

Visual people tracking with deep learning detection and feature tracking

Author: Marcos Pieras Sagardoy

Tutor: José María Cañas Plaza



July 25, 2017

Index

- 1 Introduction
 - Objetives
- 2 Software implementation
 - Object detection thread
 - Feature-based tracking thread
 - Data Association
- 3 Validation experiments
- 4 Conclusions

Introduction

Definició

Object tracking: Estimate the target state over time from image sequences

It is challenging field due to:

- Variations because of geometric changes.
- Variations due to photometric factors.
- Occlusions.
- Similar objects in the scene.

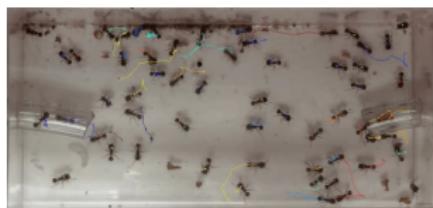
Applications



(a) Surveillance



(b) Sports

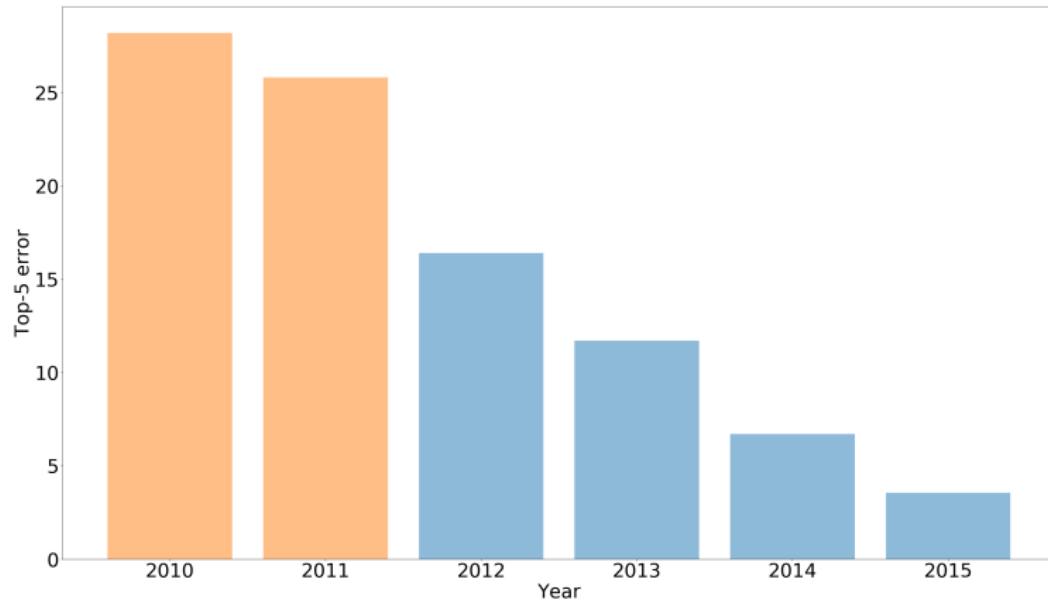


(c) Science



(d) Art

Why deep learning techniques ?



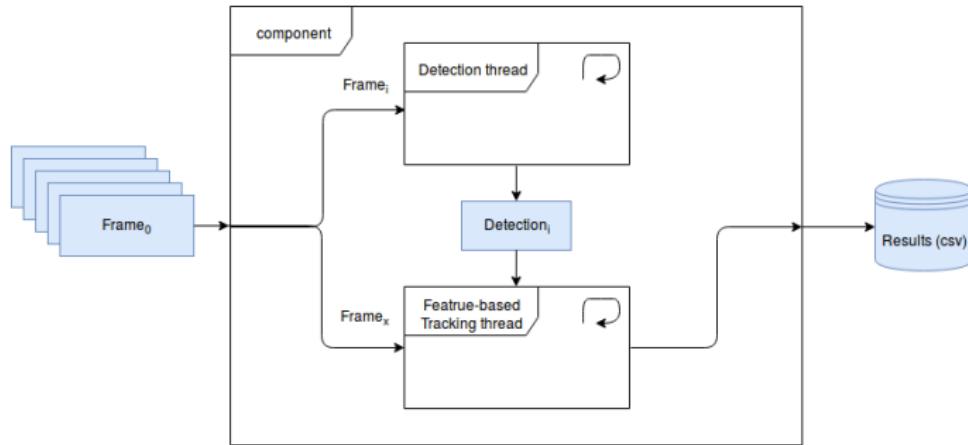
Objetives

Develop and characterize an algorithm of multiple people tracking, combining:

