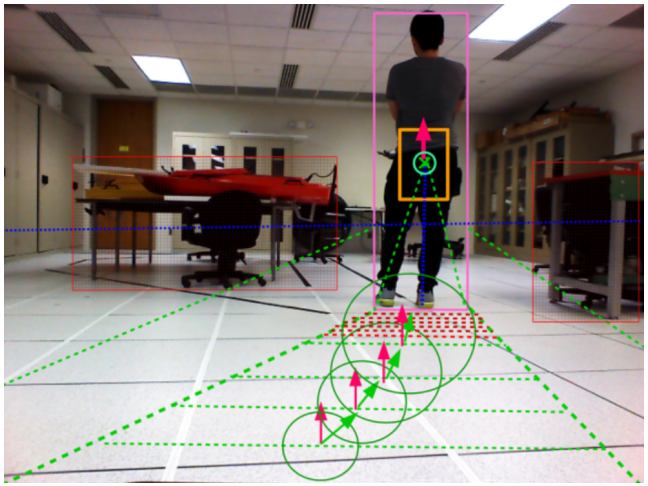


- Embedded computer (NVIDIA Jetson).

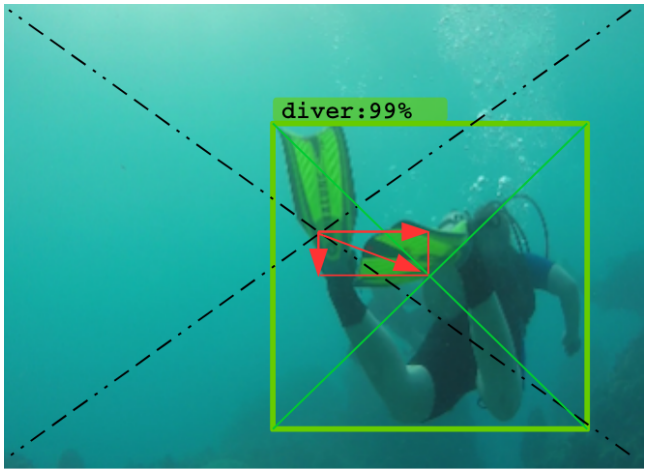


# Following behavior

- Computing a path towards the person [IHS19].



- Reactive following [IFS18].



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# Resources

# Perception Module

# Actuation Module

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# Person detection

# Face detection

# Face recognition

# TensorRT Optimizations

# Motion tracker

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