

Introduction to Computer Vision

Course schedule and introduction

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Schedule and evaluation

Introduction to computer vision

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.

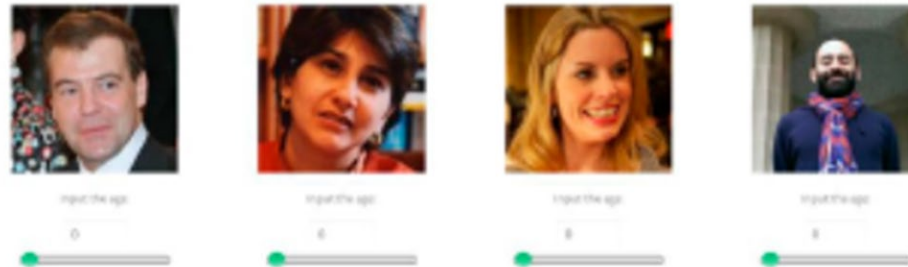
The rest of the course are devoted to autonomous lectures, programming, and studying.

Schedule

	Tuesday	Friday
13-feb	Course introduction	Image processing
20-feb	Handcrafted methods	CNN basics
27-feb	Practical session introduction	Detection and segmentation
06-mar	Recurrent and generative models	Human pose estimation
13-mar	Video understanding	Practical session progress discussion
20-mar	Presentations	Presentations
27-mar	Exam	-

Practical sessions

- Bias mitigation in apparent age recognition



- Google Colab



- Codalab



Competition

Age perception Challenge

Secret url: https://competitions.codalab.org/competitions/28709?secret_key=ad35be47-e90c-44c7-b884-9392ed27ed5f
Organized by julioj - Current server time: Feb. 2, 2021, 1:52 p.m. UTC

► Current End

Test Competition Ends

March 1, 2020, midnight UTC July 1, 2021, midnight UTC

Learn the Details Phases Participate Results Forums ↗

Test

Phase description
None

Max submissions per day: 999
Max submissions total: 200

Download CSV

Results									
#	User	Entries	Date of Last Entry	Ranking ▲	Gender (bias) ▲	Expression (bias) ▲	Ethnicity (bias) ▲	Age (bias) ▲	MAE ▲
1	jsilveira	1	02/01/21	1.200000	0.293883 (1)	1.027783 (2)	2.130759 (1)	7.460989 (1)	10.975767 (1)
2	julioj	1	02/01/21	1.800000	0.628002 (2)	0.819692 (1)	2.447512 (2)	8.988890 (2)	11.141265 (2)