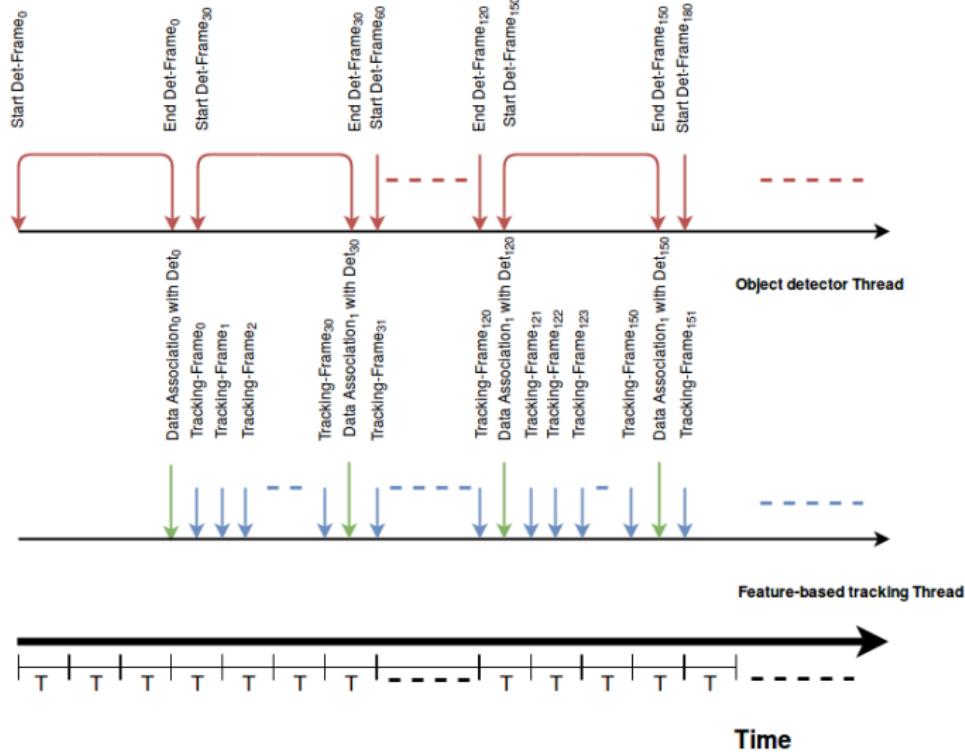
- Neural networks
- Feature-based tracking

Testing of the component on an international databases, the Multiple object tracking challenge.

