



BATCH :
LESSON :
DATE :
SUBJECT :

BATCH 168 DATA SCIENCE

DEEP LEARNING

27.01.2024

Computer Vision

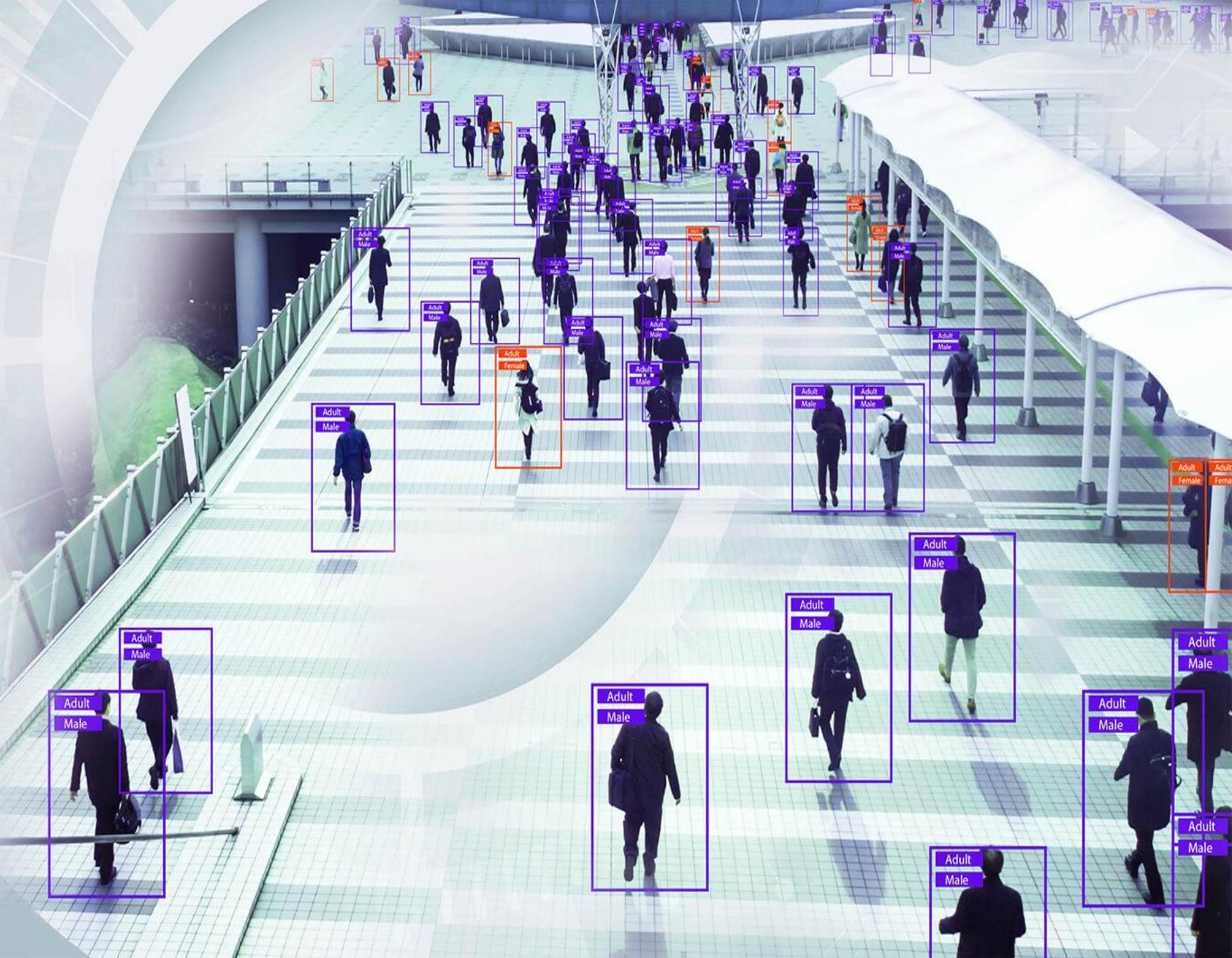
- techproeducation
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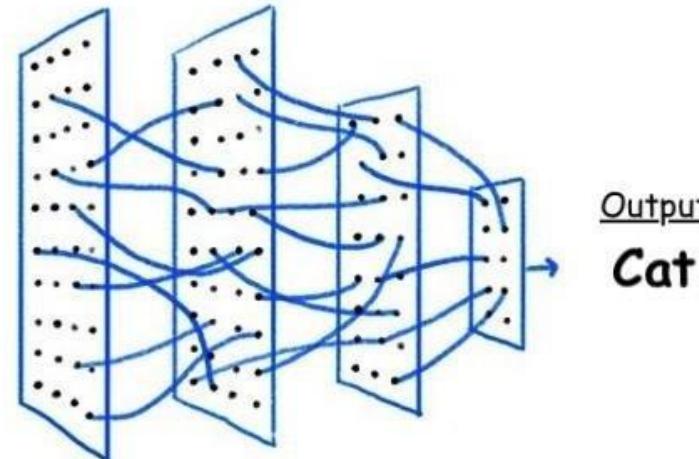
Contents

- ✓ **The Perception World of Computers: Pixel Counts and Color Codes**
- ✓ **CNN (Convolutional Neural Network) and Computer Vision**
- ✓ **Transfer Learning**
- ✓ **Most Popular Python Libraries for Computer Vision/Image Processing**
 - Pillow**
 - Scikit-image**
 - OpenCV**
- ✓ **Labeling (Makesense/Roboflow)**
- ✓ **Yolo**

COMPUTER VISION



Cat

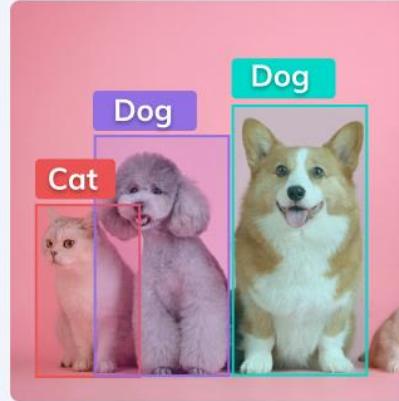


Dog

Classification



Detection

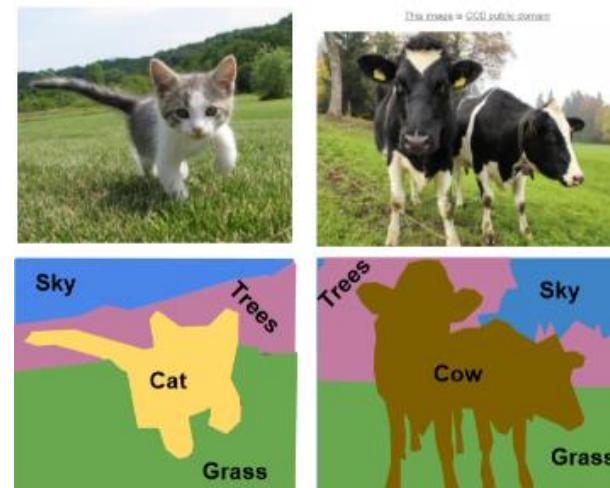


(a)



CNN

COMPUTER VISION



(b)





Yöntem/Algoritma	Açıklama
Convolutional Neural Network (CNN)	Görsel veri işleme ve tanıma için endüstri standartıdır. Yüksek başarı oranları ve öğrenme yeteneği sunar.
YOLO (You Only Look Once)	Hızlı ve hassas nesne tespiti için kullanılır, gerçek zamanlı uygulamalar için idealdir.
R-CNN (Region-Based CNN)	Bölgesel öneriler oluşturarak nesne tespiti yapar, önceki yöntemlere göre daha hızlı ve hassas sonuçlar verir.
Fast R-CNN	R-CNN'nin hızını artırmak için geliştirilmiştir ve tek bir geçişte nesne tespiti yapar.
Histogram Eşitleme	Kontrasti artırmak ve görüntüyü işlemek için kullanılır.
Edge Detection (Kenar Tespiti)	Görüntüdeki nesnelerin kenarlarını belirlemek için kullanılır.
Feature Matching (Özellik Eşleme)	Özellik çıkarma ve karşılaştırma için kullanılır.
Object Detection (Nesne Tespiti)	Özel nesnelerin ve nesne sınıflarının tespiti için kullanılır.
Semantic Segmentation (Semantik Segmentasyon)	Görüntüdeki nesnelerin ayrıntılı sınırlarını belirlemek için kullanılır.
PCA (Principal Component Analysis)	Boyut indirgeme ve özellik çıkarma için kullanılır.
SVM (Support Vector Machine)	Sınıflandırma ve tanıma için kullanılır.