Schedule - evaluation

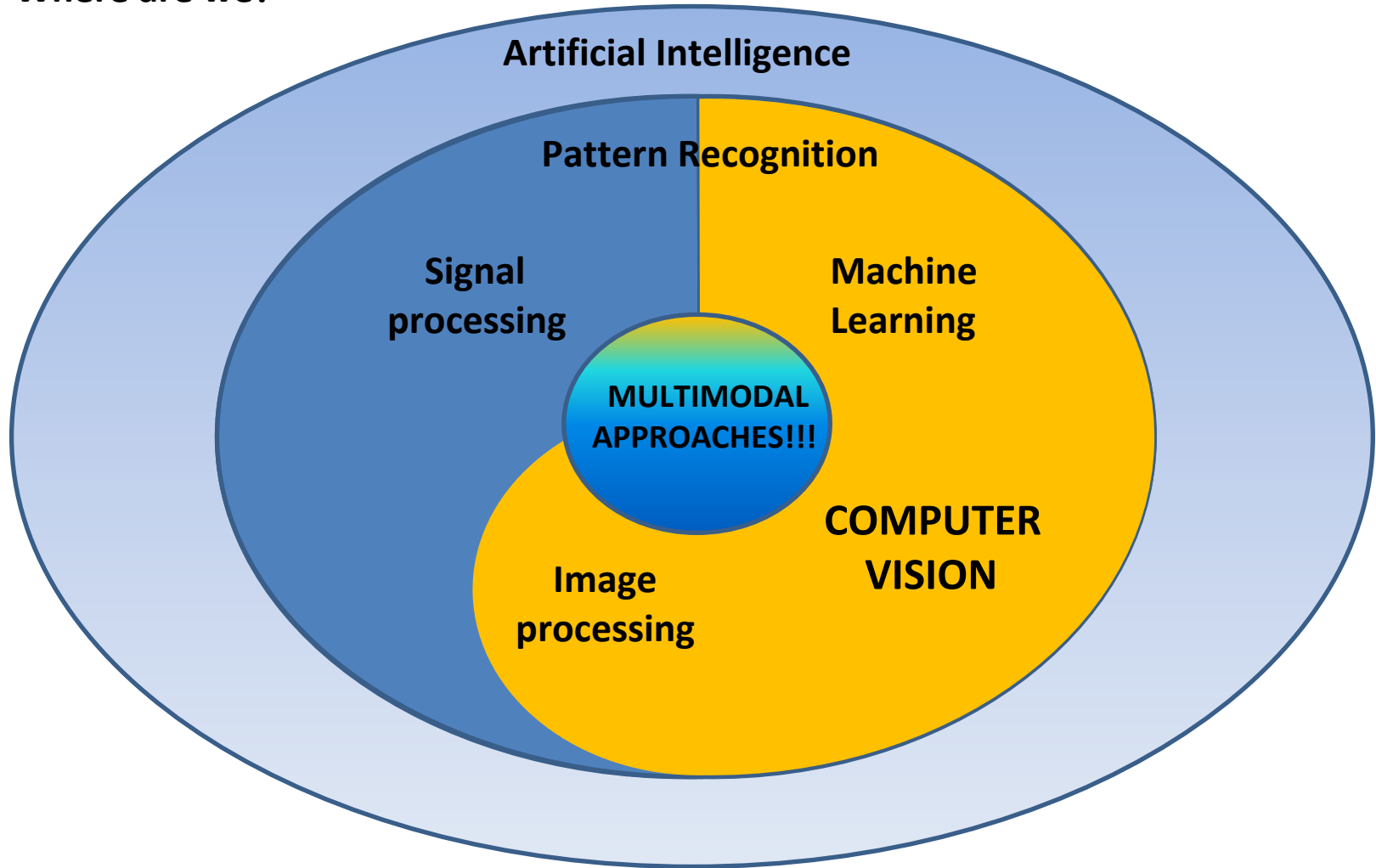
- **Evaluation**
- During the course each student will deliver 2 Google Colab notebooks with practical exercises implementation. (*PR*).
- The final creativity vs score tradeoff for the final challenge leaderboard (3rd notebook) will add a score plus. (*PLUS*)
- The student will do a critical analysis 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?



