Introduction to Computer Vision
Course schedule and introduction

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Schedule

Introduction to computer vision: subject summary

In this course we will give an introduction to the field of Computer Vision. We will review different computer vision sub-fields, starting from an overview on Image Processing, following by handcrafted descriptors and learning schemes, to more recent deep learning strategies, showing its applicability to real applications domains, such as detecting and segmenting objects to human behavior recognition and analysis, just to mention a few. We will review different state-of-the-art works and will provide some practical examples as additional material.

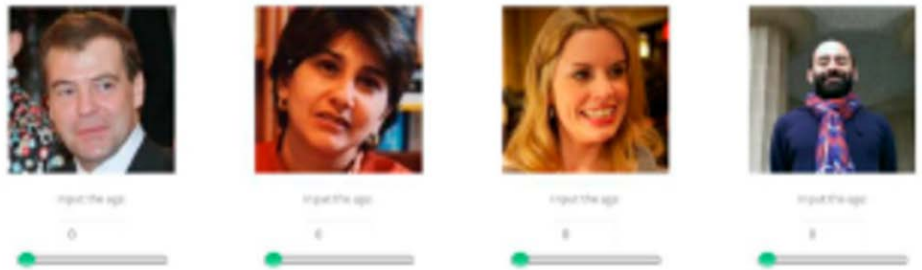
Each week:
Each week it will be two sessions of 1.5h mixed theoretical-practical topic exposition class.
The rest of the course are devoted to autonomous lectures, programming, and studying.

Schedule

	Tuesday	Friday
14-feb	Course introduction	Image processing
21-feb	Handcrafted methods	CNN basics
28-feb	Practical session introduction	Detection and segmentation and generative models
07-mar	Recurrent models	Human pose estimation
14-mar	Video understanding	Practical session progress discussion
21-mar	Presentations	Presentations
28-mar	Exam	-

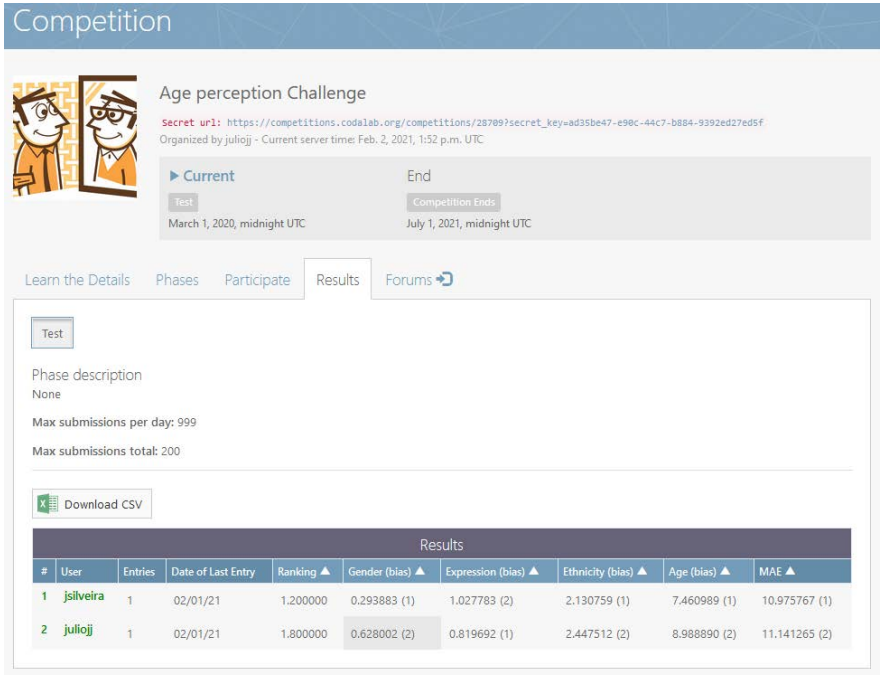
Practical sessions

- Bias mitigation in apparent age recognition



- Google Colab

- Codalab



Schedule - evaluation

- **Evaluation**
- During the course each student will deliver 2 Google Colab notebooks with practical exercises implementation. *(PR).*
- The final creativity vs score tradeoff for the final challenge leaderboard (3rd notebook) will add a score plus. (*PLUS*)
- The student will do a critical analysis paper presentation (*P*)
- At the end of the course an online test exam will be performed (*TS*). The final score (*FS*) will be computed as follows:
- ***FS = 0.5 * PR + 0.3 * P + 0.2 * TS + PLUS(0…2)***
- A minimum score of 3.5 over 10 points is required for each part *PR, P, and TS* in order to compute the final score *FS*.

