



Computer Vision

Week3

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Summary

Image preprocessing techniques

Image analysis techniques

Object detection

Object tracking techniques

Optical character recognition (OCR)

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Image preprocessing techniques

Images preprocessing techniques

- **Pixel brightness transformations:** Elle modifie la luminosité du pixel, ajuste le contrast, transforme et corrige la
- **Geometric Transformations:** Elle travaille avec les positions des pixels, élimine les distorsions dans les images,
- **Image Filtering:** Elle modifie les propriétés des images pour extraire des informations d'une image comme les coins,
- **Fourier transform and image restoration:** Elle décompose une image en ses composants sinus et cosinus (*image*

SOMMAIRE

Image analysis techniques

Image analysis techniques

- Scene analysis.
- Image description.
- Image understanding.
- Pattern recognition.
- Neural networks.

Pour la pratique: **Analyze Image API**

Object Detection



Latest technological advances

Rapid development in deep convolutional neural networks (CNN) and GPU's enhanced computing power are the main drivers behind the great advancement of computer vision based object detection

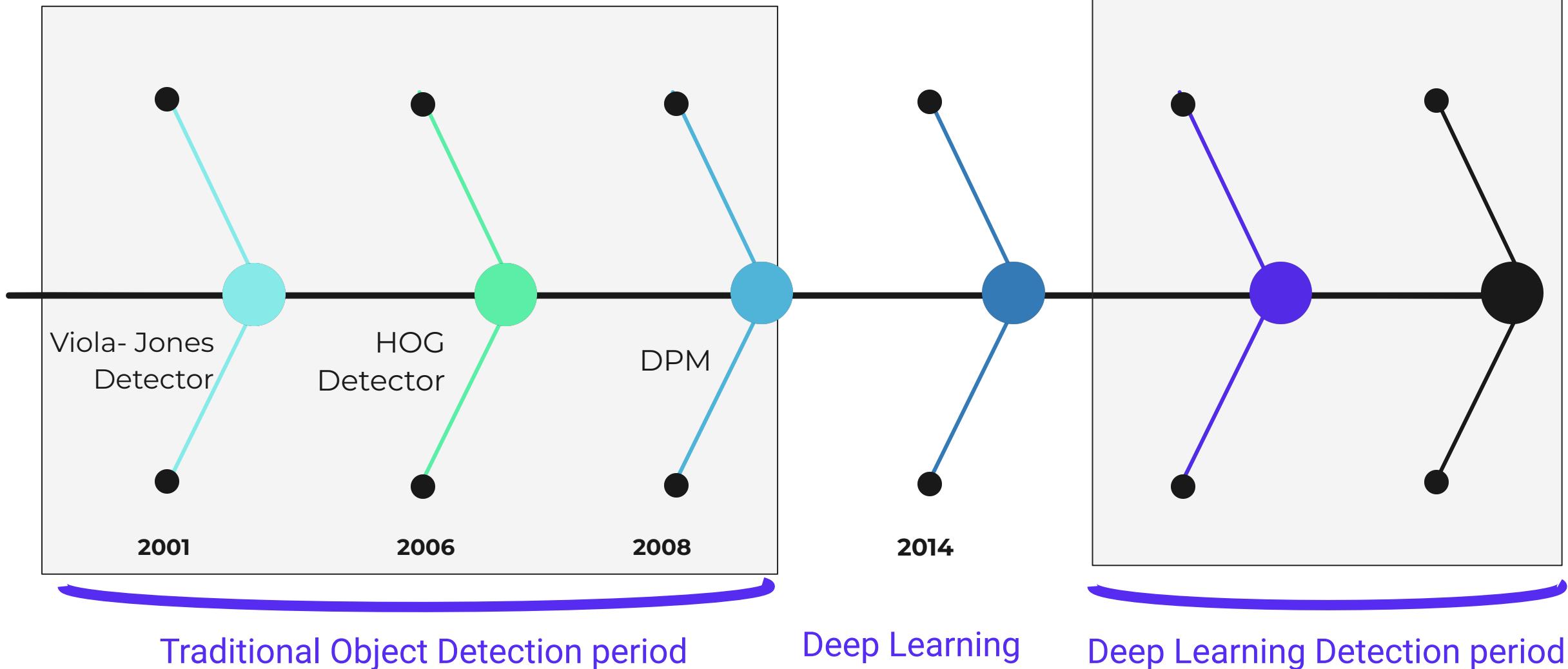
How it works !

Object detection can be performed using either traditional (1) image processing techniques or modern (2) deep learning networks

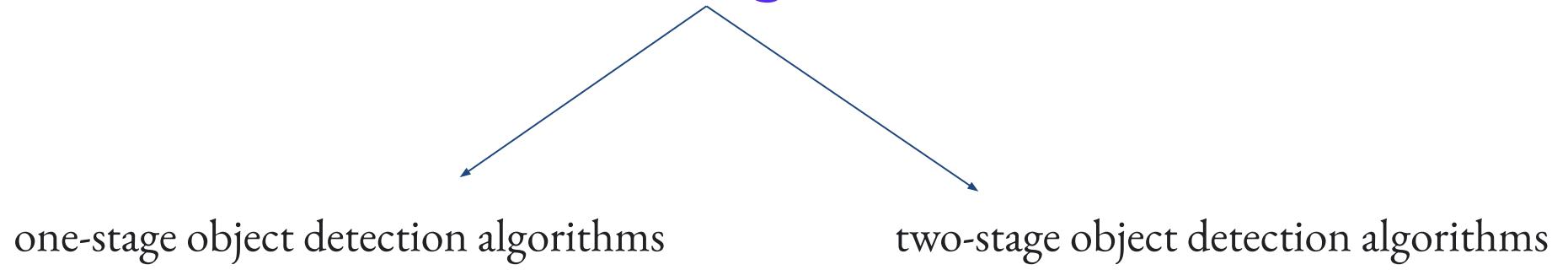
Milestones in state-of-the-art Object Detection