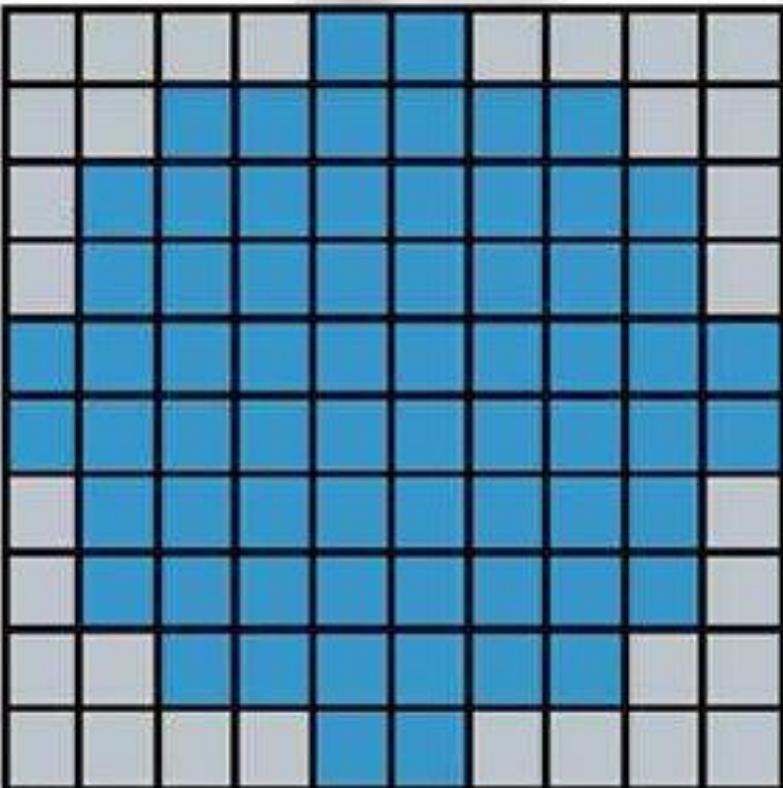
Computer Vision



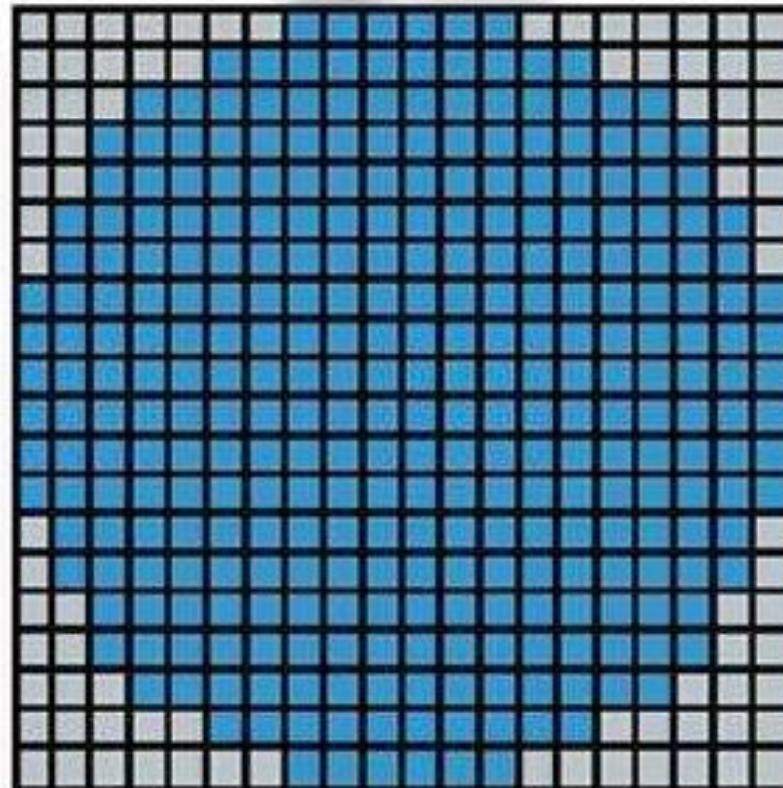


Computer Vision

10 PPI



20 PPI



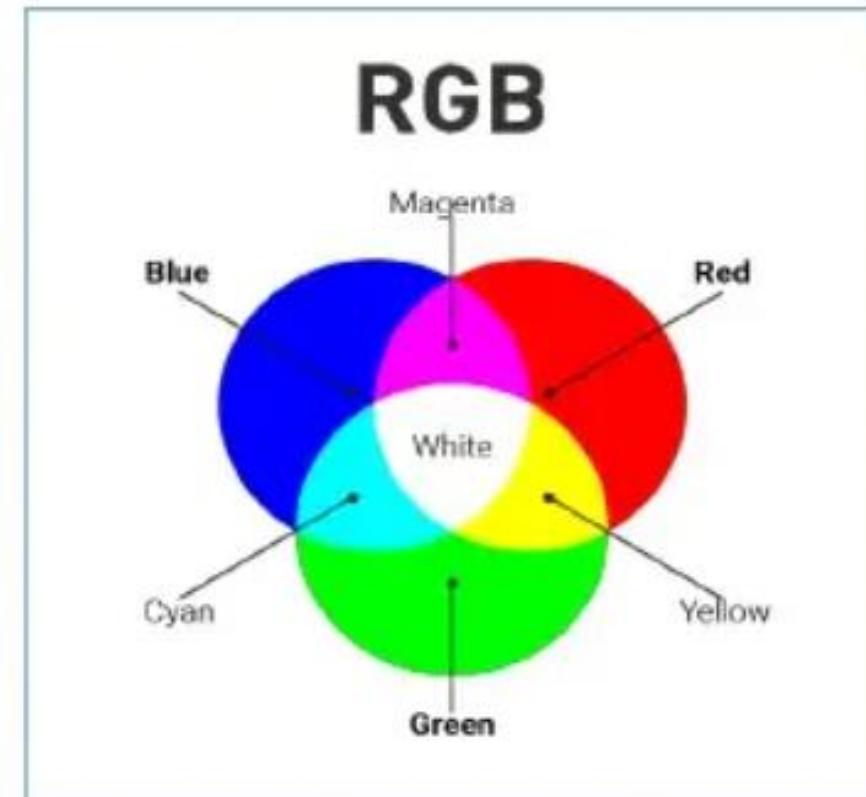
2,54 cm

2,54 cm



Computer Vision

Color Name	RGB Value (0 to 255)			Color
	B (Blue)	G (Green)	R (Red)	
Blue	255	0	0	
Green	0	255	0	
Red	0	0	255	
White	255	255	255	
Black	0	0	0	