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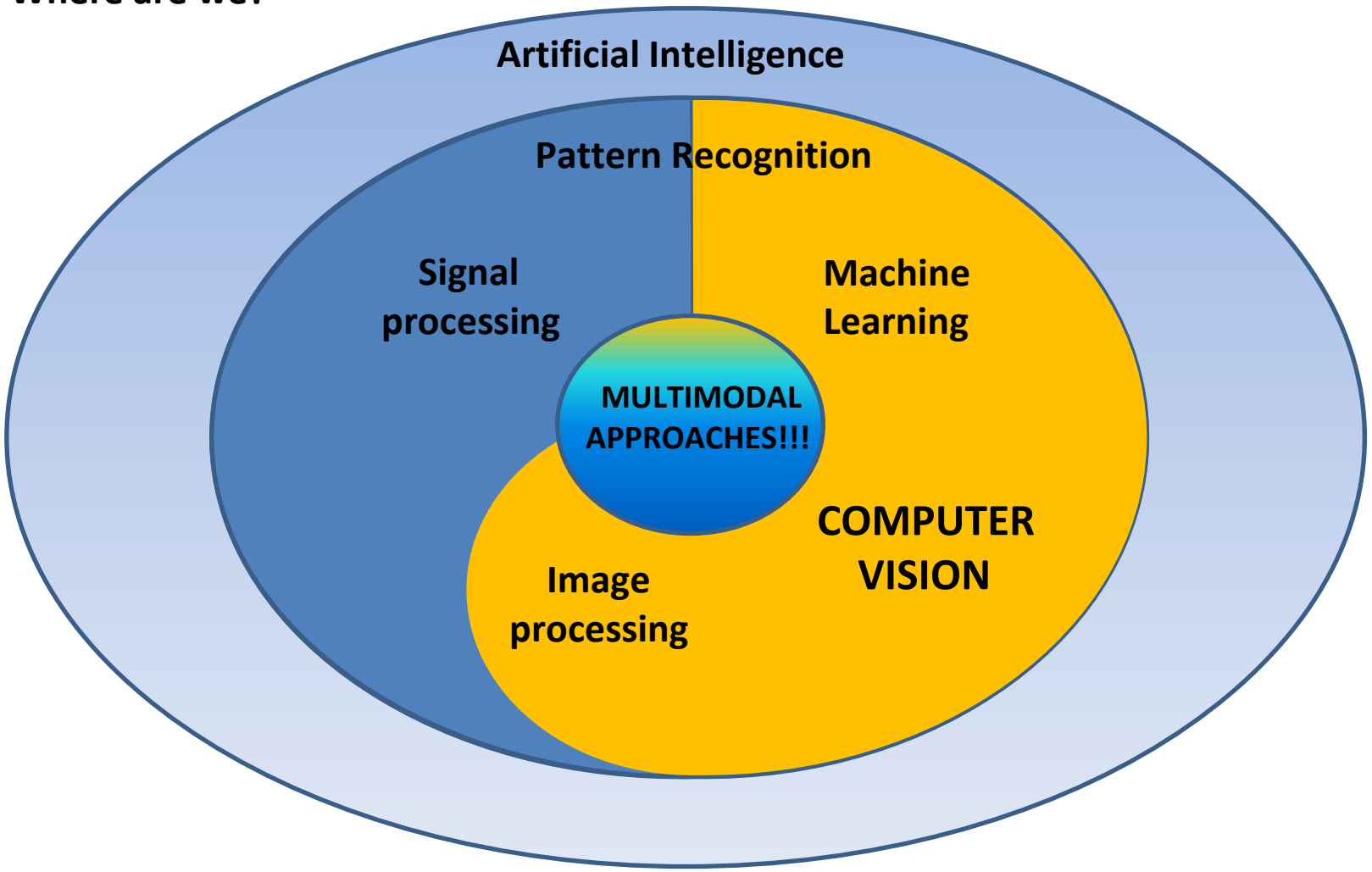
Schedule and evaluation

Introduction to computer vision

Where are we?


Artificial Intelligence
Pattern Recognition
Signal processing
Machine Learning
MULTIMODAL APPROACHES!!!
COMPUTER VISION
Image processing

The Pattern Recognition pipeline

IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 22, NO. 1, JANUARY 2000

Statistical Pattern Recognition: A Review

Anil K. Jain, *Fellow, IEEE*, Robert P.W. Duin, and Jianchang Mao, *Senior Member, IEEE*