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*

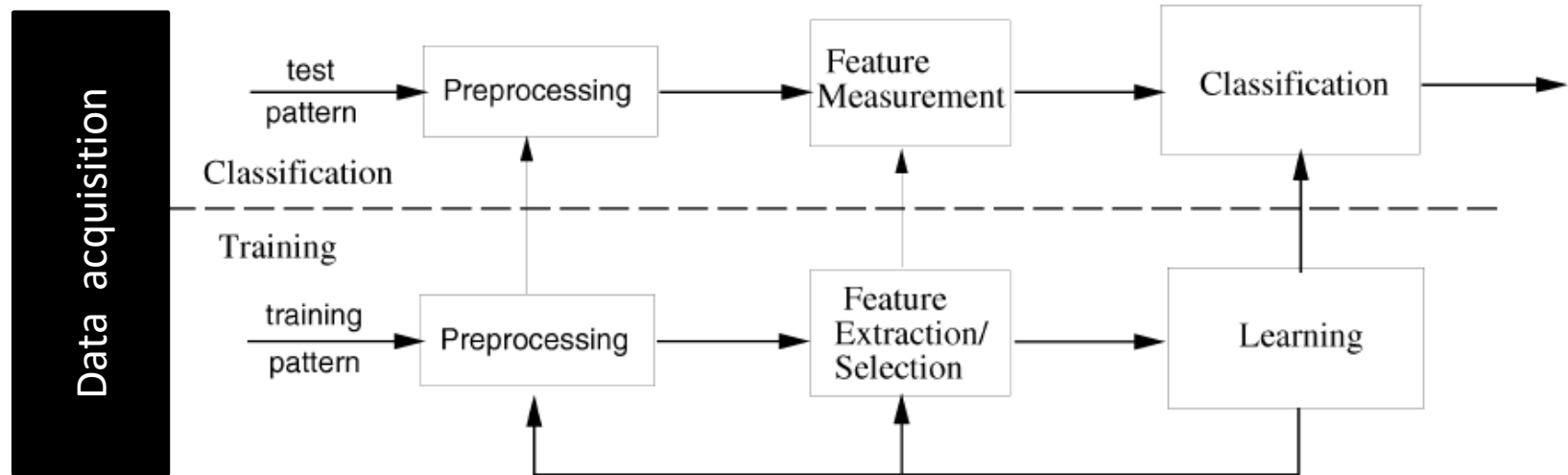
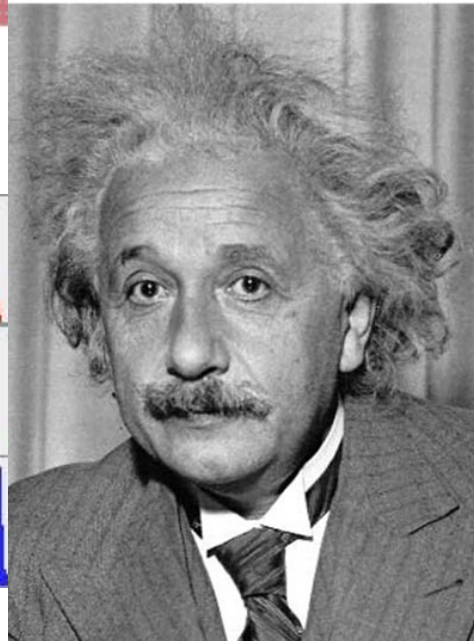
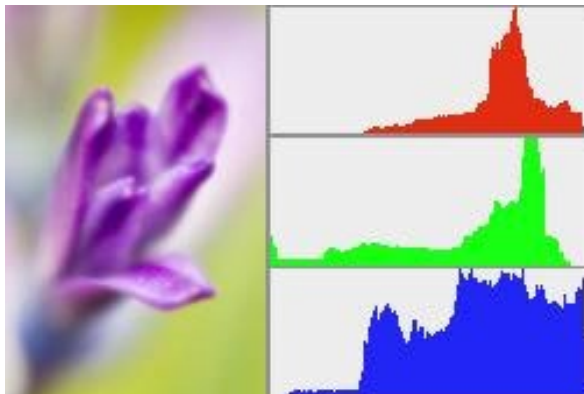
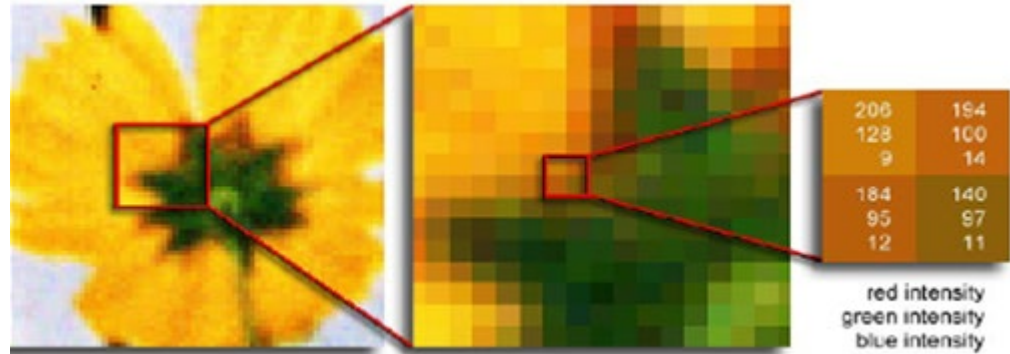
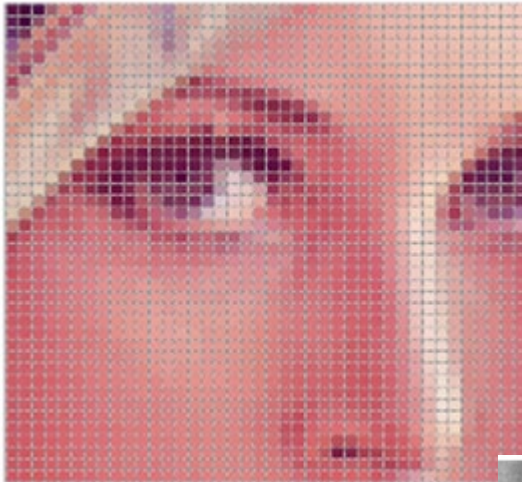
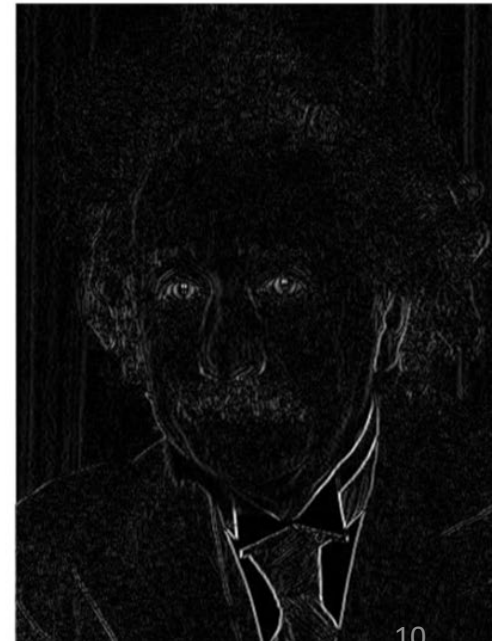