HOW WE SEE





Computer Vision

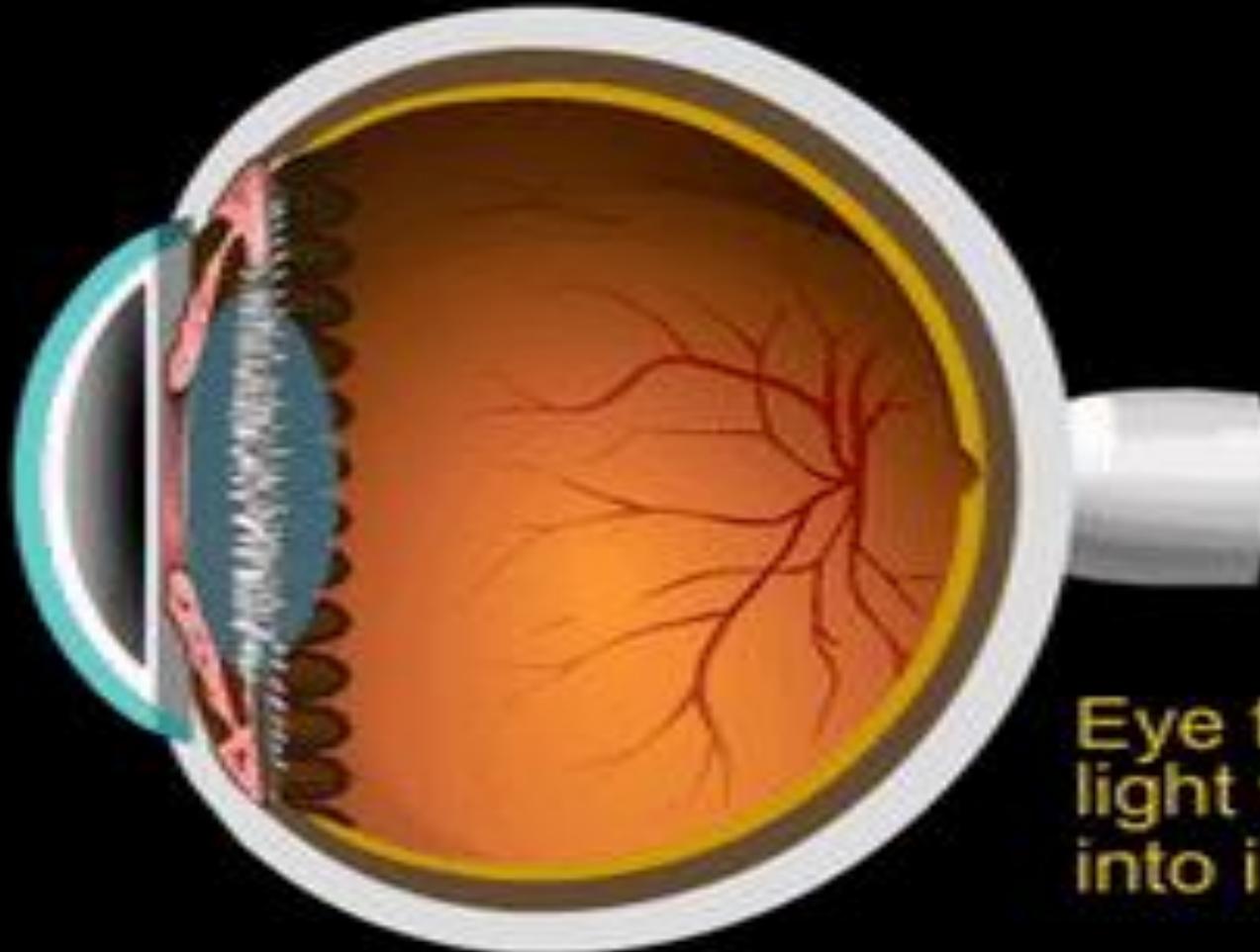




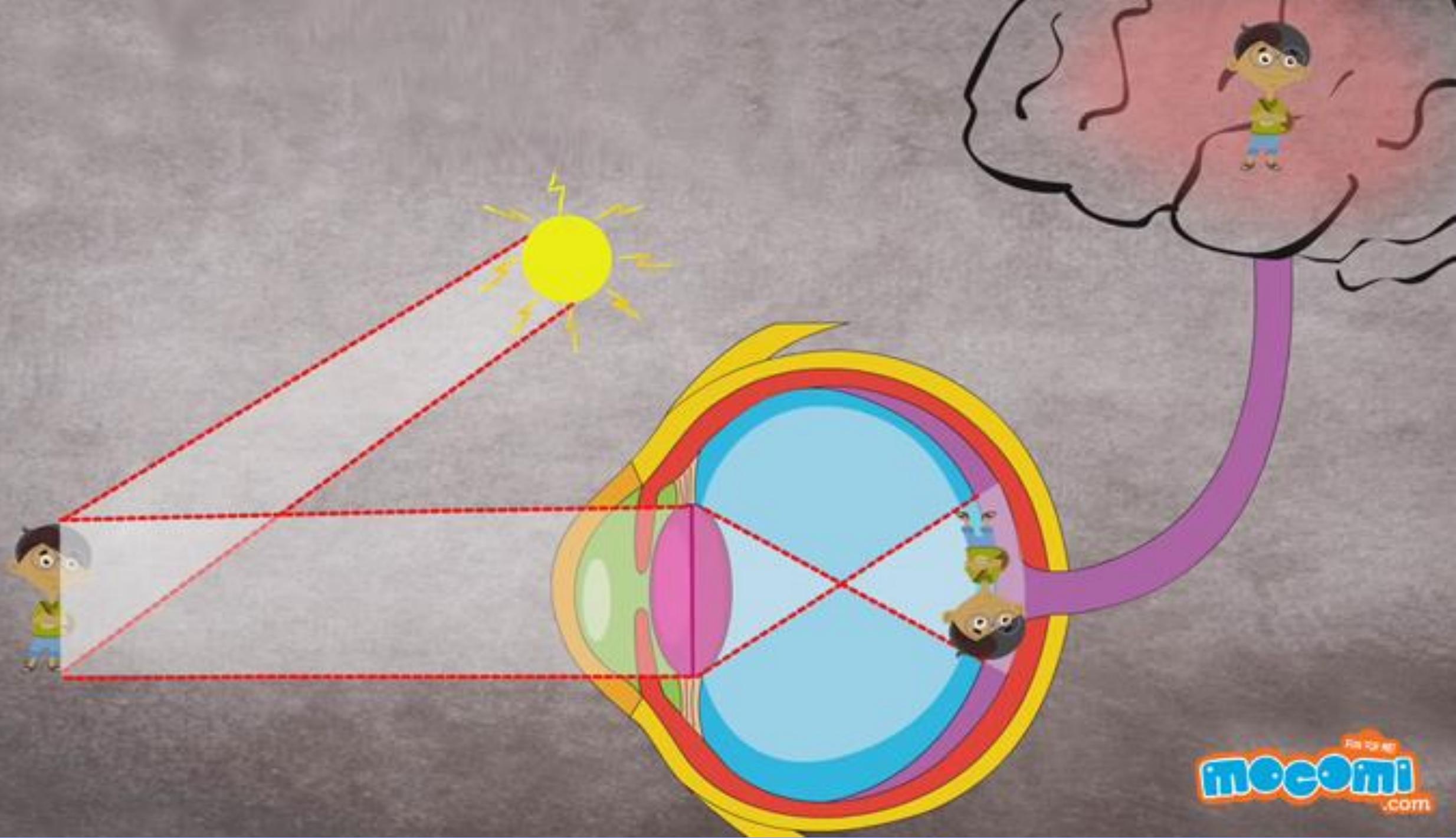
Computer Vision



Light

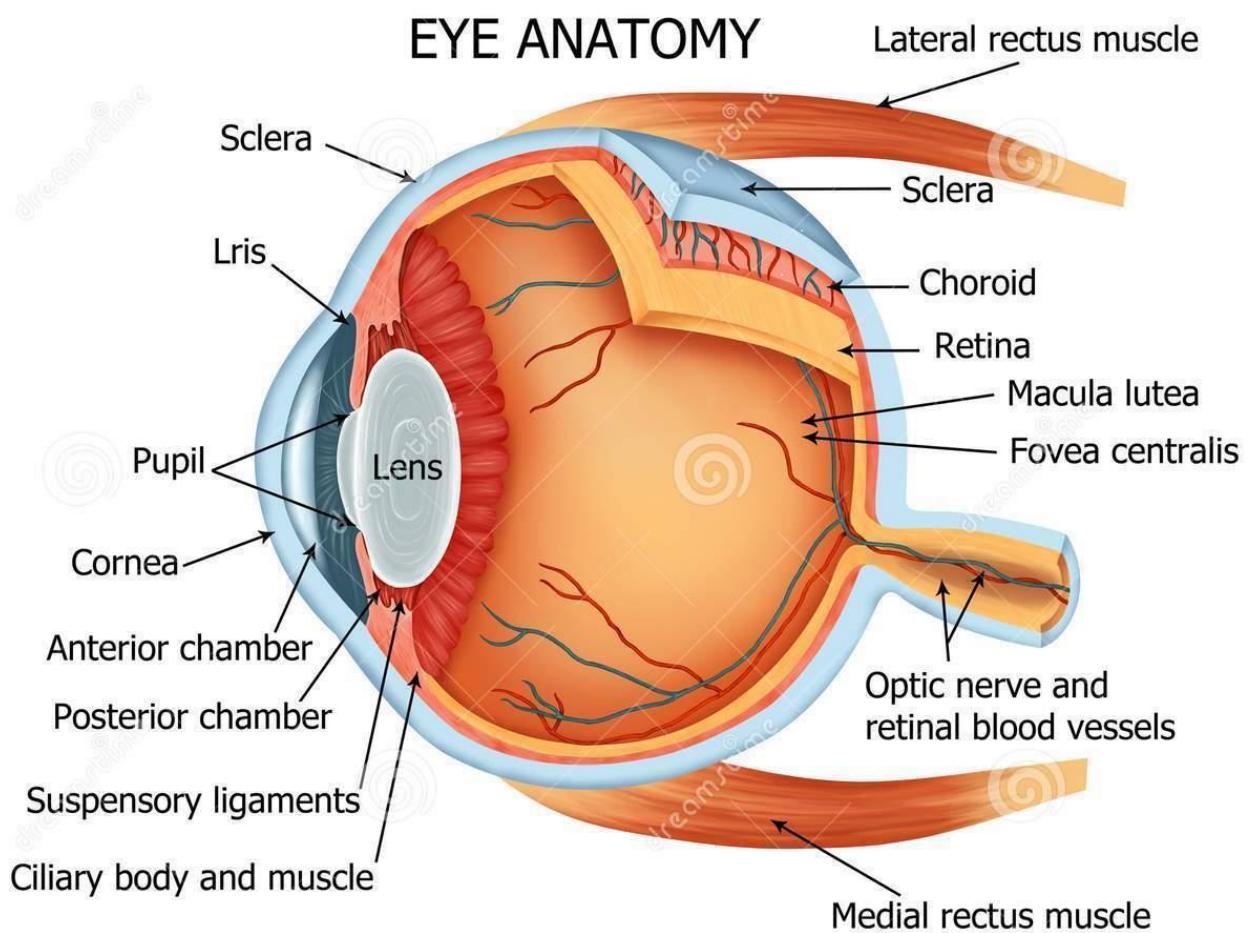


Eye translates
light waves
into images.