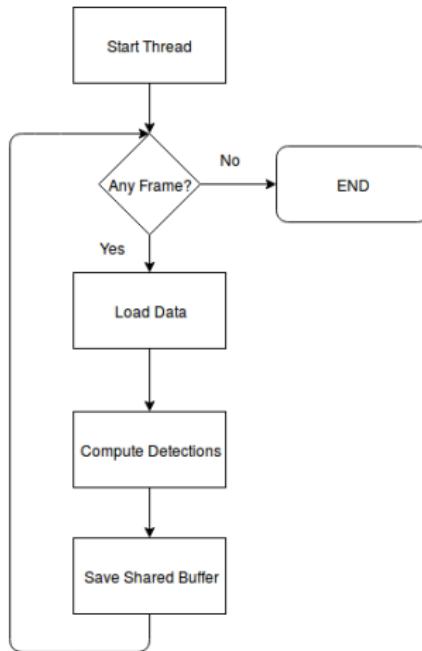
System Overview: Diagram



System Overview: Temporal diagram



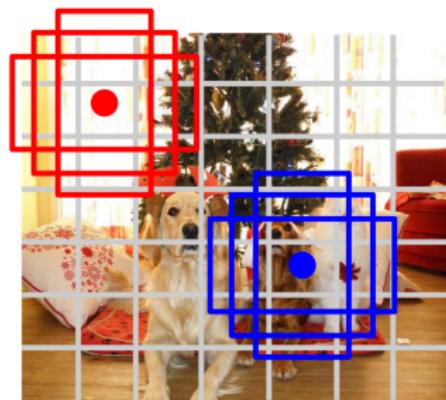
Object detector thread: Overview



Single Shot Multibox Detector [SSD] I

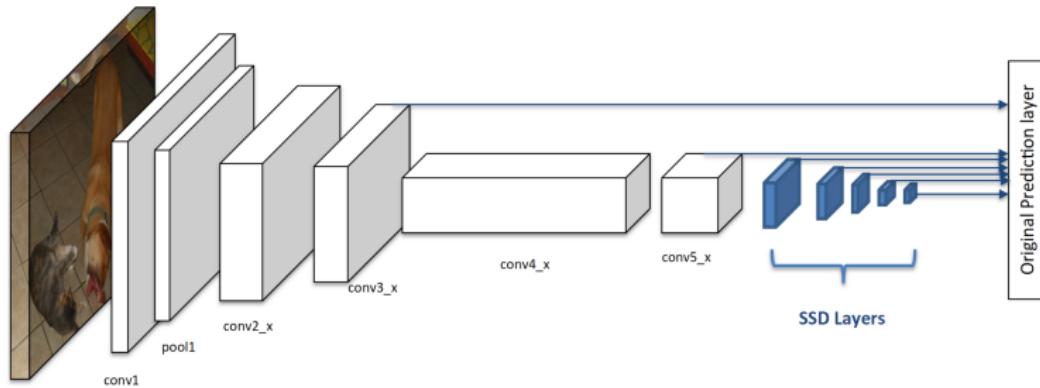


(e) Input image.



(f) Divided image.

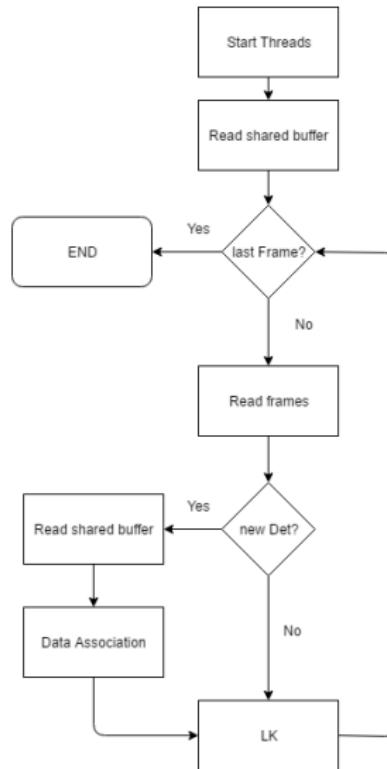
Single Shot Multibox Detector [SSD] II



Result Object detector thread



Feature-based tracking thread: Overview



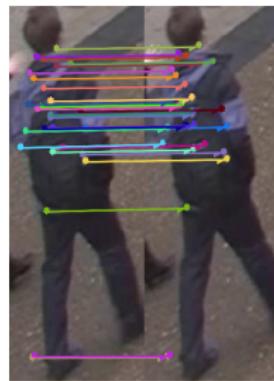
Feature-based tracking overview



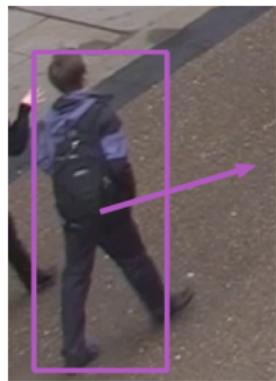
(g) Detection.



(h) Points.