Image processing principles

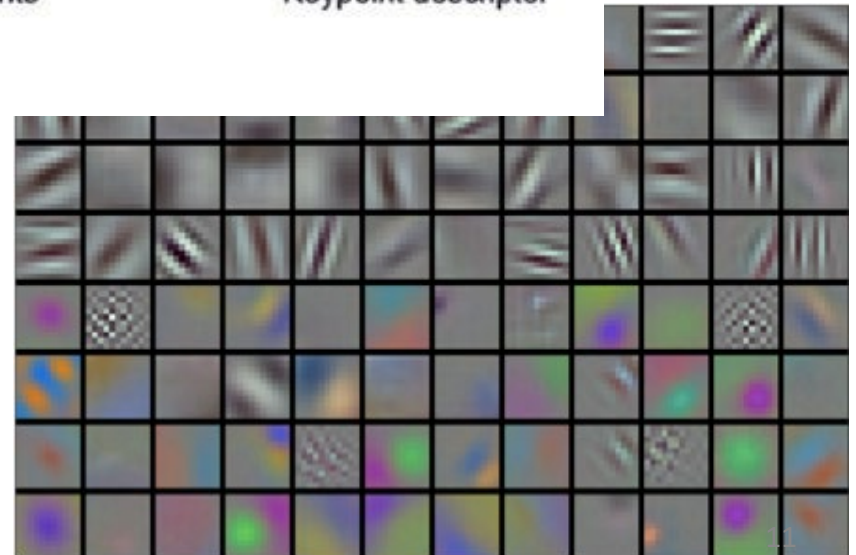
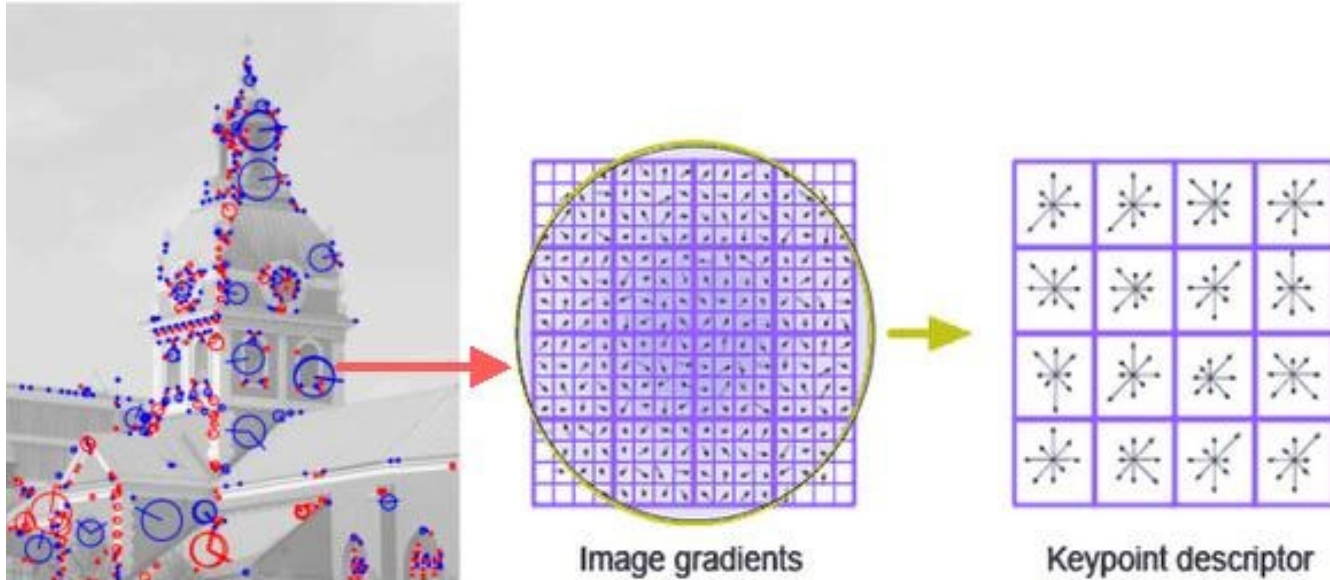