The progress of object detection is usually separated into two separate historical periods

The progress of Object Detection



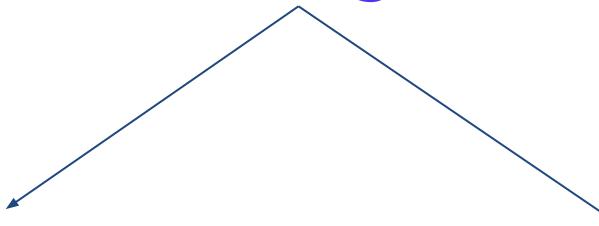
Deep Learning Object Detection algorithms



Deep Learning Object Detection algorithms

one-stage object detection algorithms

1. YOLO (2016)
2. SSD (2016)
3. RetinaNet (2017)
4. YOLOv3 (2018)
5. YOLOv4 (2020)
6. YOLOR (2021)

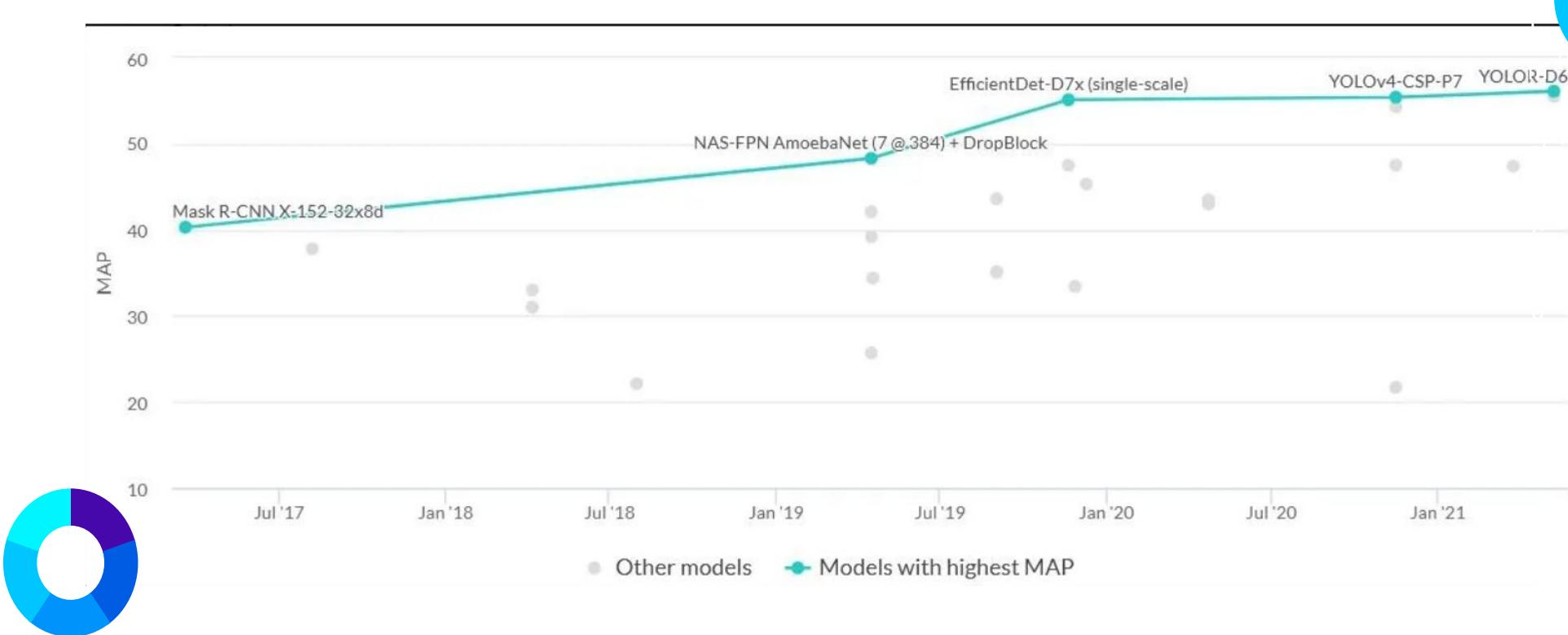


two-stage object detection algorithms

1. RCNN and SPPNet (2014)
2. Fast RCNN and Faster RCNN (2015)
3. Mask R-CNN (2017)
4. Pyramid Networks/FPN (2017)
5. G-RCNN (2021)