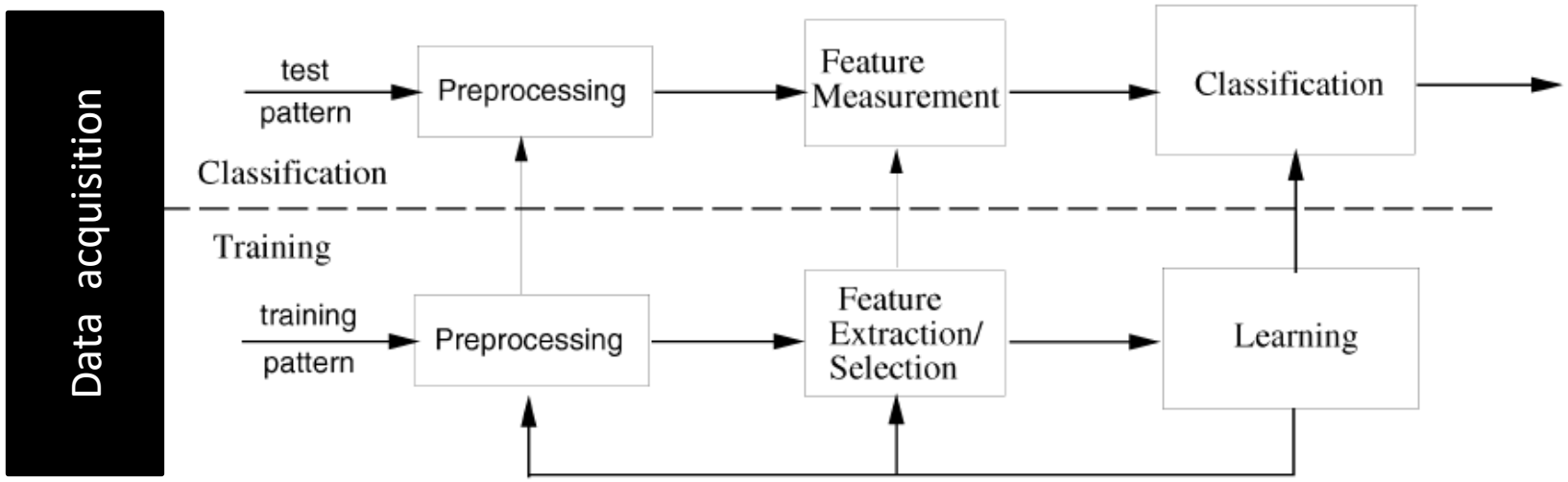
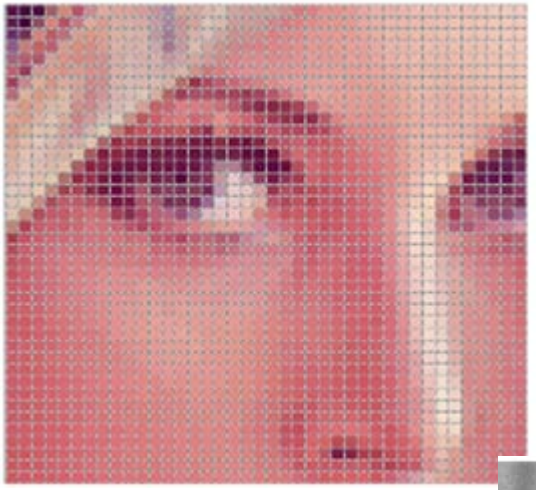
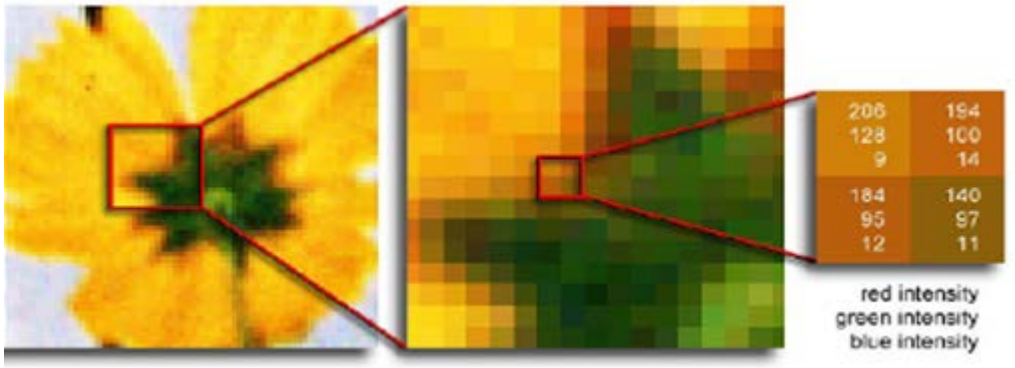
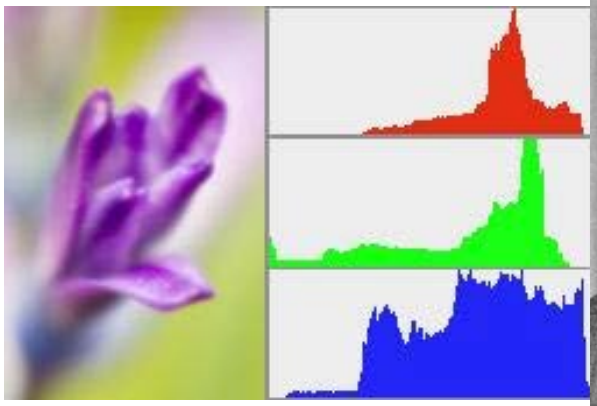
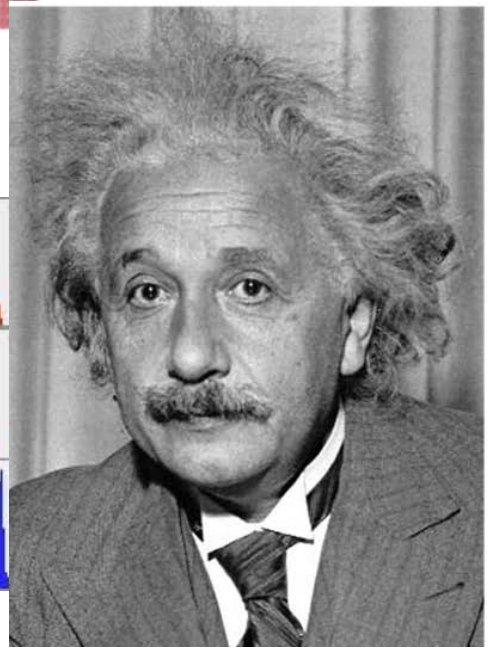