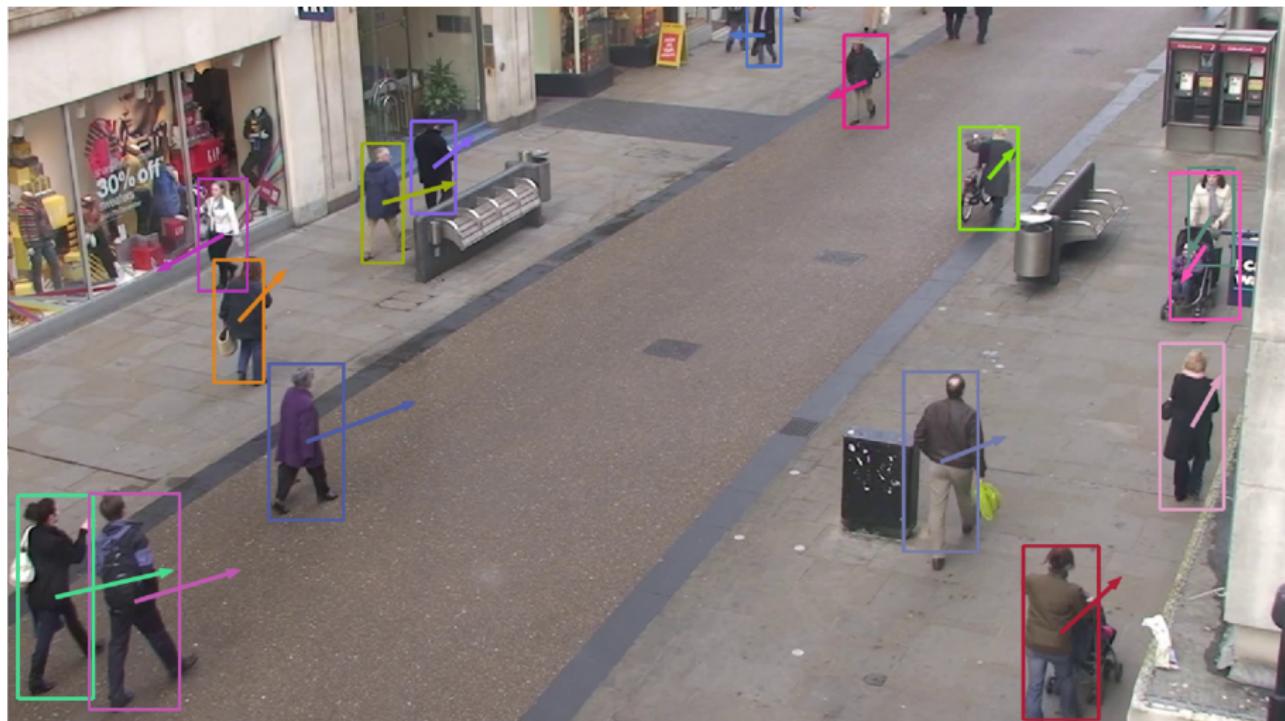


(i) Matching.