1	0	-1
2	0	-2
1	0	-1

Sobel



Handcrafted models



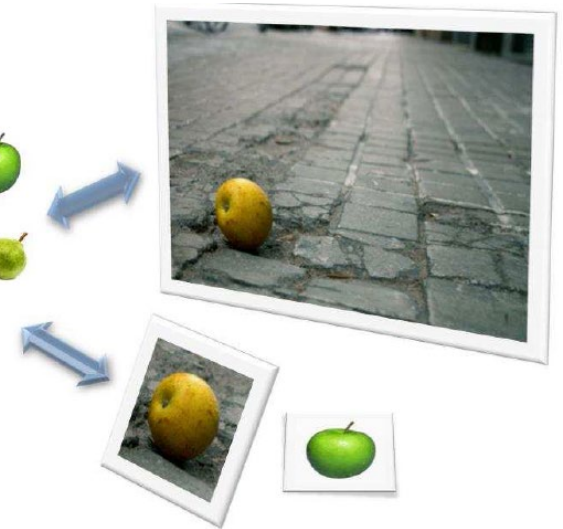
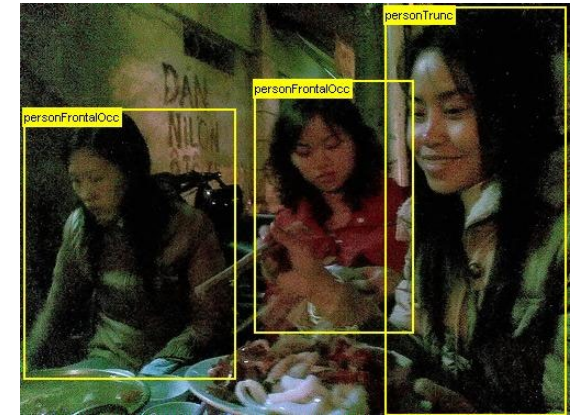
The Pattern Recognition pipeline