Image processing principles



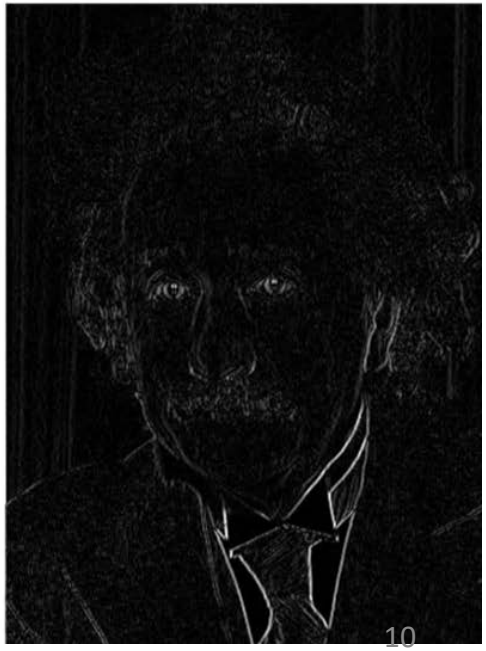




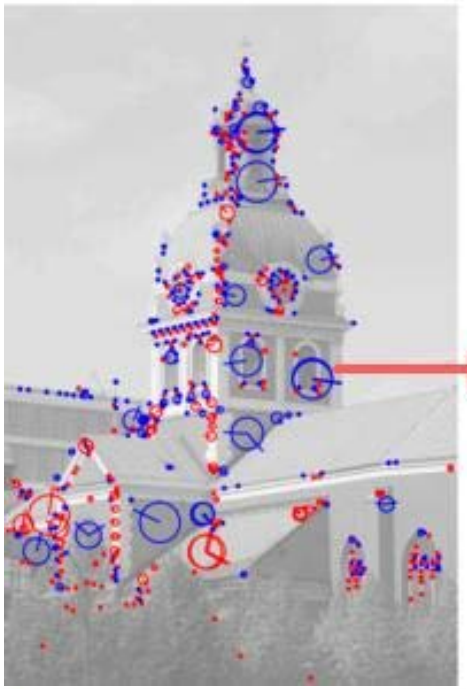


1	0	-1
2	0	-2
1	0	-1

Sobel



Handcrafted models



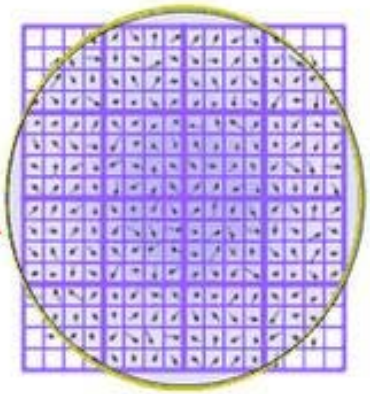
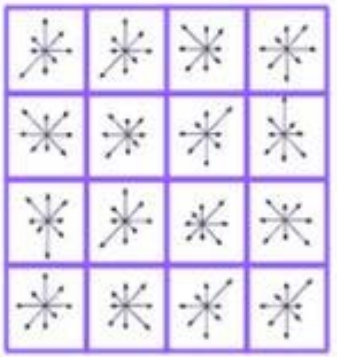
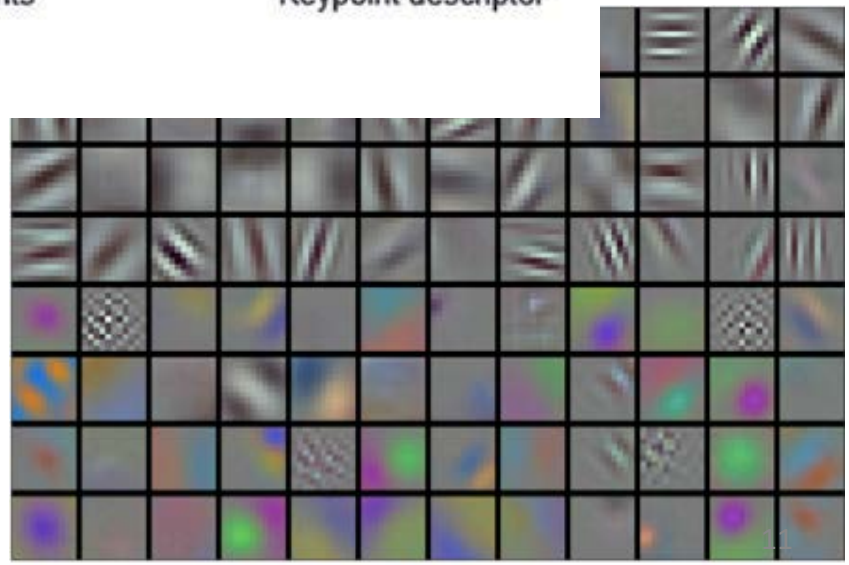


Image gradients