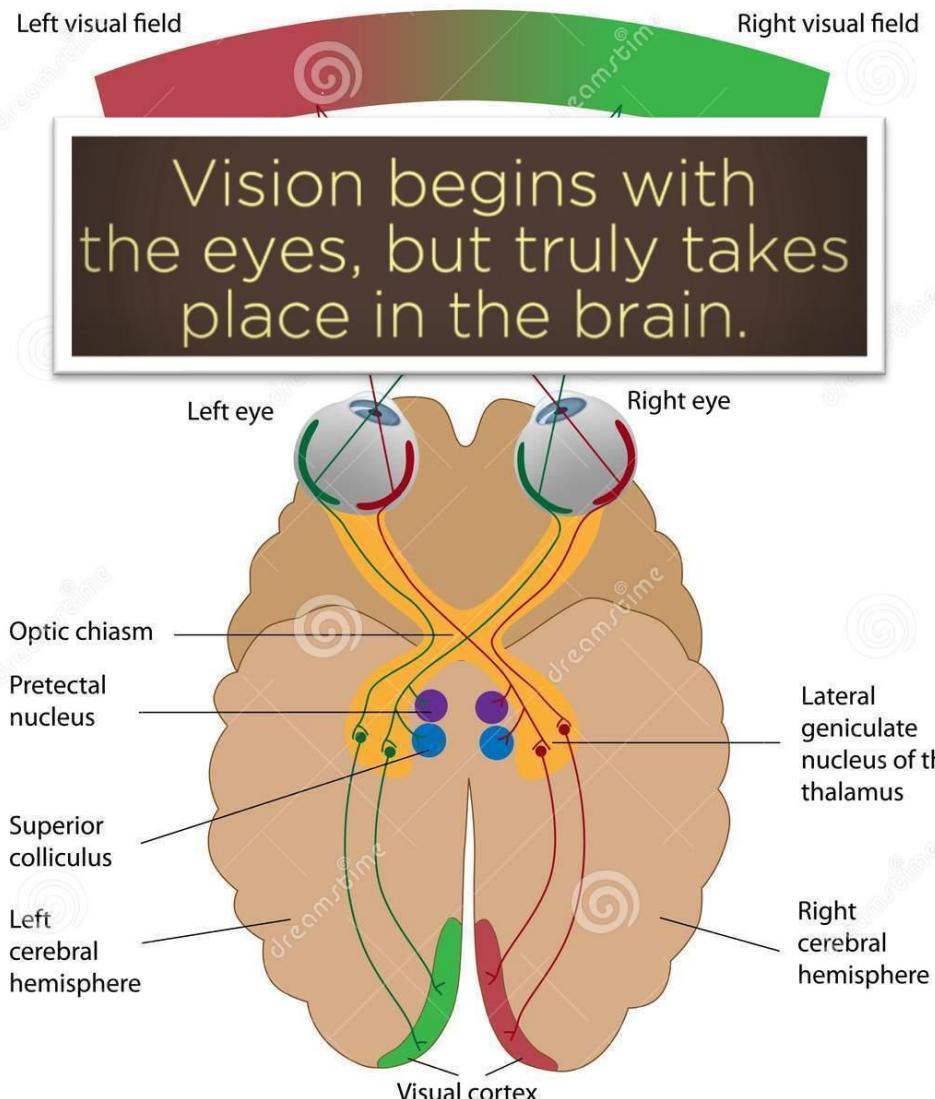




Computer Vision

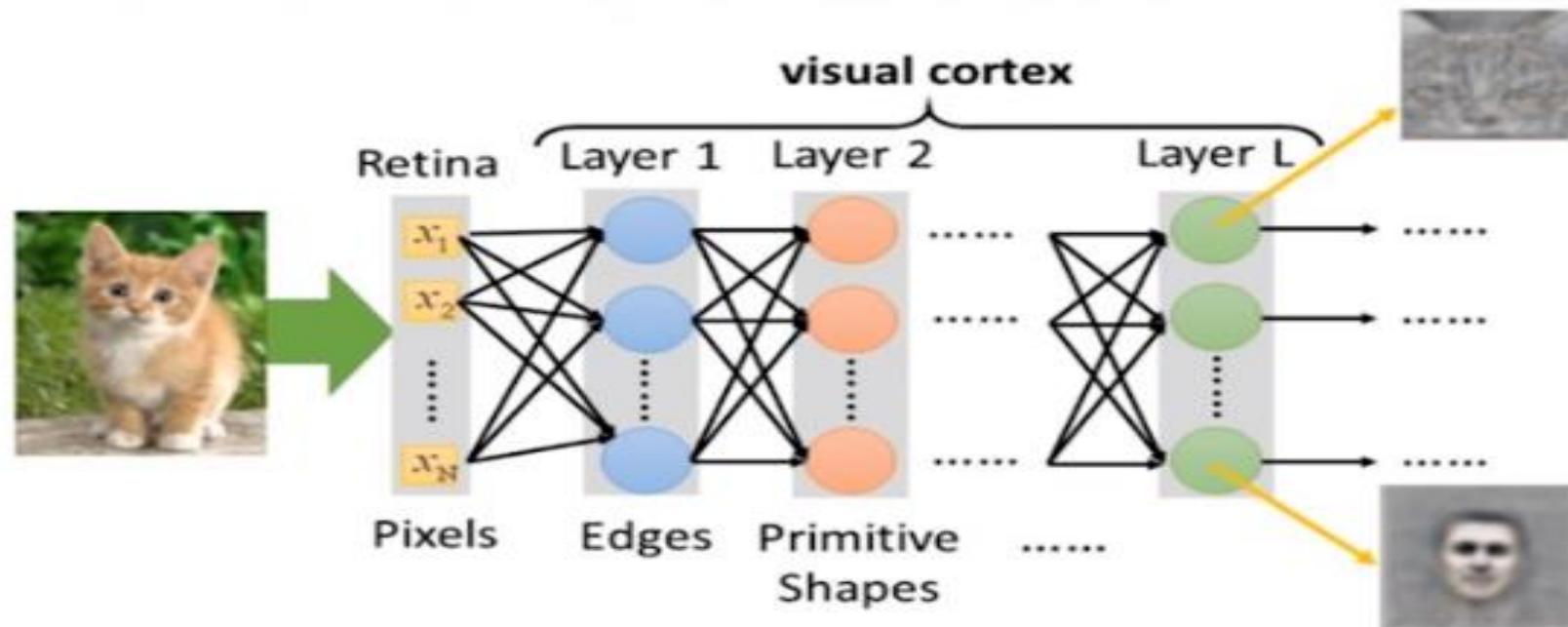
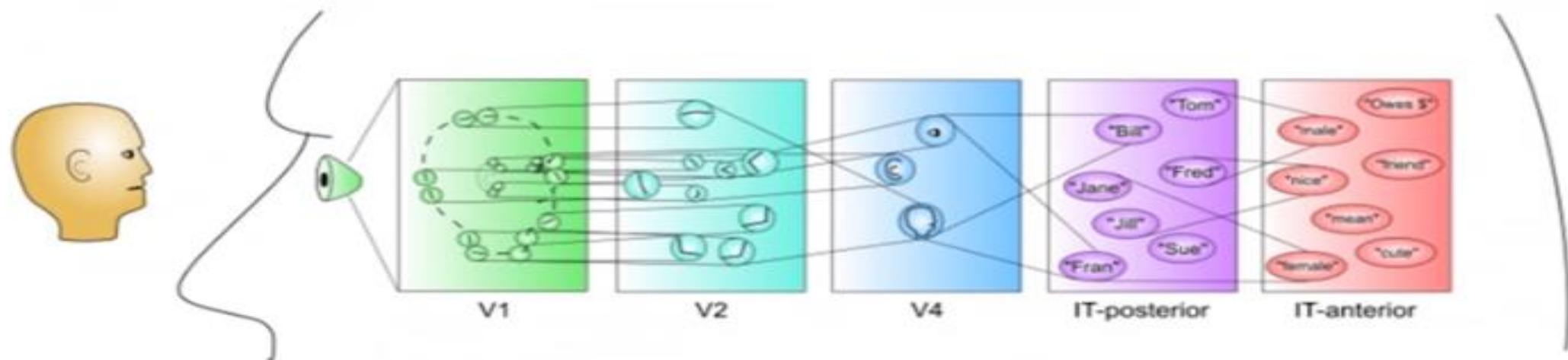


The Visual Projection Pathway



Visual Cortex

(Its Structure is Instructive and Inspiring)





Fei-Fei Li:

How we're teaching computers to understand pictures

TED2015 · 17:58 · Filmed Mar 2015

Subtitles available in 15 languages

 View interactive transcript



car: 66%

car: 97%

car: 95%

car: 86%

car: 94%

car: 98%

car: 97%

car: 89%

car: 85%

person: 59%
person: 92%
person: 91%

car: 71%

car: 69%





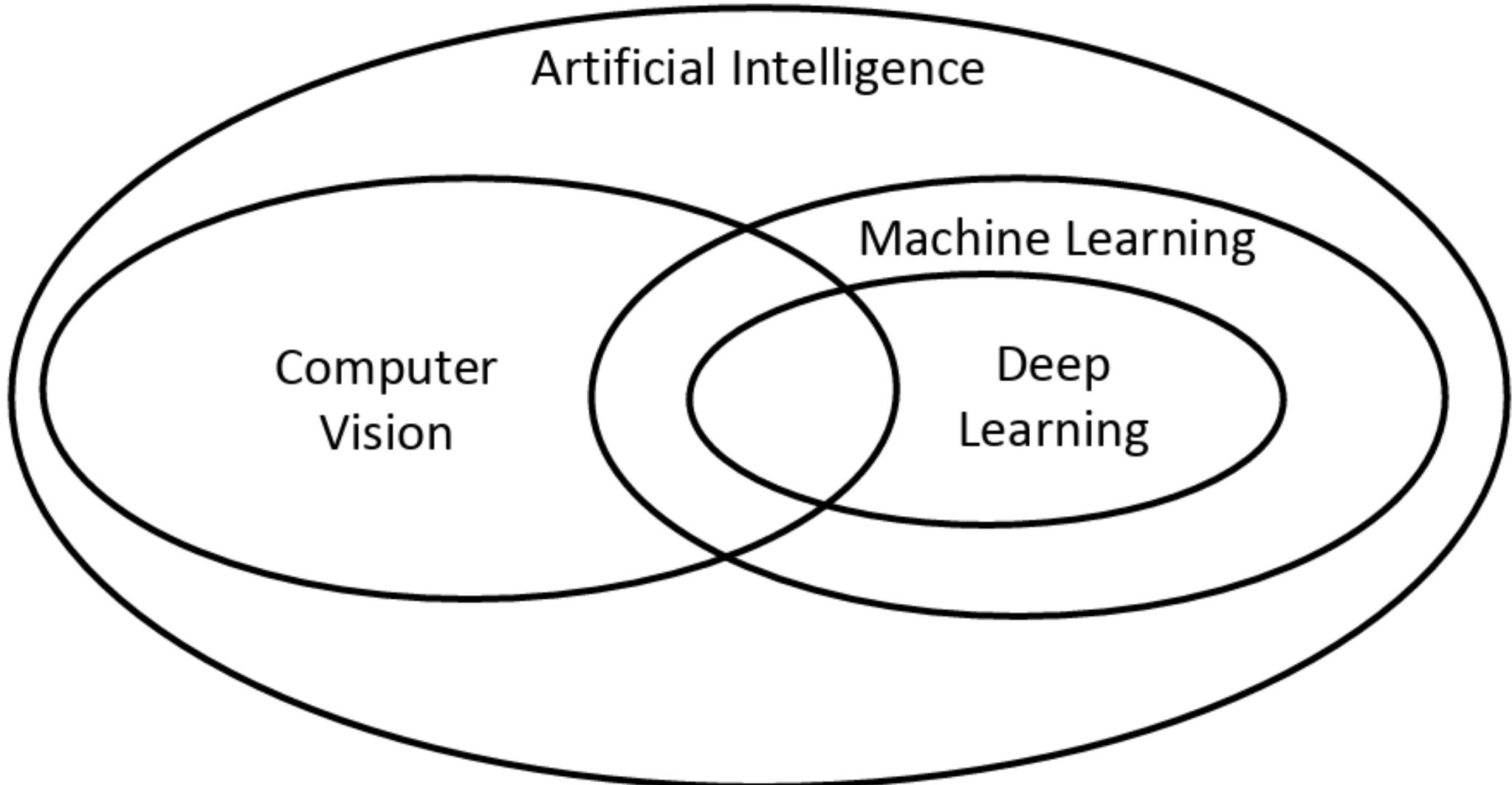
**What is the role of computer
vision in our daily lives?**

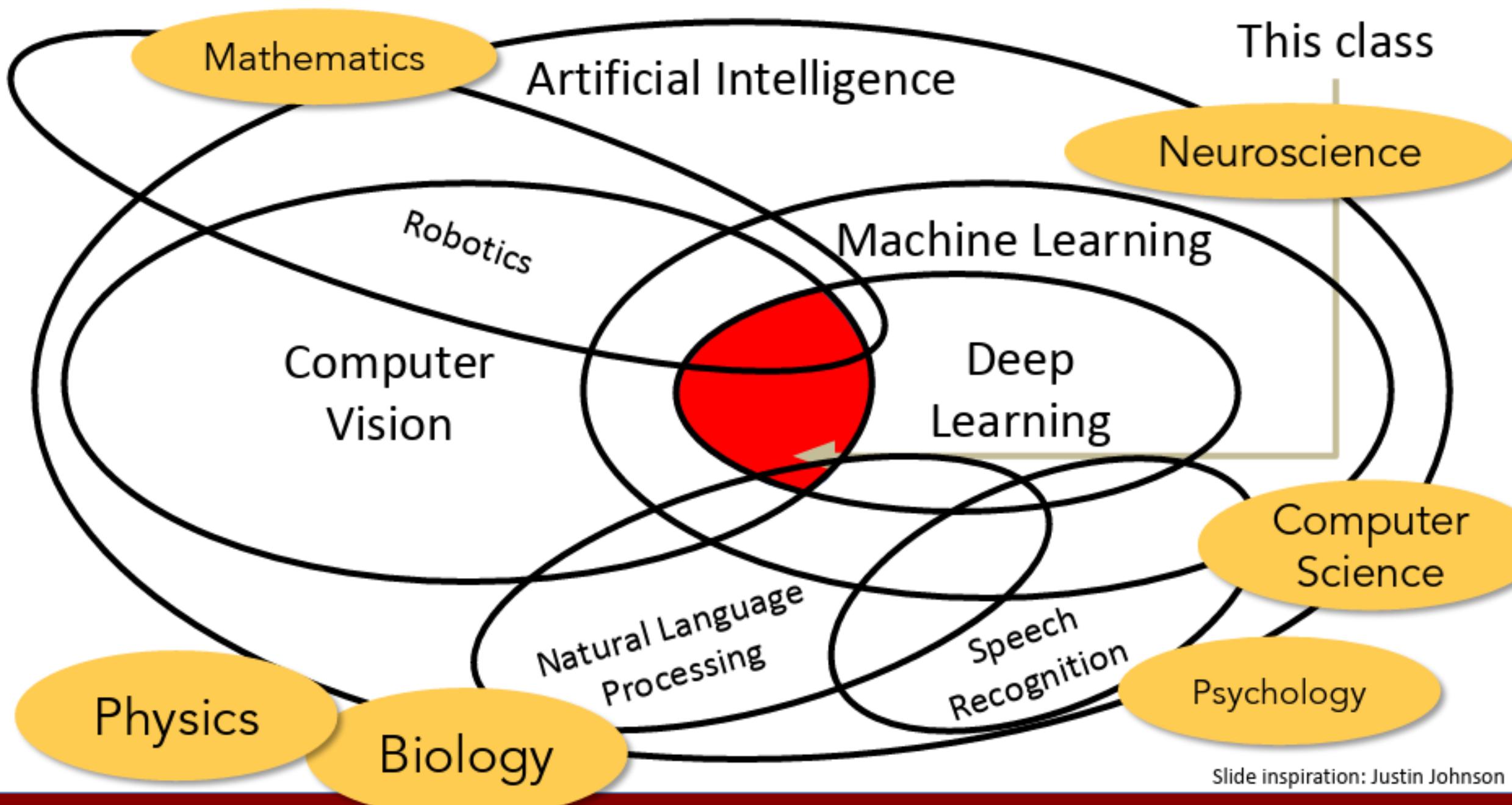
Computer Vision is everywhere!