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



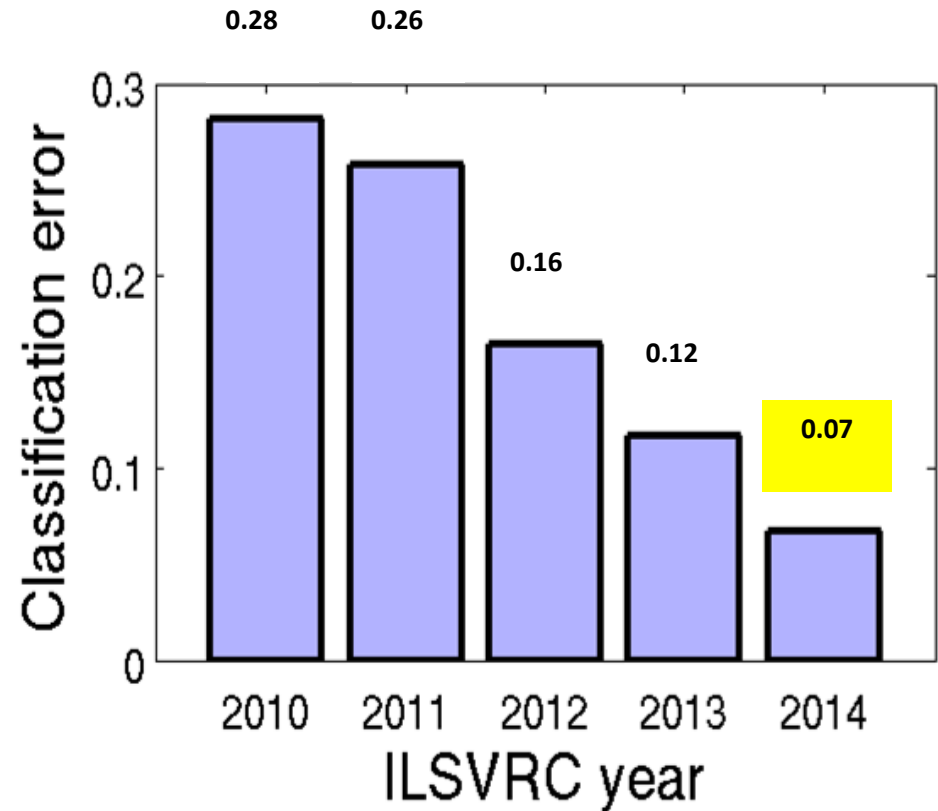
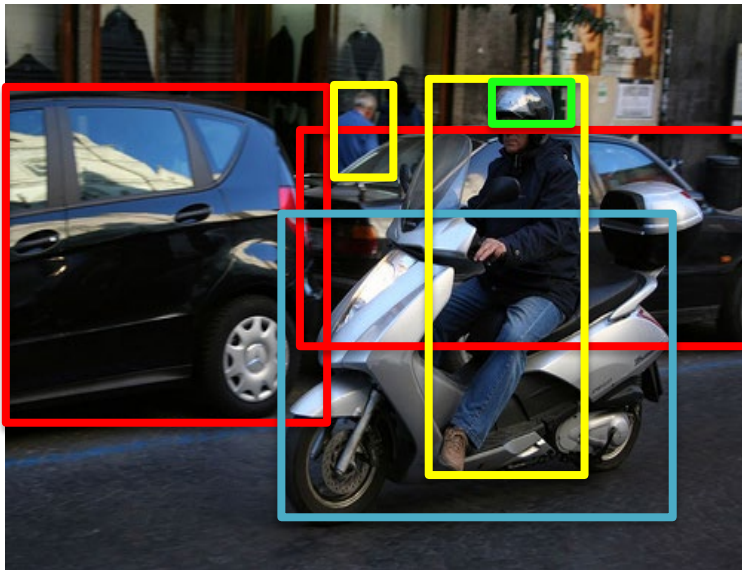
Occlusions