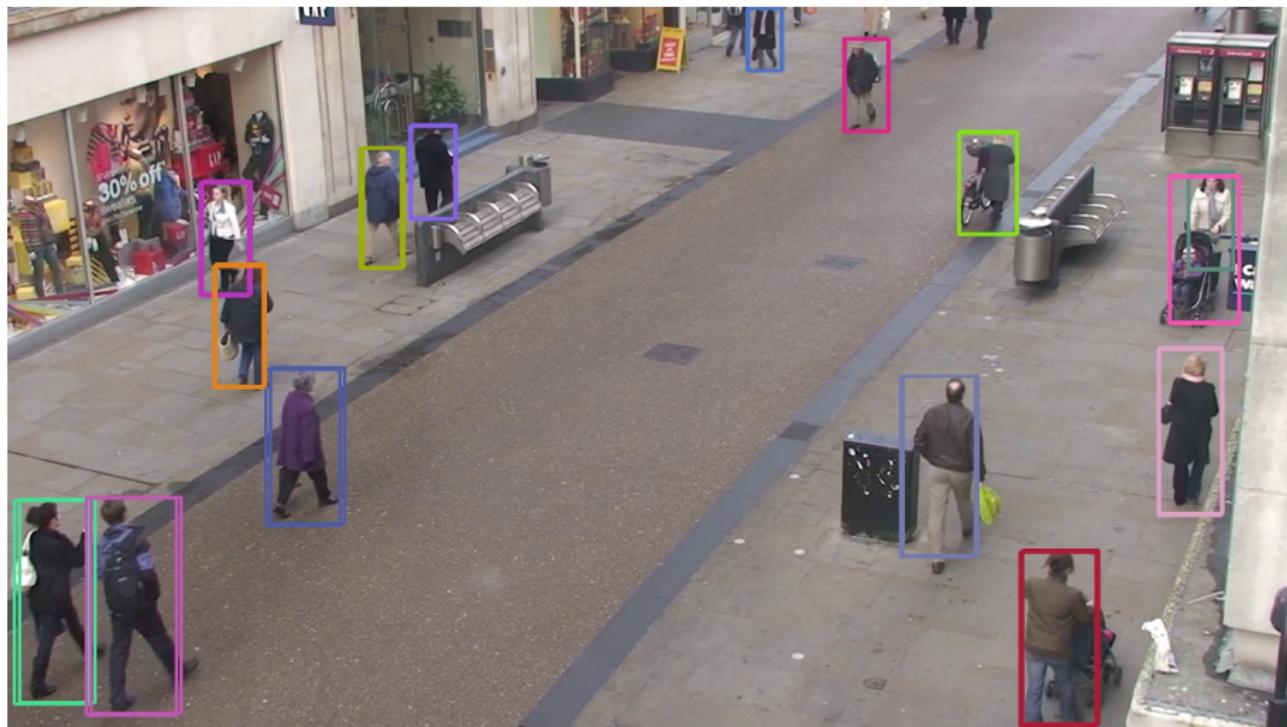


(j) Displacement.