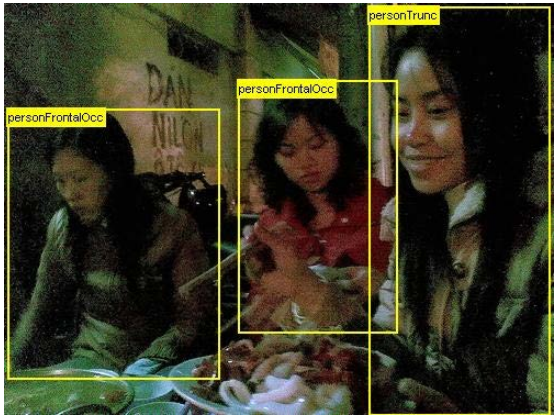


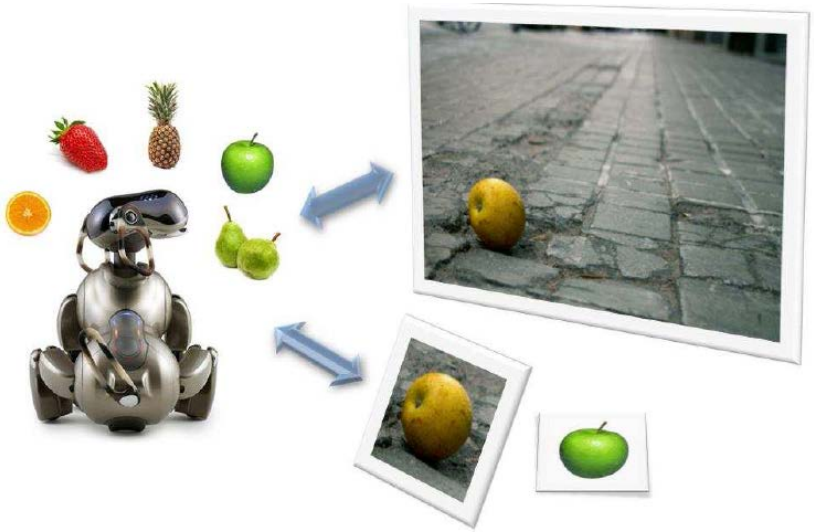
Keypoint descriptor



The Pattern Recognition pipeline

Identification
Detection
Segmentation
Classification





Binary classifiers
Multi-class classifiers
Multi-task learning
One-class classifiers
On-line learning
Large scale learning
etc.