Convolutional Neural Networks

IMAGENET

Person
Car
Motorcycle
Helmet



Convolutional Neural Networks

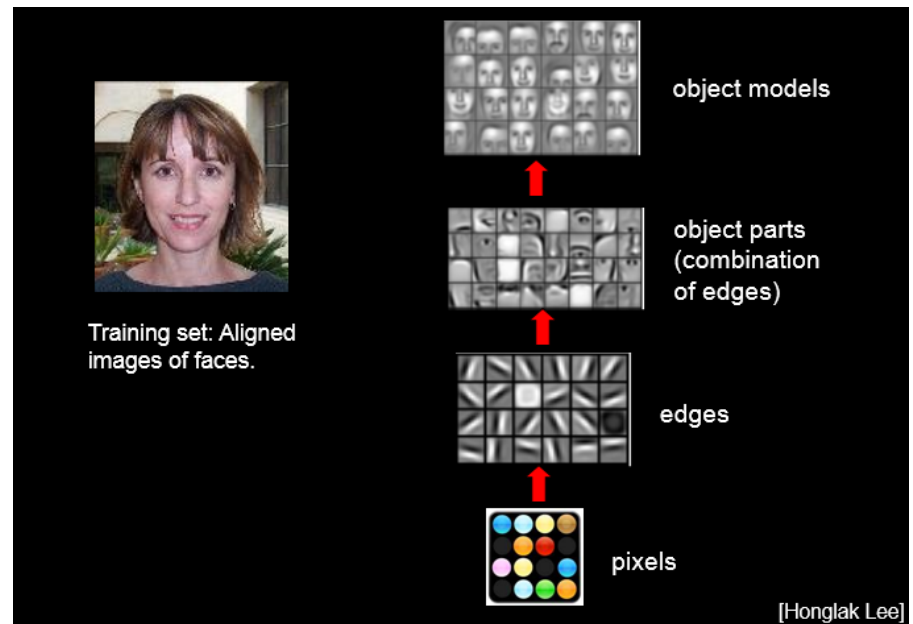
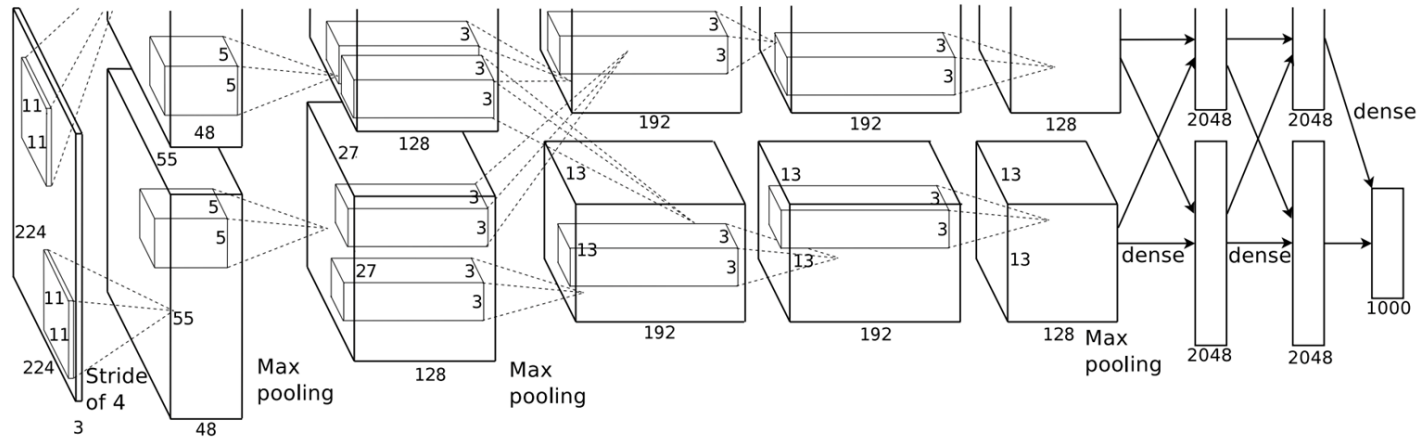
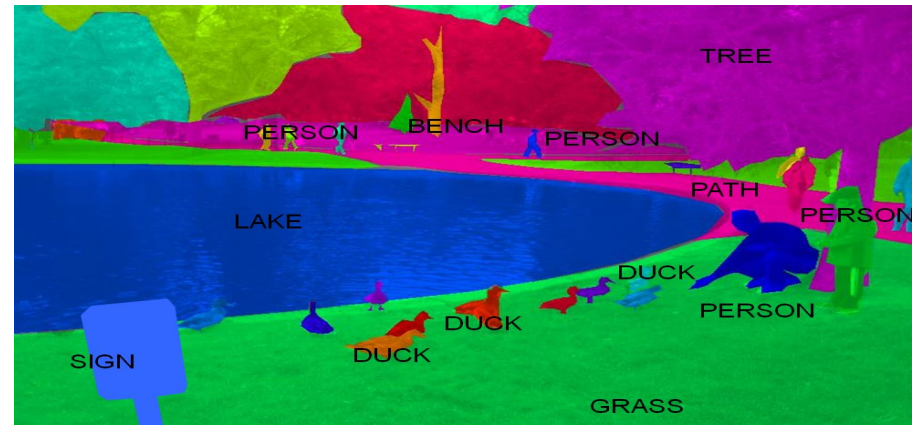