Computer Vision





Object Tracking



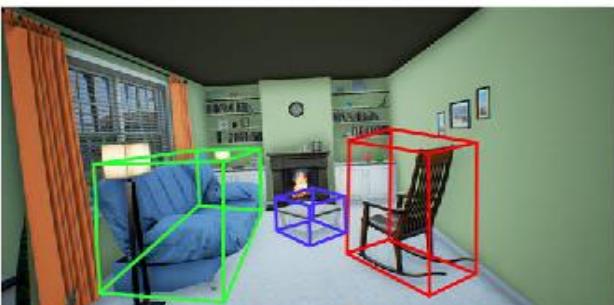
● ● ● / ●

Pose Estimation



● ● / ● ●

Object Detection



● ● / ● ●

Action Recognition



● ● ● / ● ●

Autonomous Navigation



● ● ● / ● ●

3D Reconstruction



● ● ● / ●

Crowd Understanding



● ● / ● ● ●

Urban Scene Understanding



● ● / ● ●

Indoor Scene Understanding



● ● ● / ●

Multi-agent Collaboration



● ● / ● ● ●

Human Training



● ● ● ●

Aerial Surveying



● ● ● / ● ●

● Image

● Image Label

● Depth/Multi-View

● User Input

● Video

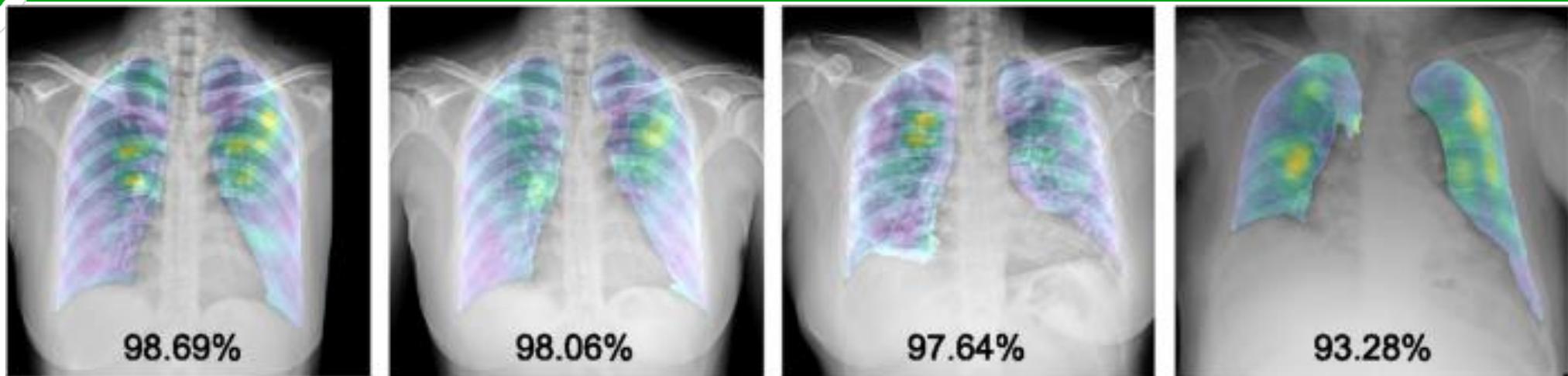
● Physics

● Segmentation/Bounding Box

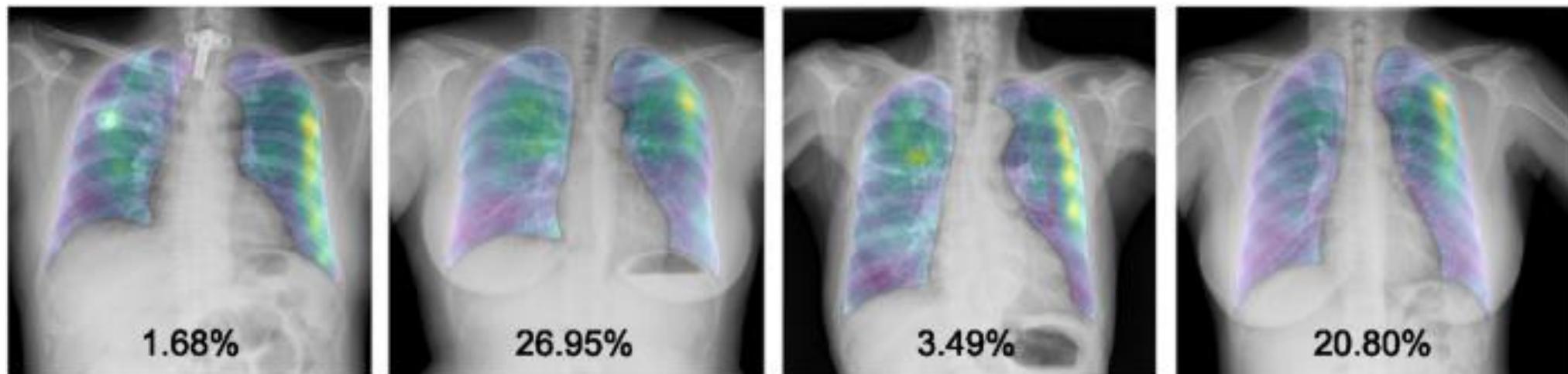
● Camera Localization



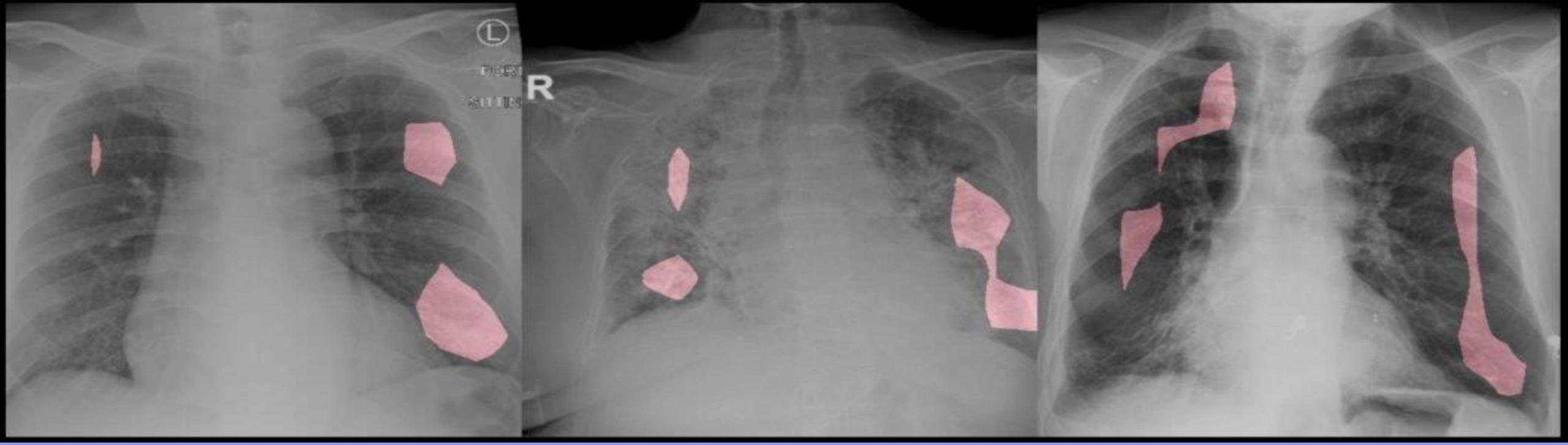
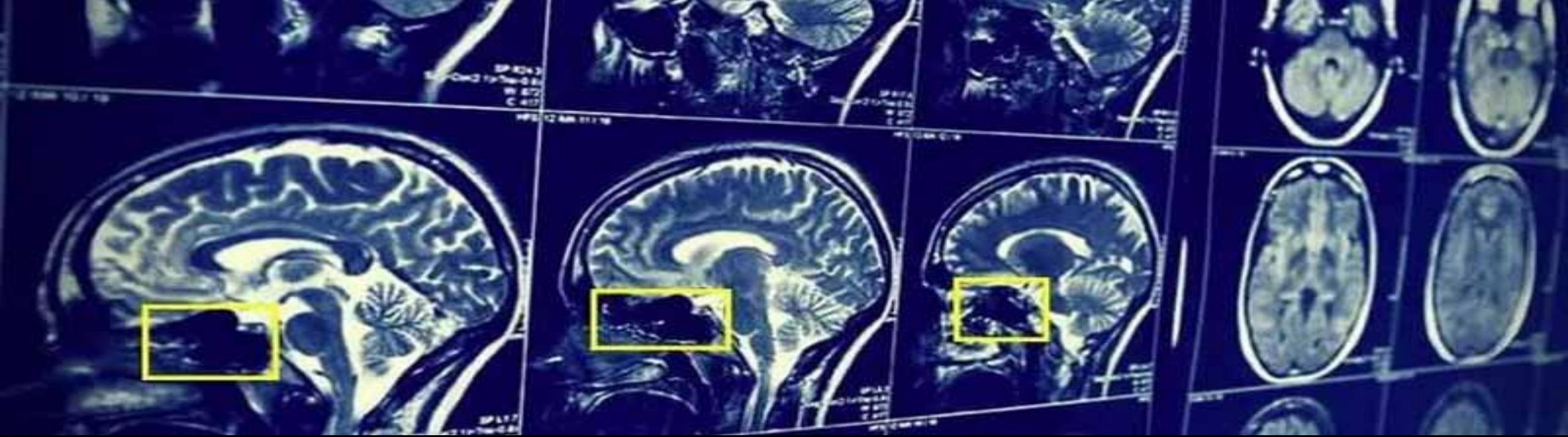
Computer Vision



(a)