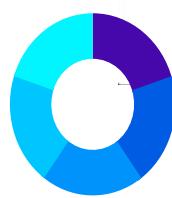
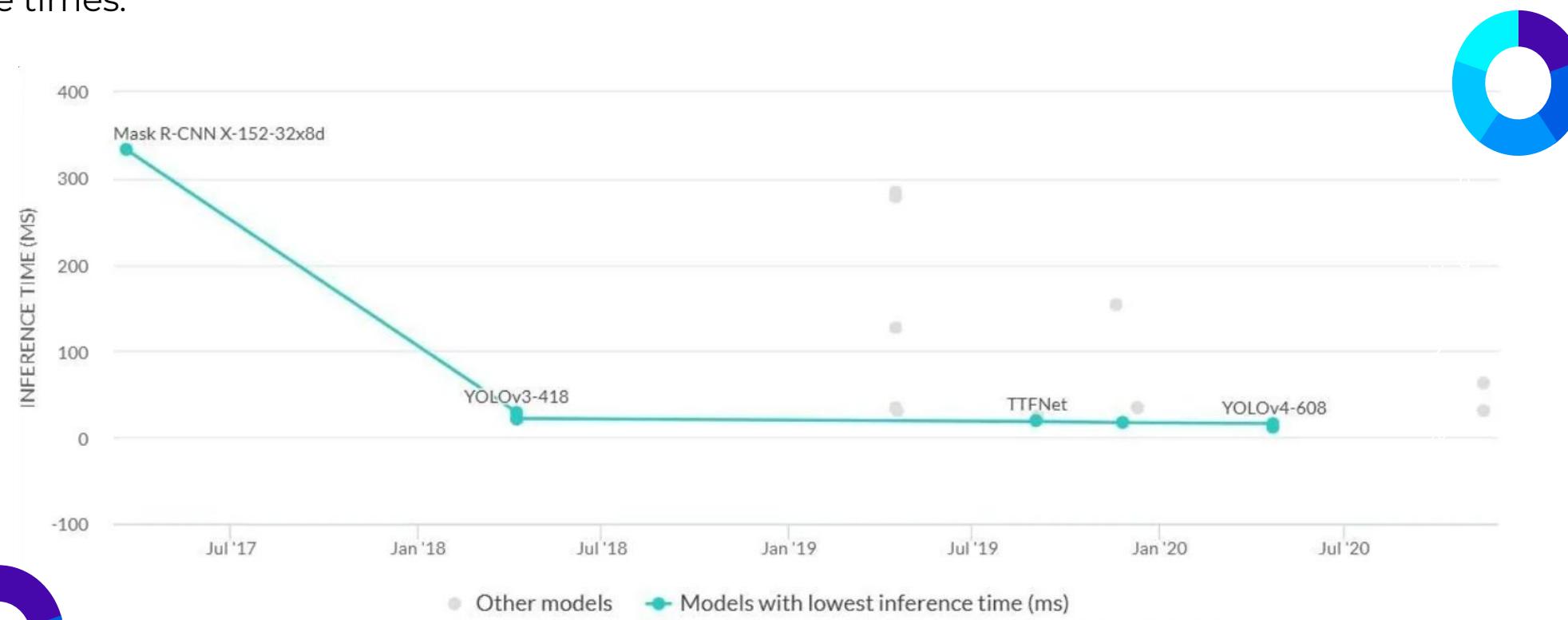
How to compare OD algorithms

The best real-time object detection algorithm
(Accuracy) based on the Mean Average
Precision(MAP)