Displacement



Upload estimation



Tracking failure

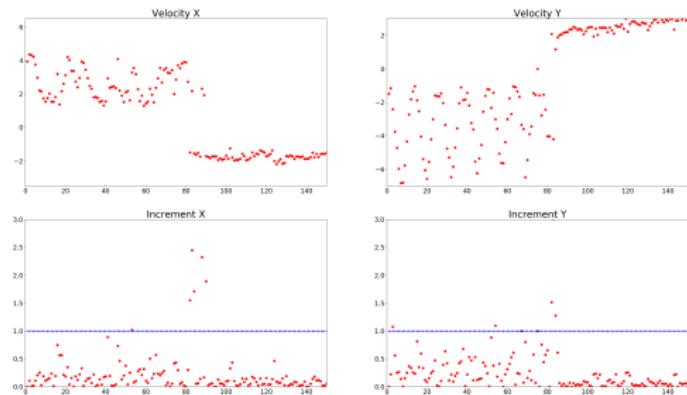


(k) Trajectory

Tracking failure



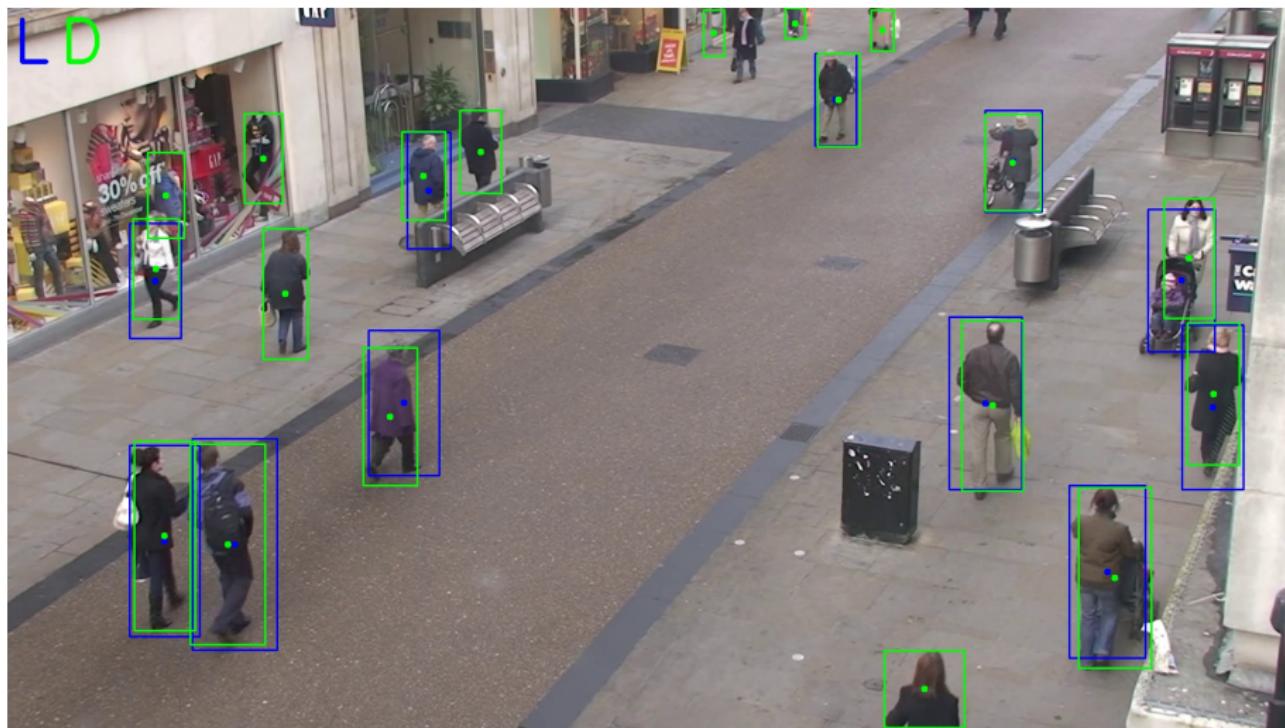
(a) Trajectory



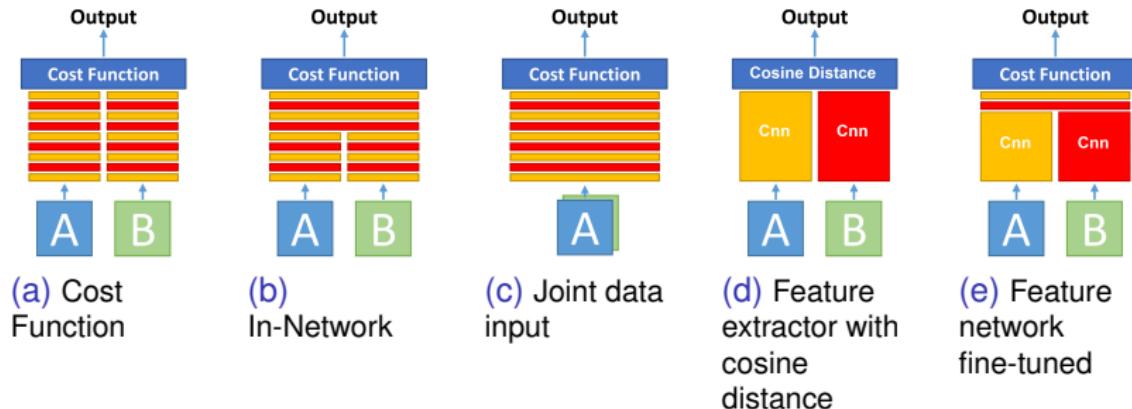
Data Association I

- **Situation 1**, blob with nearby detection, replaced by blob detection.
- **Situation 2**, blob without nearby detection, blob continues.
- **Situation 3**, blob detection, new or past ?