Wall-E

Challenges in visual analysis

Intra-class variabilities

Changes in illumination

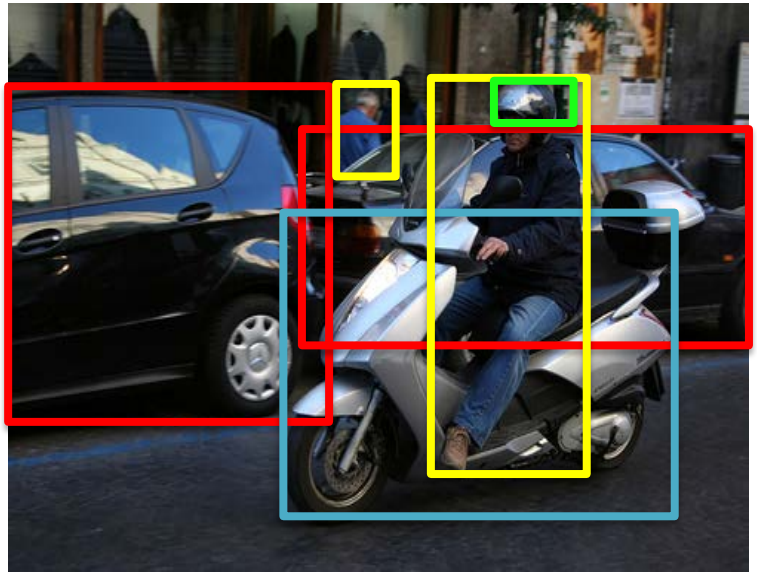
Interclass variabilities

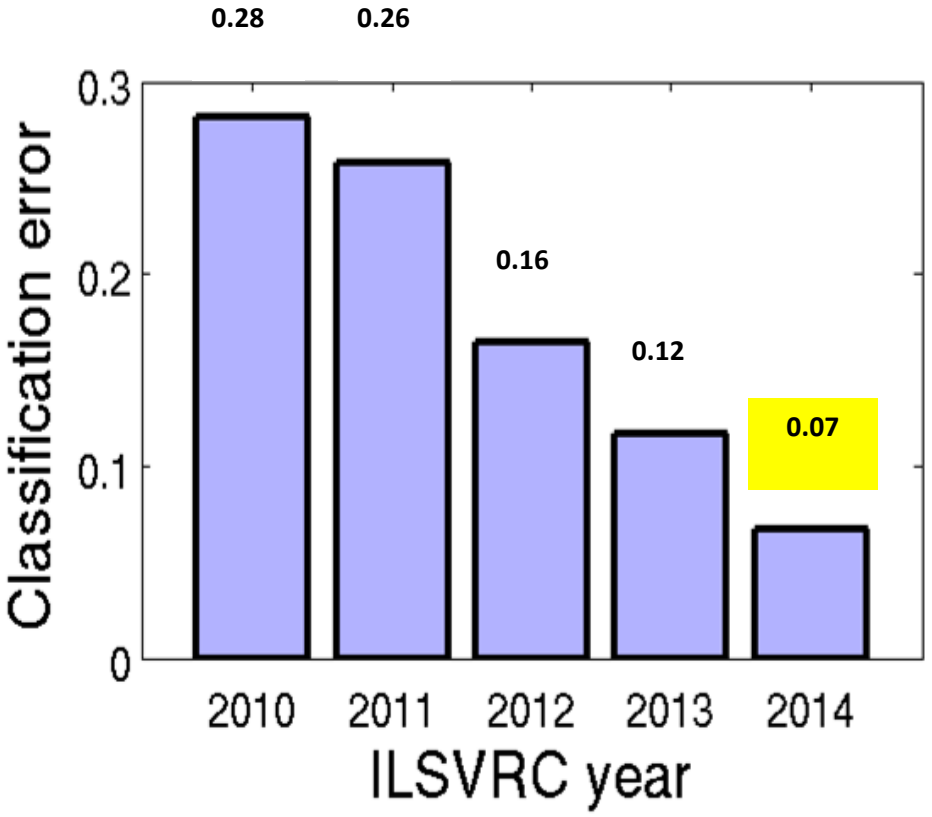
Occlusions

Convolutional Neural Networks