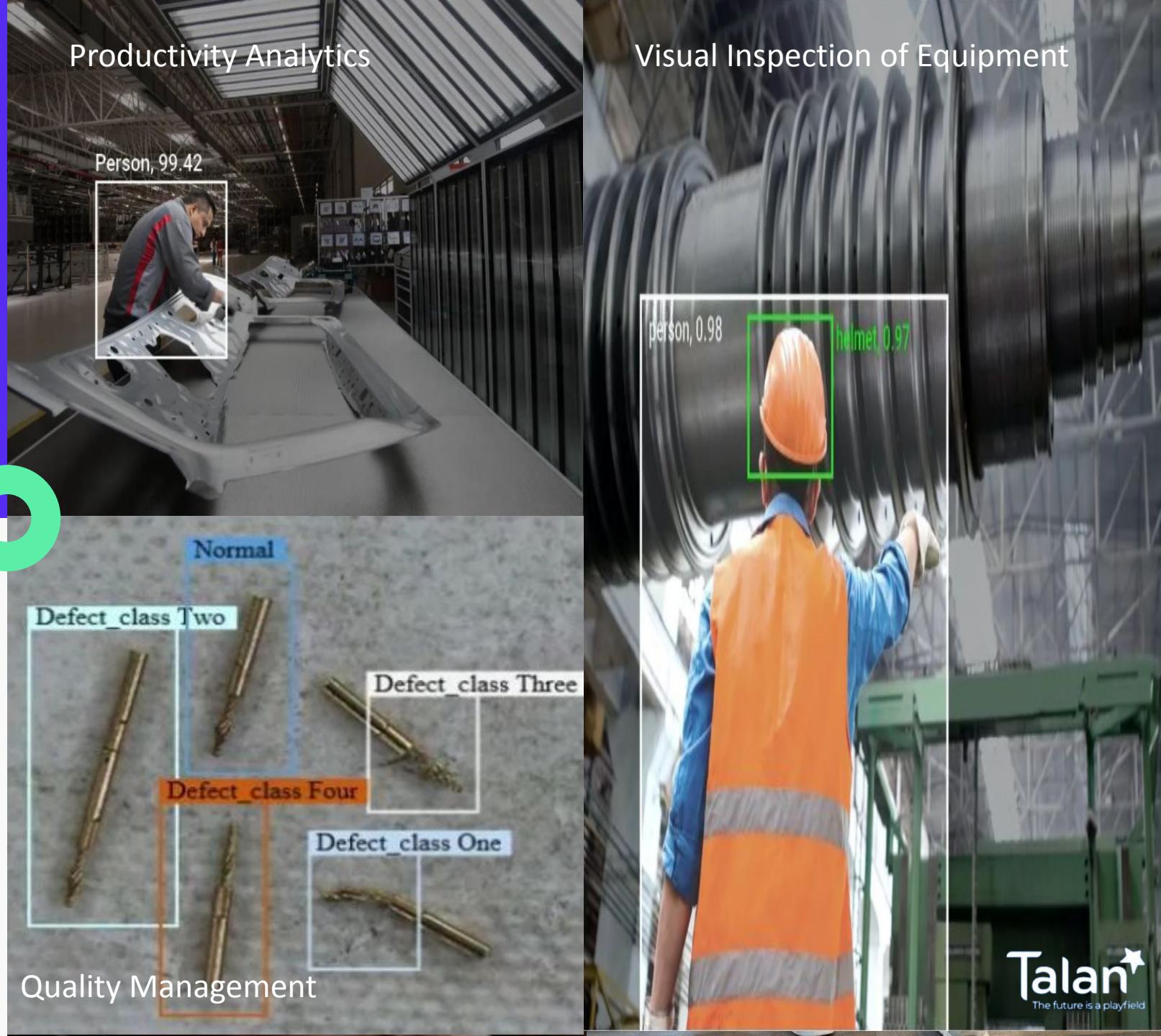
How to compare OD algorithms

The fastest real-time object detection algorithm (Inference time) based on current inference times.



Computer Vision in Manufacturing

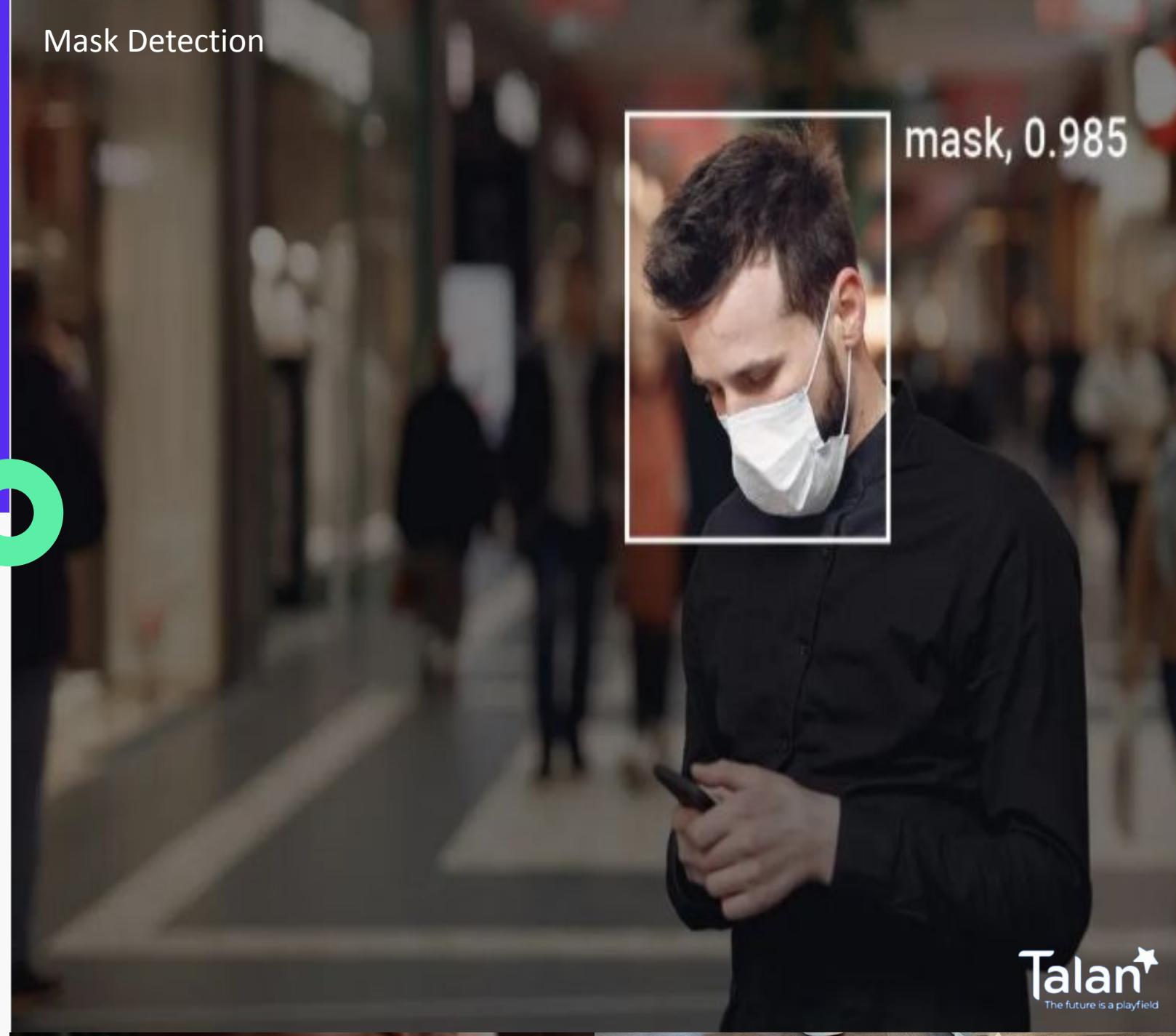
Object Detection Use Cases and Applications