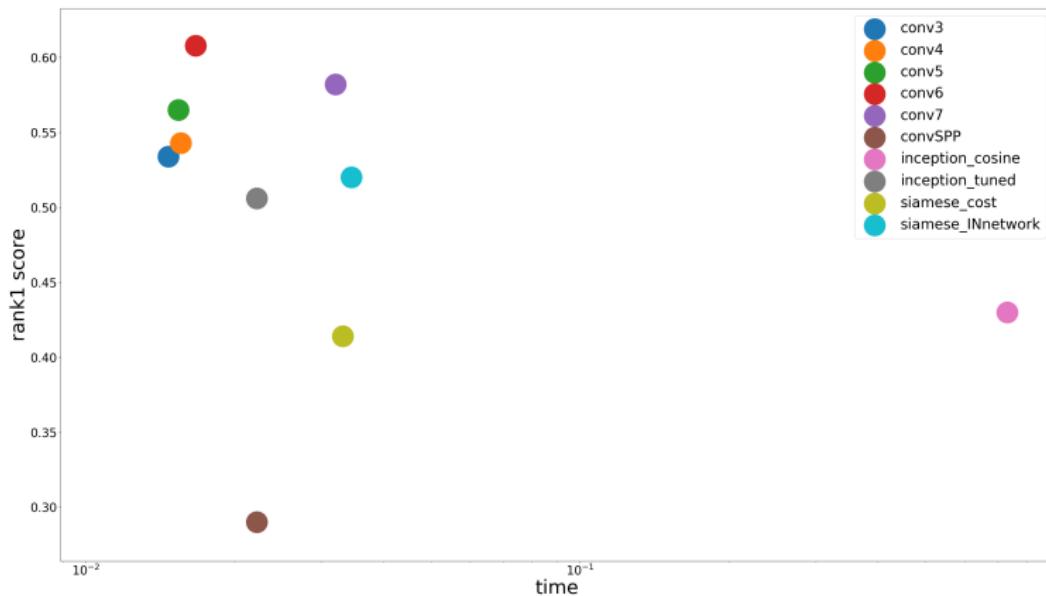
Data Association II



Reidentification architectures



Comparison reidentification methods



Results by sequence

	GT	MT	PT	ML	FP	FN	IDs	MOTA	MOTP	FPS
02	54	0	13	41	2181	15526	113	0.1	67.1	9.02
04	83	0	41	42	5495	33980	290	16.6	71.1	12.3
05	125	3	43	79	28571	4713	109	-12.2	67.8	17.94
09	25	1	19	5	932	3225	71	19.7	62	10.52
10	54	0	4	50	404	11647	81	1.5	68.4	14.23
11	69	0	16	53	948	7366	72	8.6	71.4	17.49
13	107	0	9	98	1315	10743	32	-5.6	67.1	20.5
<i>Global</i>	517	3	127	387	18896	78999	618	10.8	70.3	15.85

Table: Results algorithm by sequences.