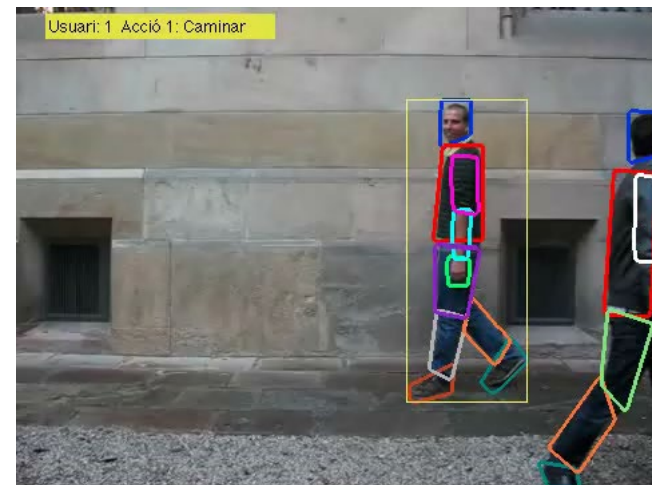
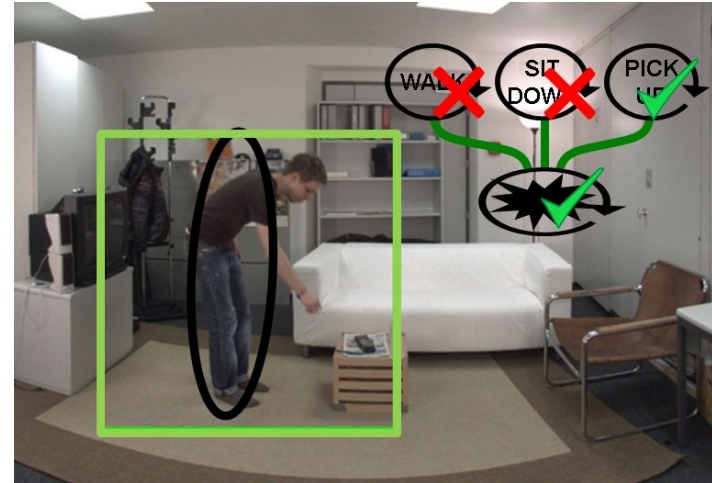
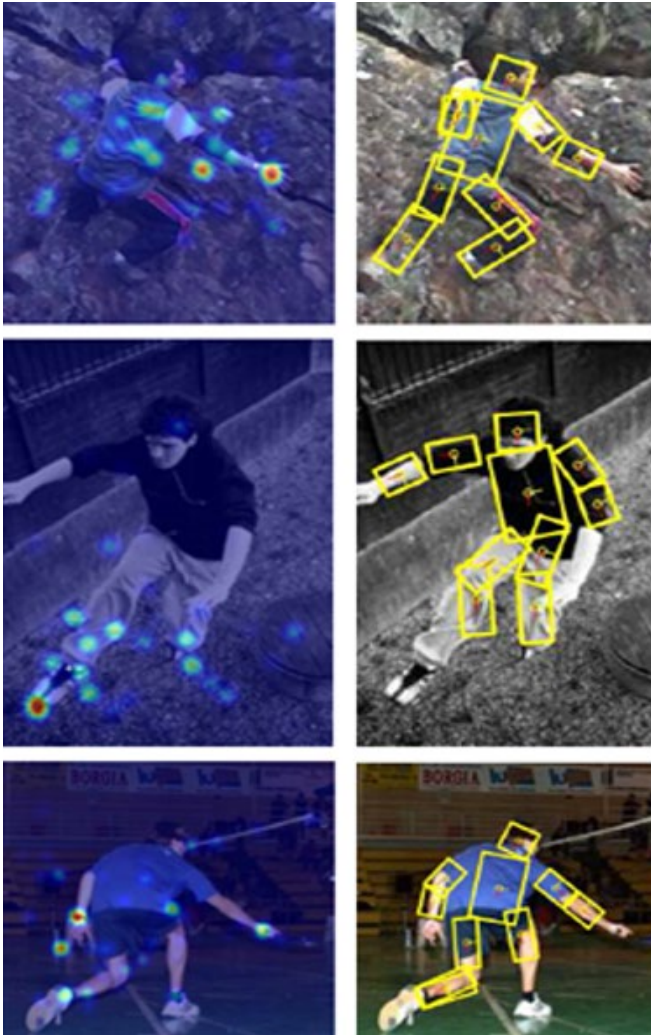
Image segmentation and object detection

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, BM3V, NIPS, IJCV, TPAMI.
 - **Deadline 7/3/2023**
- 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.

- You can contact me if you are interested in a research oriented computer vision & Deep learning master Project
 - sergio.escalera.guerrero@gmail.com