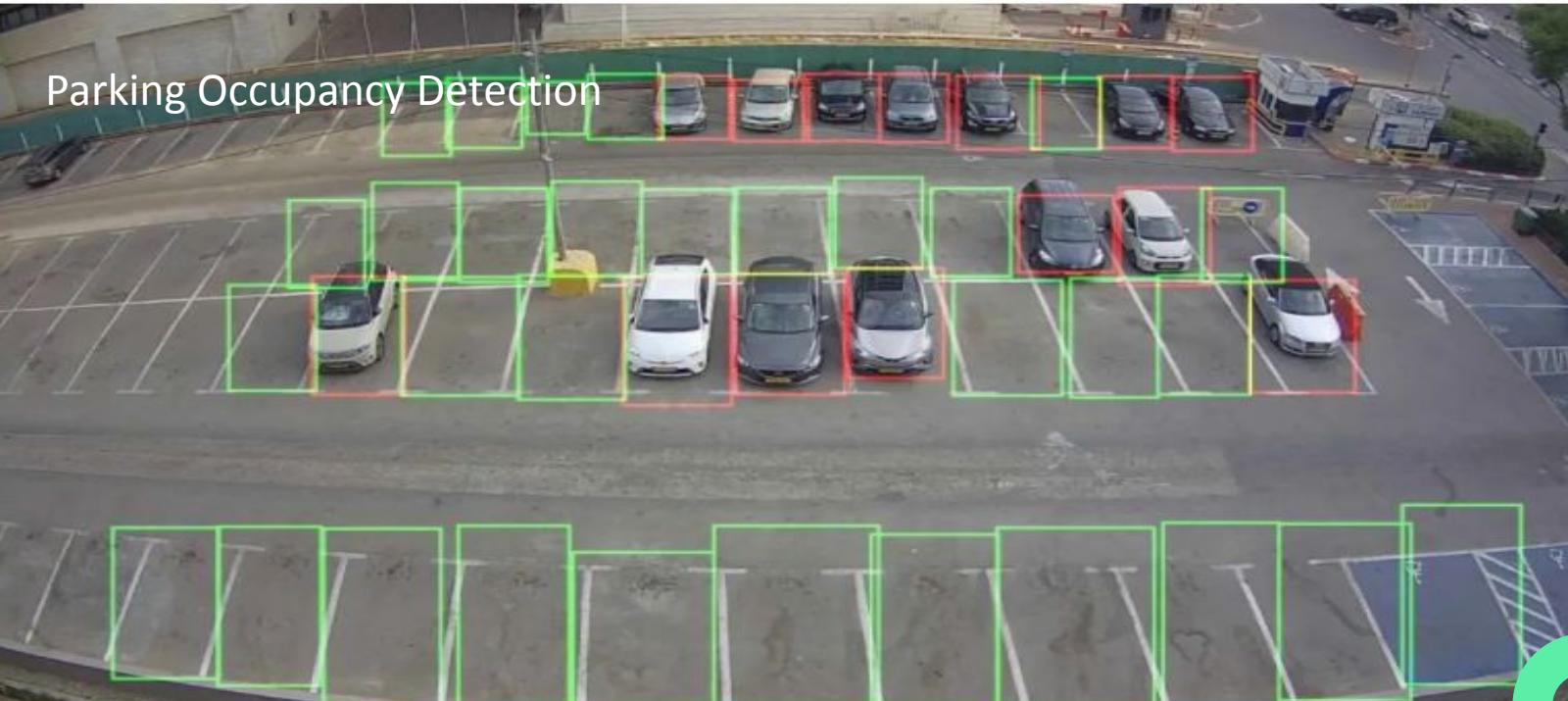
Object Detection Use Cases and Applications