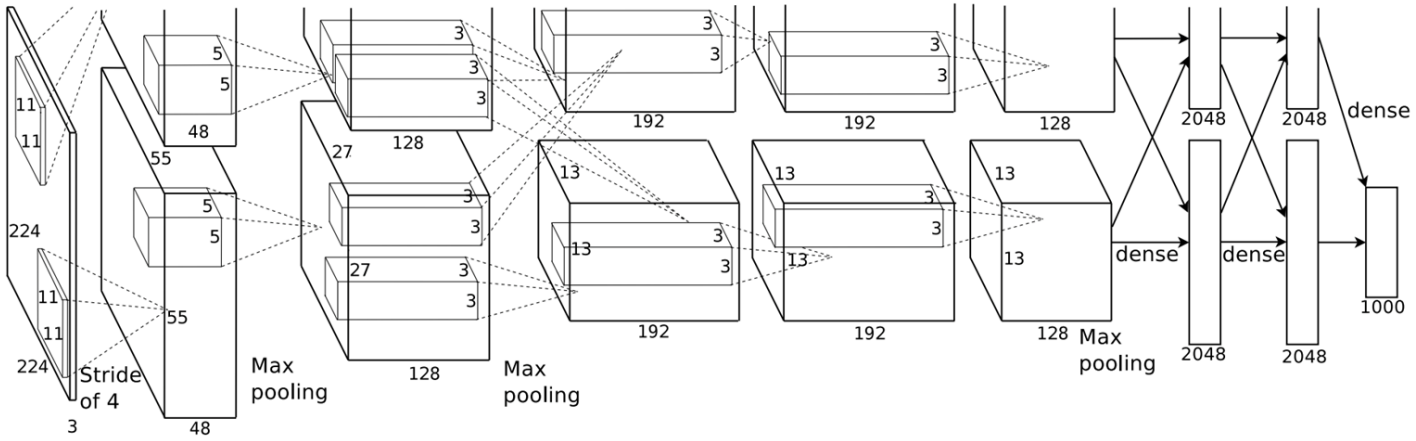
IMAGENET

Person
Car
Motorcycle
Helmet





Convolutional Neural Networks



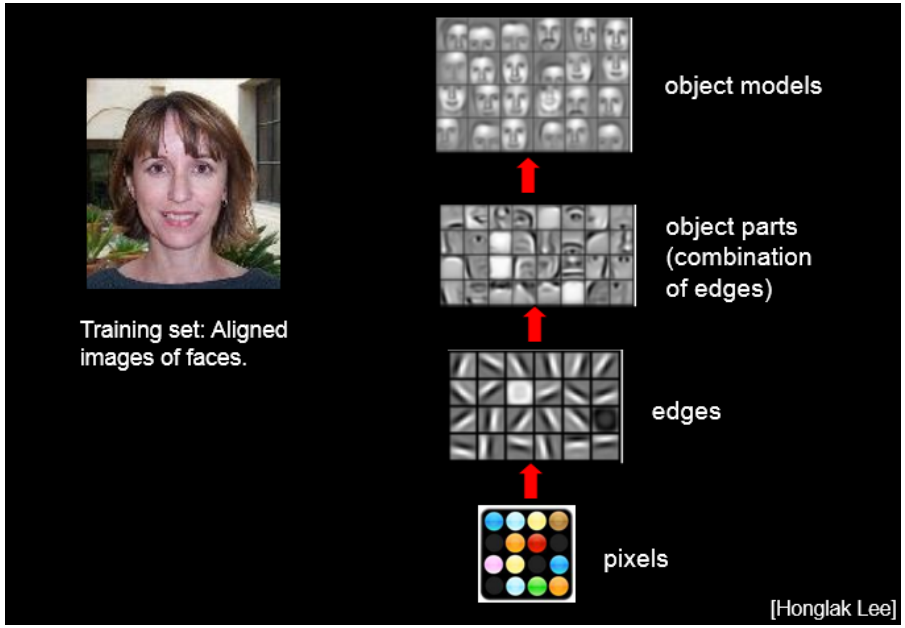
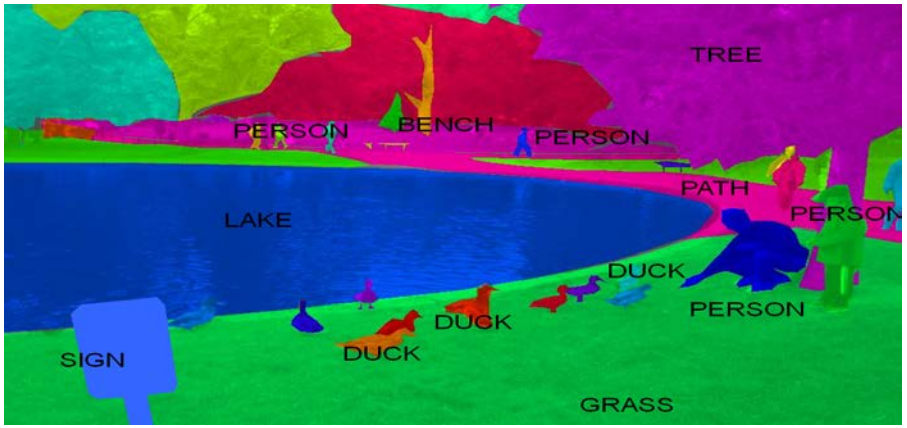
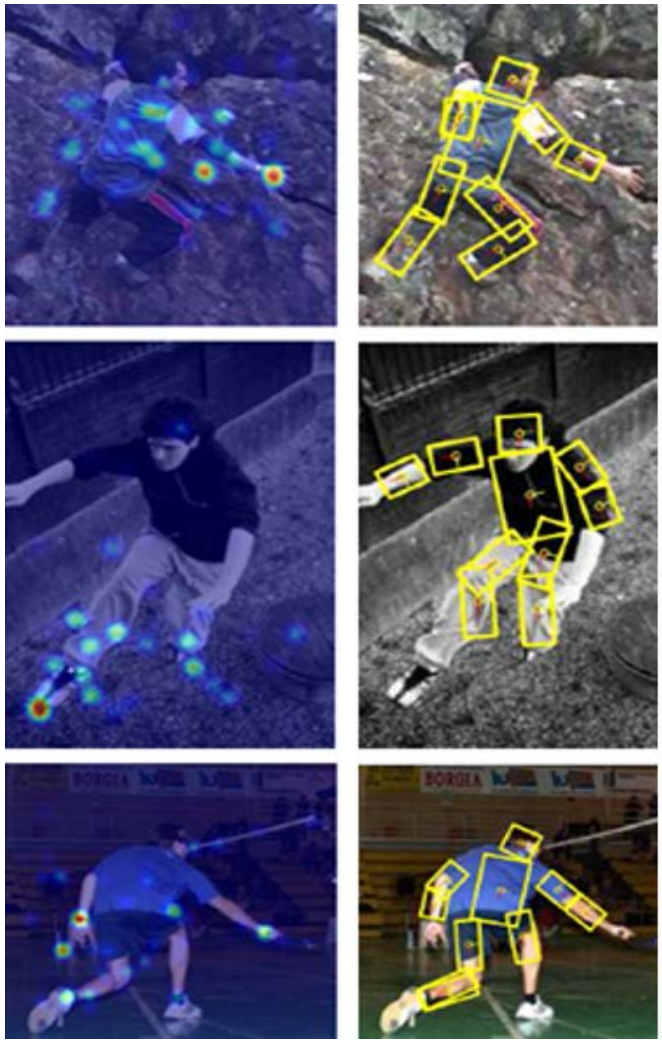