Weaknesses

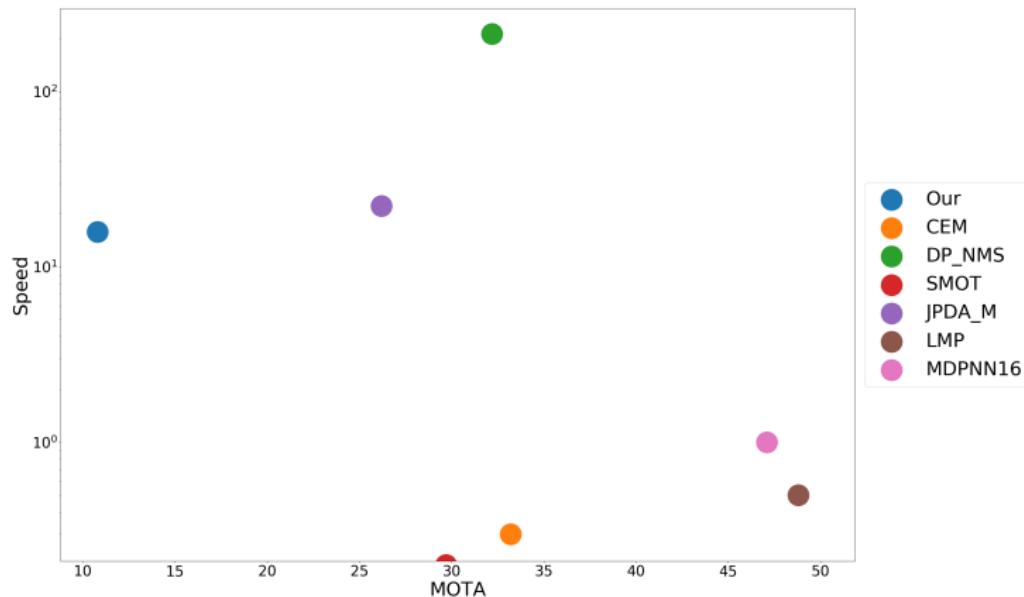


(f) Hight texture blob

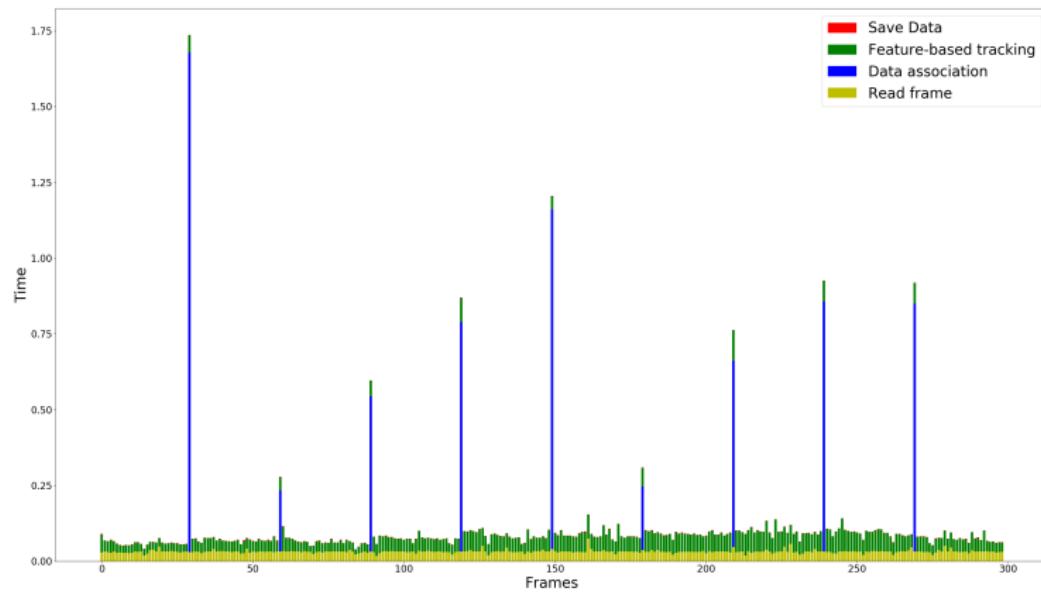
(g) Low texture blob

(h) Far away blob

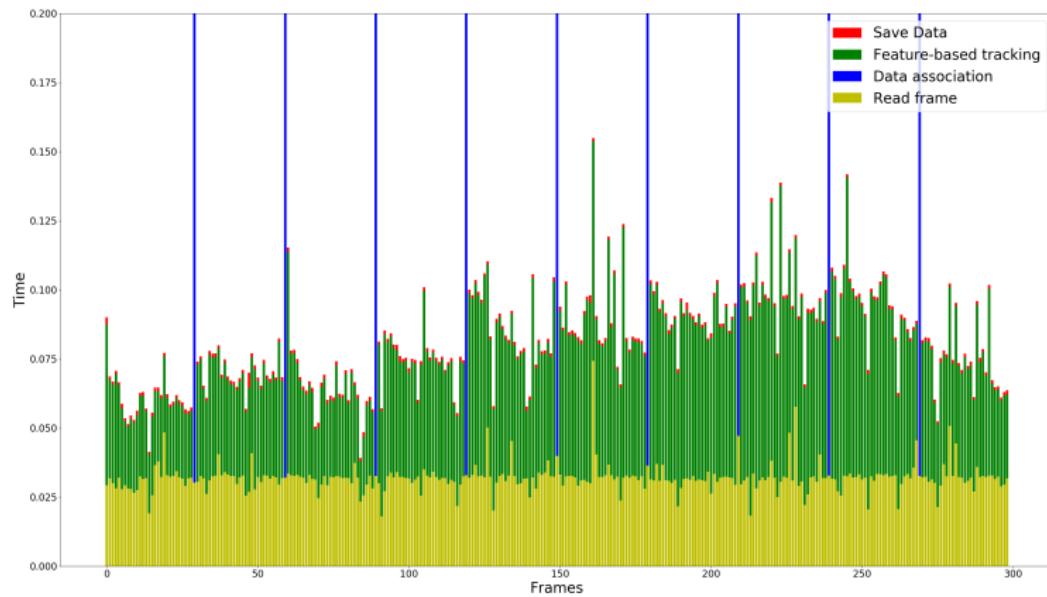
Comparison with SOTA



Timing performance I



Timing performance II



Conclusions

Conclusions

- Object detector using deep learning.
- Development of a Feature-based tracking module.
- Merging detections and feature-based tracking, adding a reidentification module.
- Testing of the component on an international databases.

Thank you for your attention !