Computer Vision in Healthcare

Mask Detection

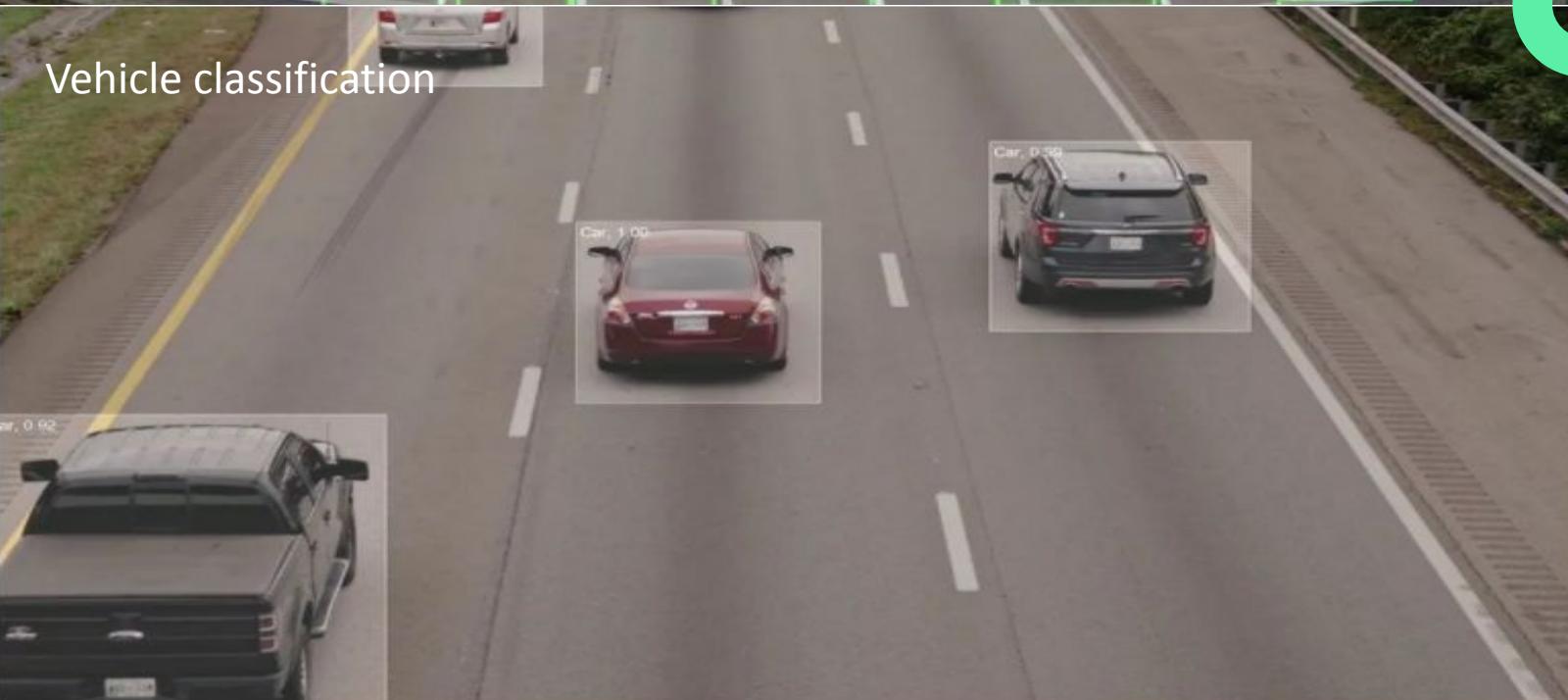


Parking Occupancy Detection



Object Detection Use Cases and Applications

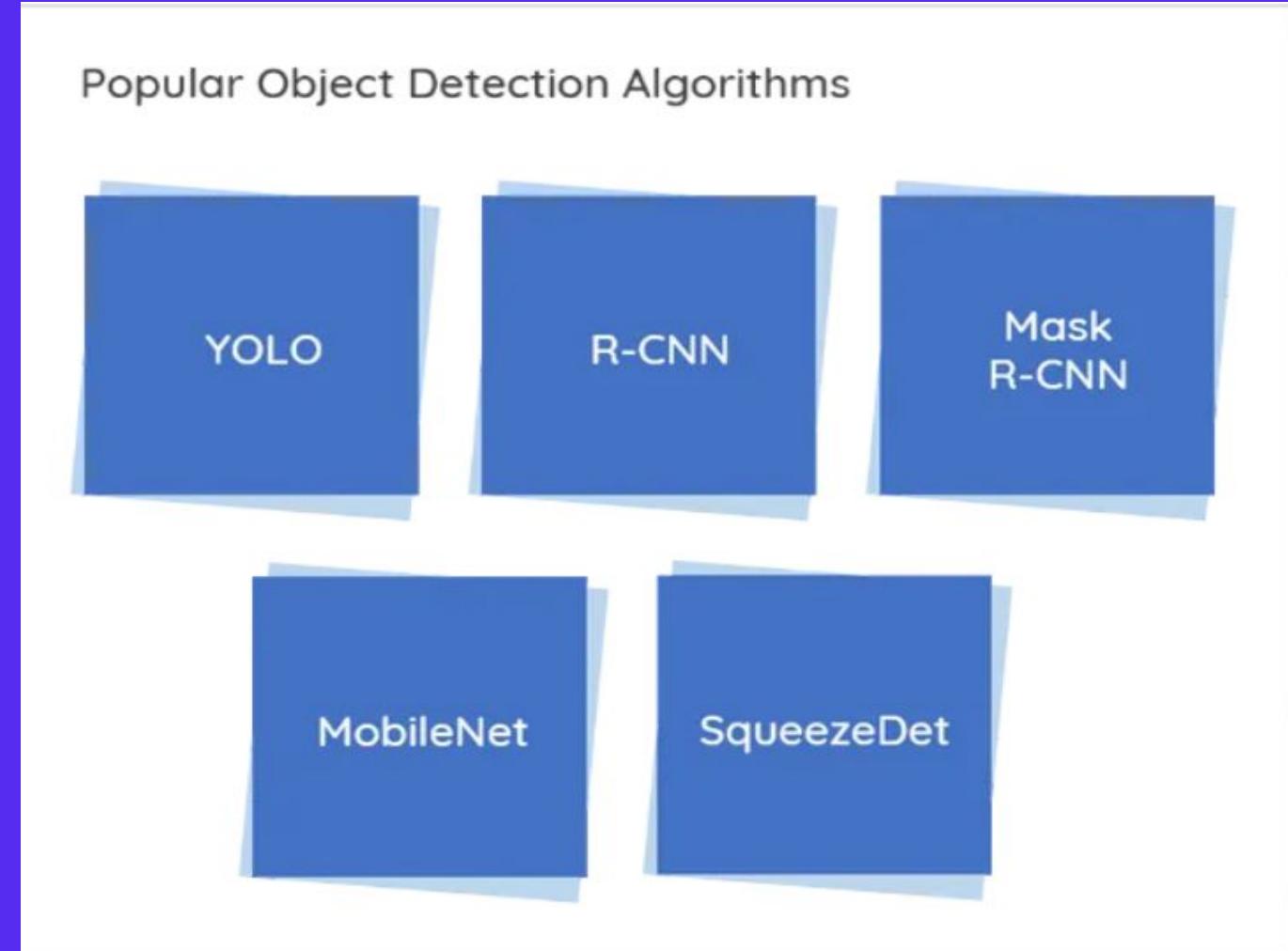
Vehicle classification



Computer Vision in Transportation

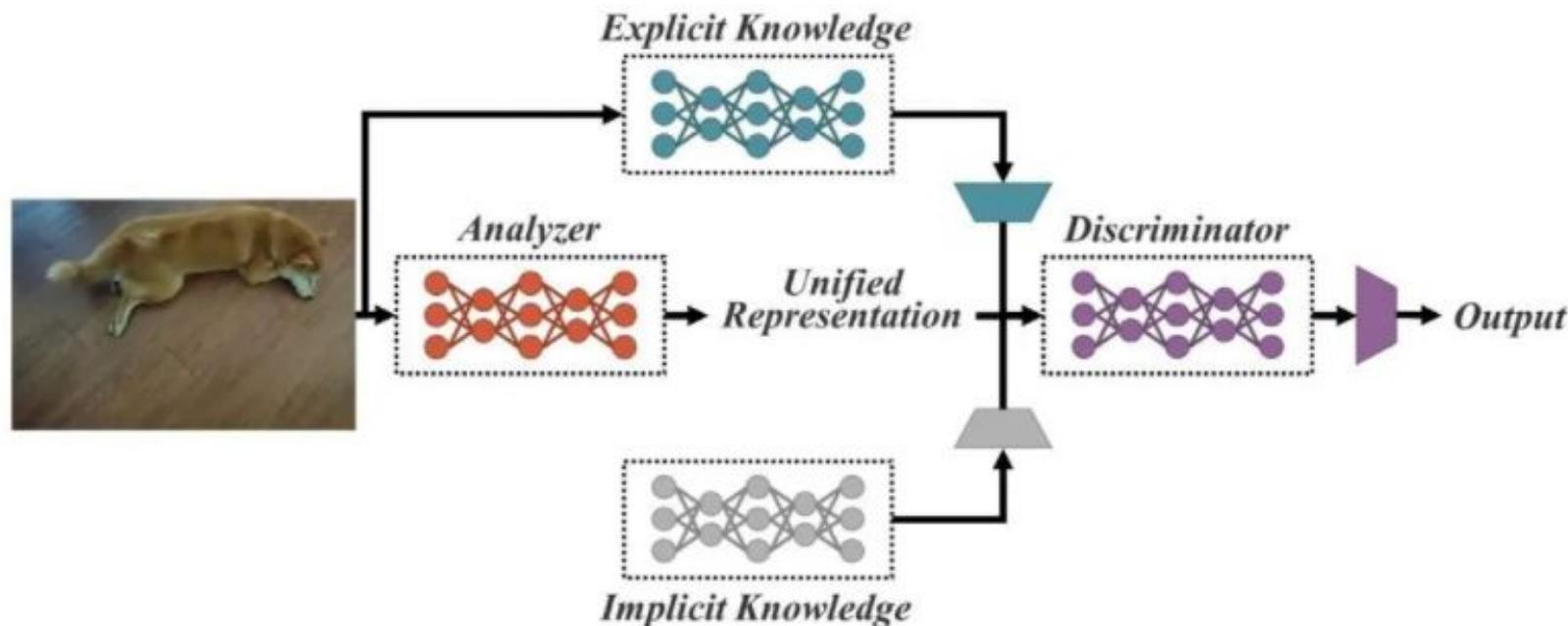
Most popular OD

Algorithms

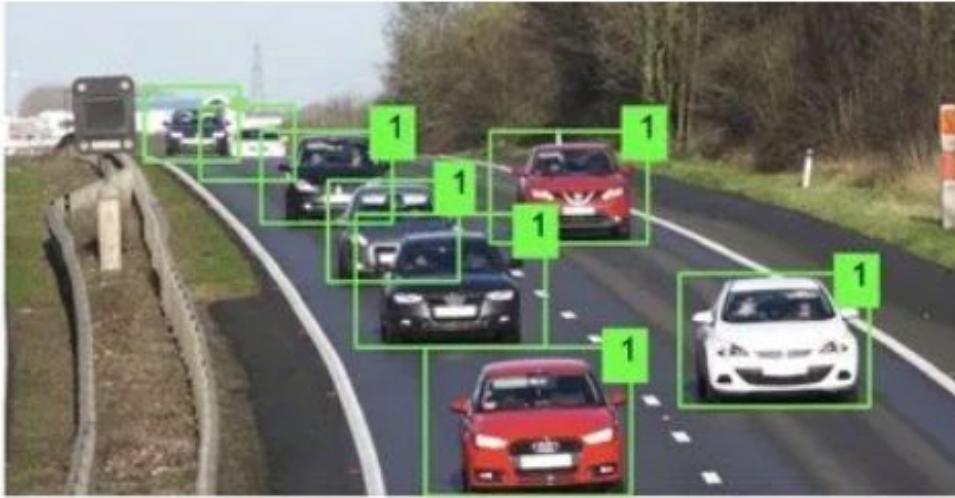


YOLOR “You Only Learn One Representation”

- YOLOR is based on encoding implicit(features obtained from deep layers) and explicit(features obtained from shallow layers) knowledge together.
- three notable processes by which this architecture is made functional: kernel space alignment, prediction refinement, and a convolutional neural network (CNN) with multi-task learning