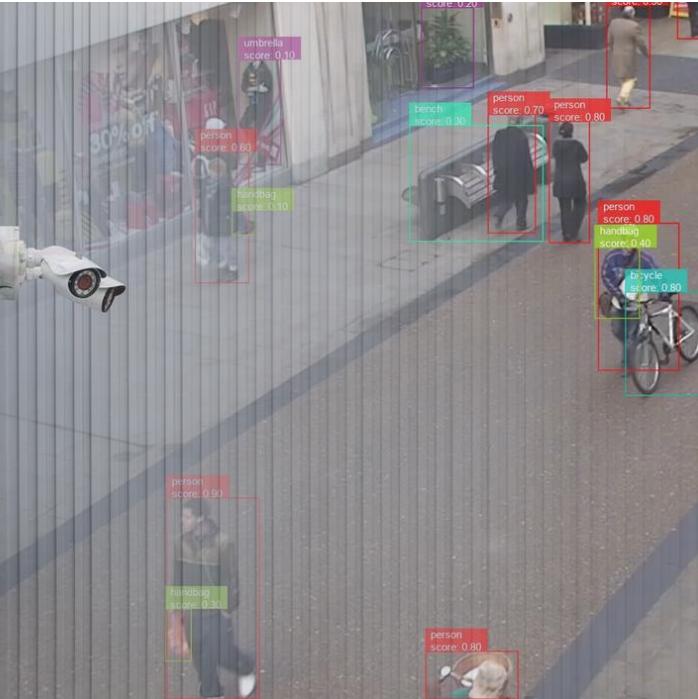


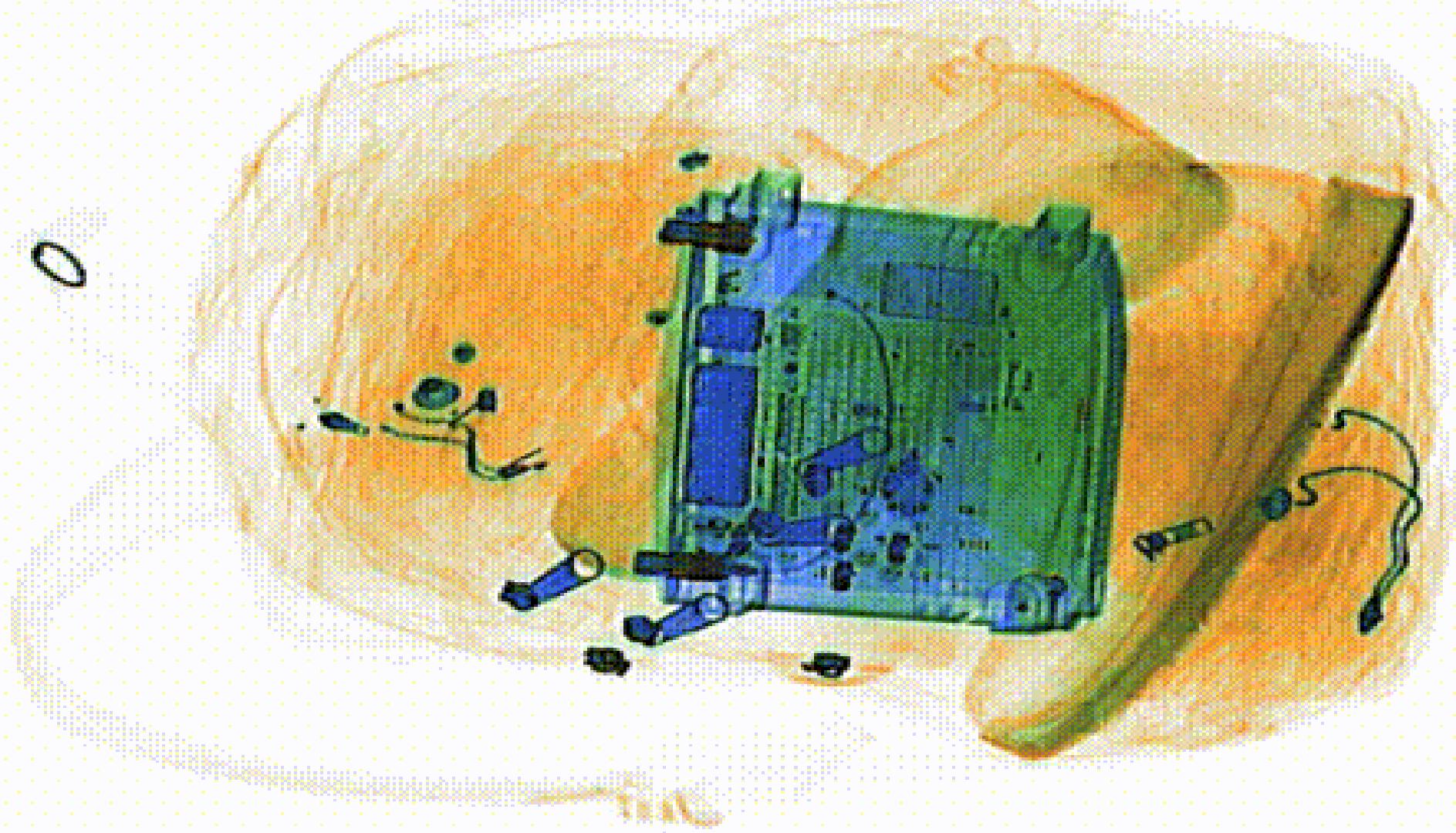
(b)





Computer Vision







Login without a password...



Fingerprint scanners on
many new laptops,
other devices



Face recognition systems now
beginning to appear more widely
<http://www.sensiblevision.com/>



Computer Vision

Object recognition (in mobile phones)





Computer Vision

Special effects: shape capture



Computer Vision
in Media &
Entertainment

Pirates of the Caribbean, Industrial Light and Magic



Computer Vision

>> manufacturer products

consumer products <<

Our Vision. Your Safety.

rear
looking
camera



forward
looking
camera

side looking camera

> **EyeQ** Vision on a Chip



> read more

> **Vision Applications**



Road, Vehicle,
Pedestrian Protection
and more

> read more

> **AWS** Advance Warning System



> read more

News

> Mobileye Advanced Technologies Power Volvo Cars World First Collision Warning With Auto Brake System

> Volvo: New Collision Warning with Auto Brake Helps Prevent Rear-end

> all news



Events

> Mobileye at Equip Auto, Paris, France

> Mobileye at SEMA, Las Vegas, NV

> read more



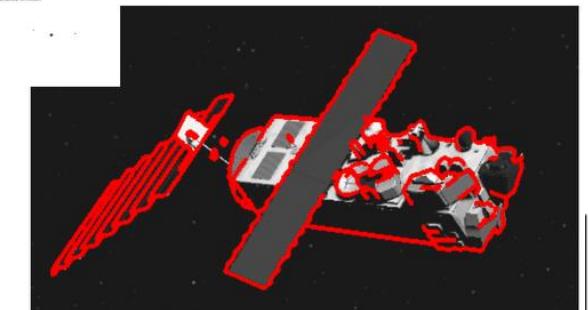
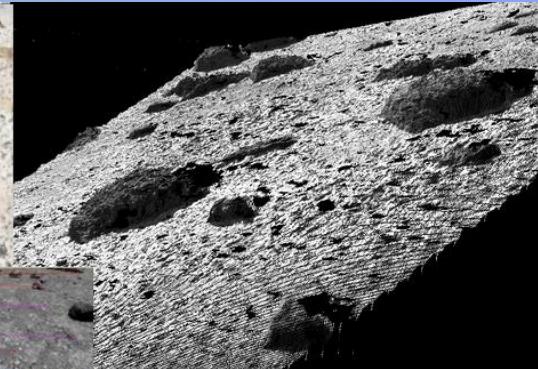
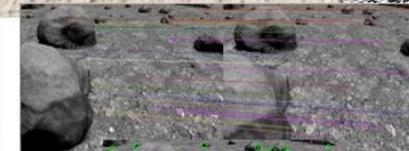


Computer Vision

Vision in space

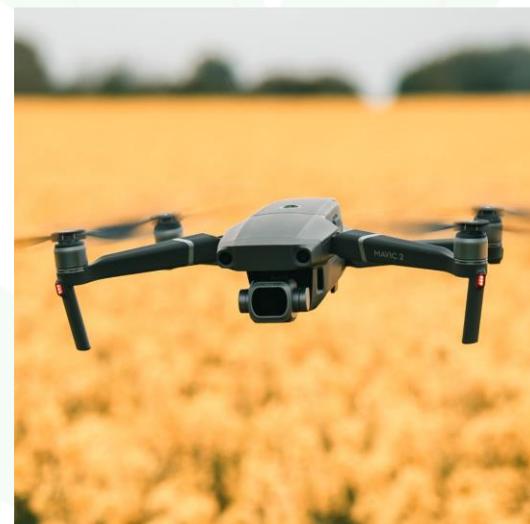
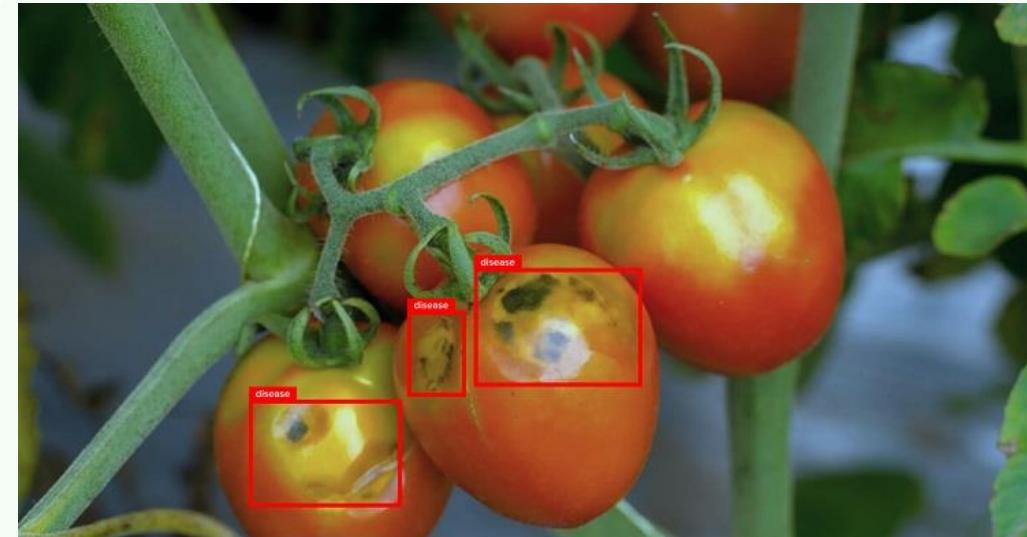
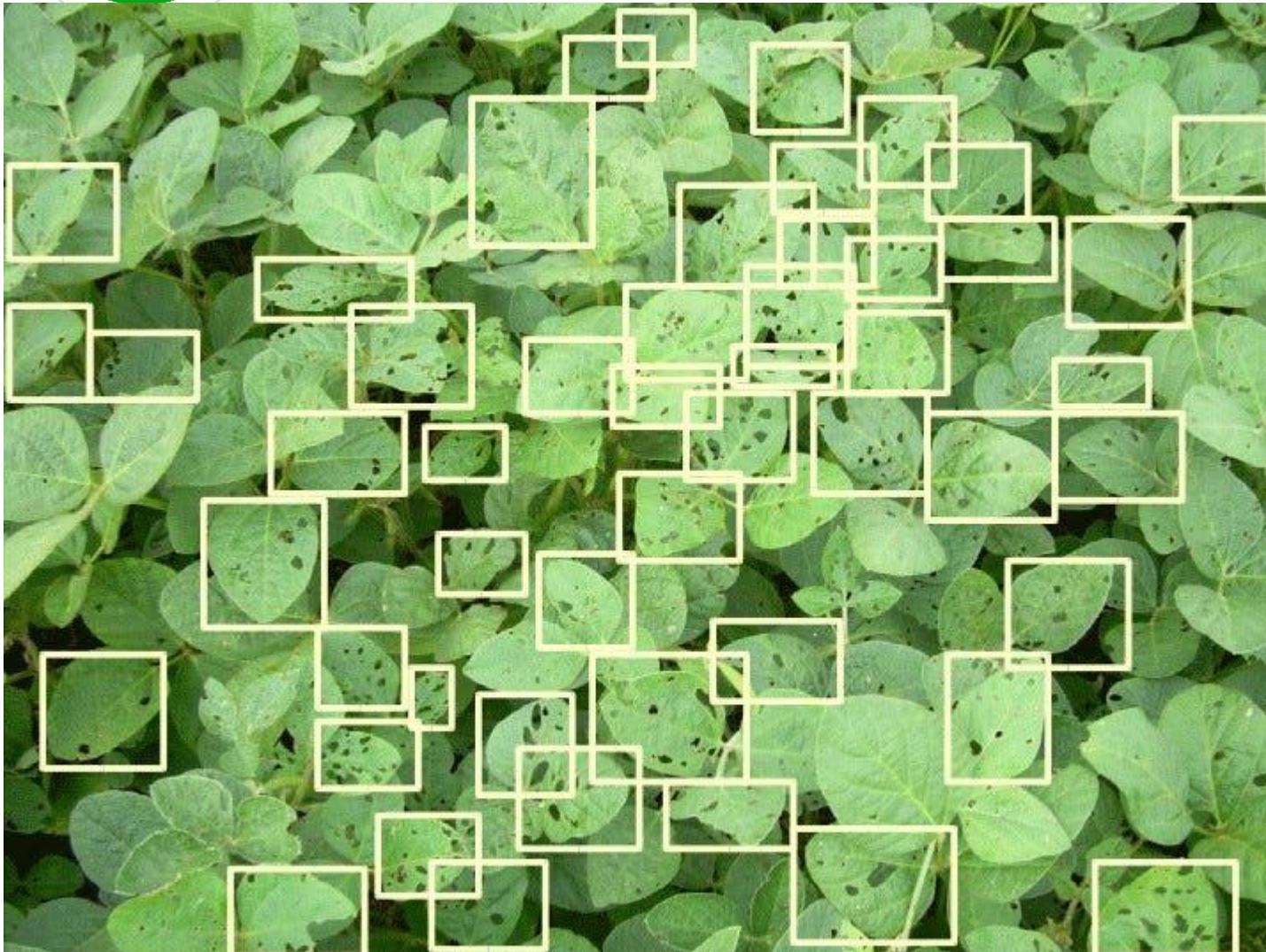