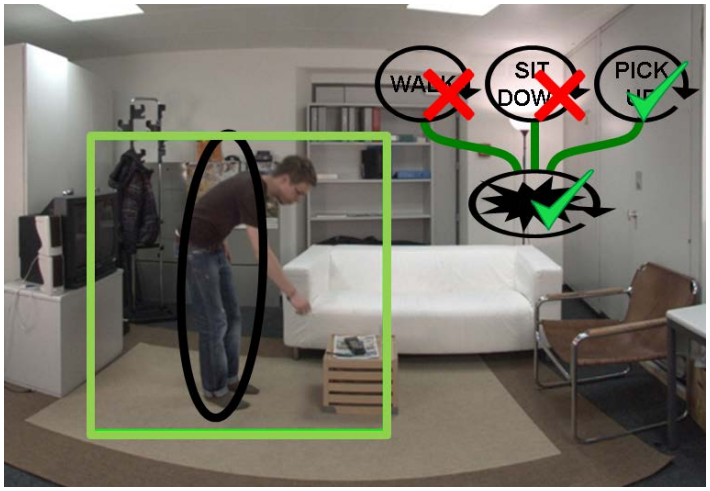
Image segmentation and object detection

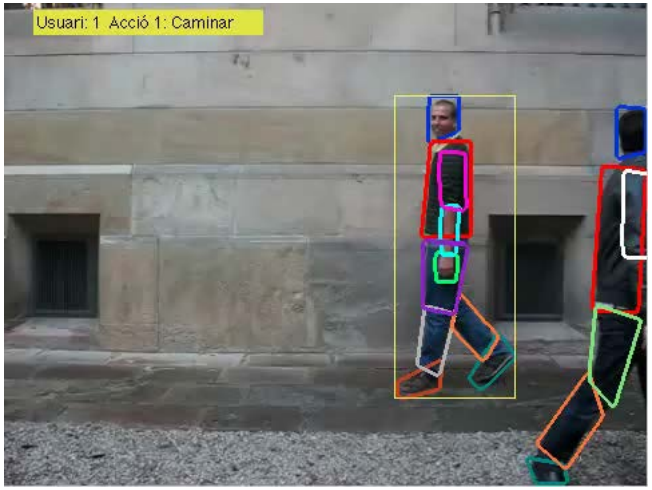
Multiple **detected** classes -> multi-class **classification**
Multiple pixel labels -> Multi-label **segmentation**



Pose and behaviour analysis







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- Papers for seminars:
  - Send an email:
  - sergio.escalera.guerrero@gmail.com before the deadline with a list of at least three priority ranked papers for presentation. Consider relevant conference and journal papers, such as CVPR, ICCV, ECCV, BMCV, NIPS, IJCV, TPAMI.
  - Deadline 7/3/2022

- You can (should) send the draft of your presentation for revision few days before your presentation, and the final version (mandatory) by the week of the presentation.