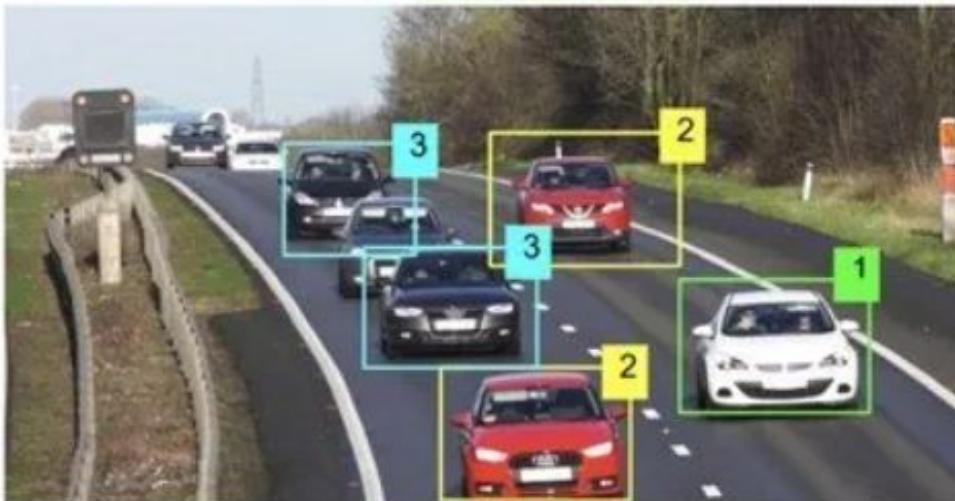


Object Tracking vs Object Detection



Typical Object
Detection Algorithm

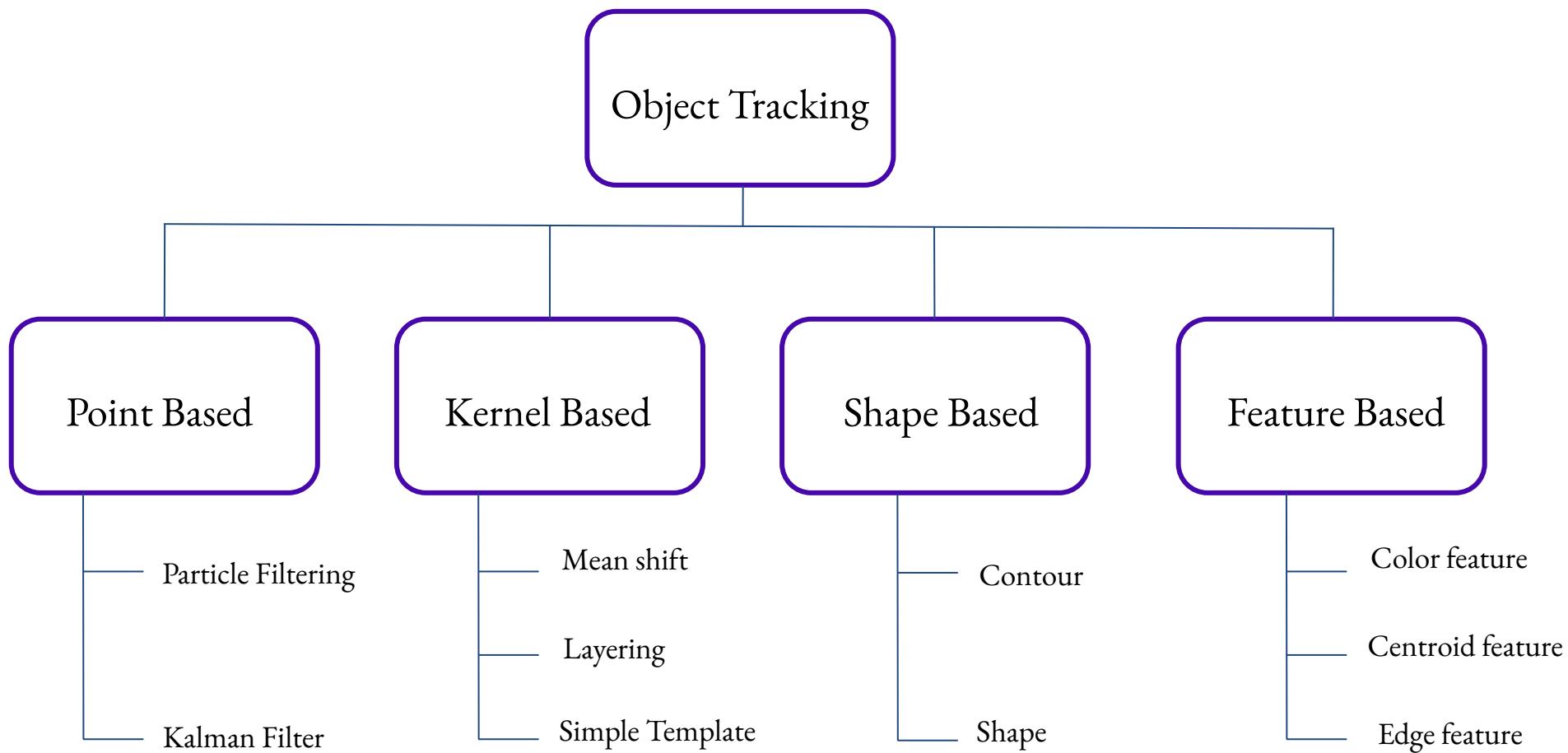
Vs.



Typical Object
Tracking Algorithm

Results (output)

OT Techniques



Object Tracking Methods

Tracker	MOTA ↑	IDF1 ↑	FPS ↓
SORT	74.6	76.9	30
DeepSORT	75.4	77.2	13
FairMOT	77.2	79.8	25.9
TransMOT	76.7	75.1	9.6
BYTETrack	80.3	77.3	30



Demo



Merci

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