[NASA'S Mars Exploration Rover Spirit](#) captured this westward view from atop a low plateau where Spirit spent the closing months of 2007.





Computer Vision





Computer Vision





Exploring Visual Processing Tasks: From CNNs to Computer Vision



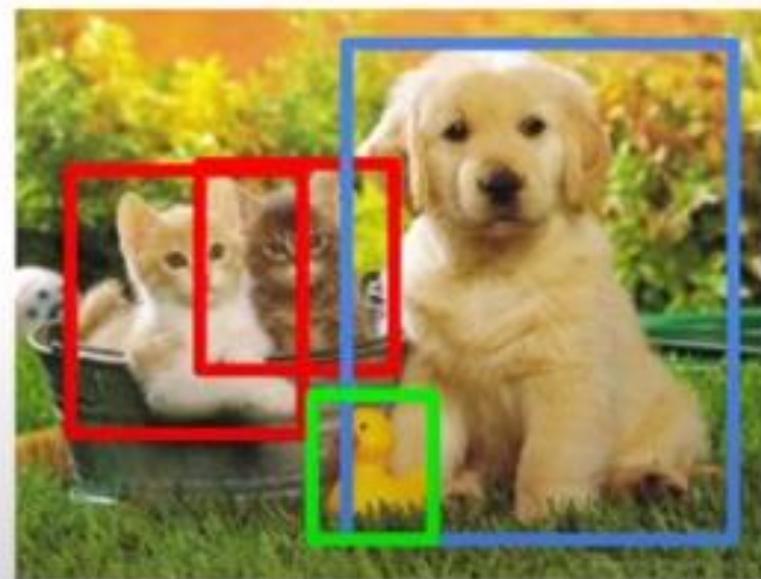
Computer Vision

Classification



CAT

Object Detection



CAT, DOG, DUCK



Computer Vision

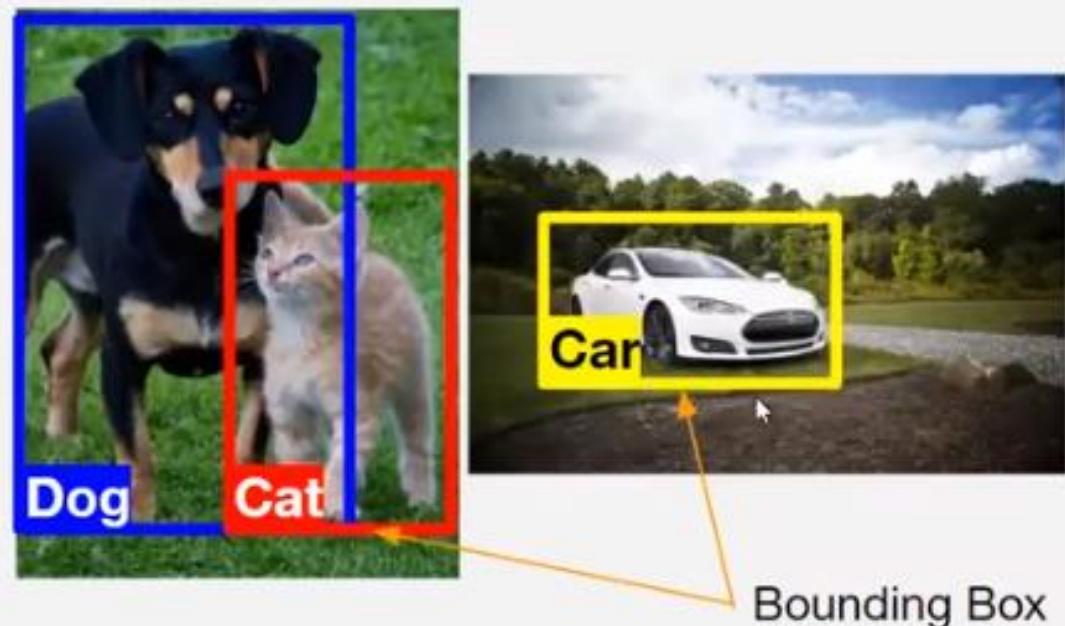
Classification

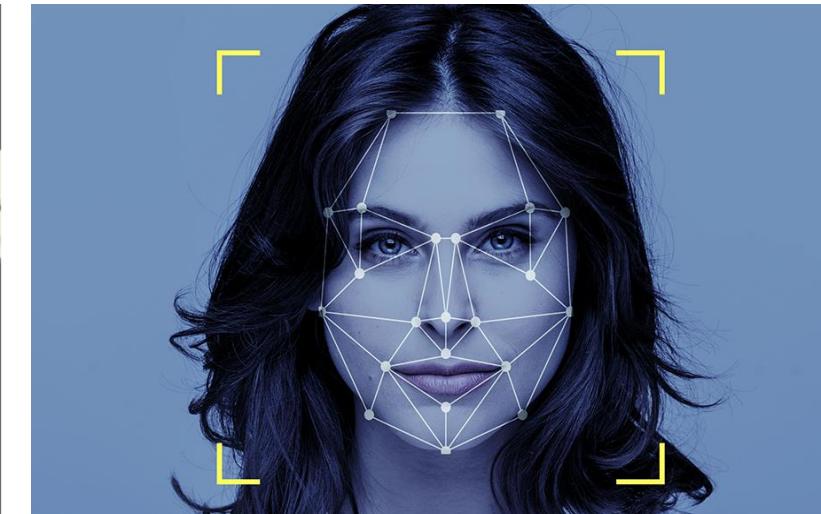
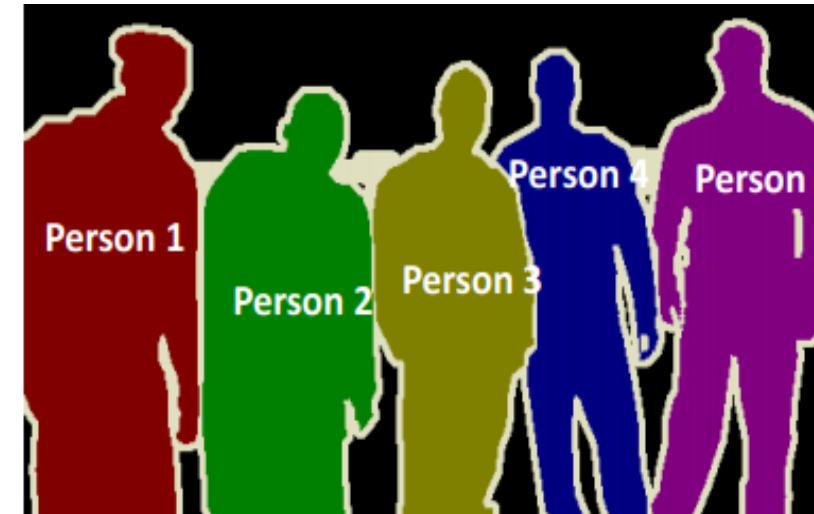
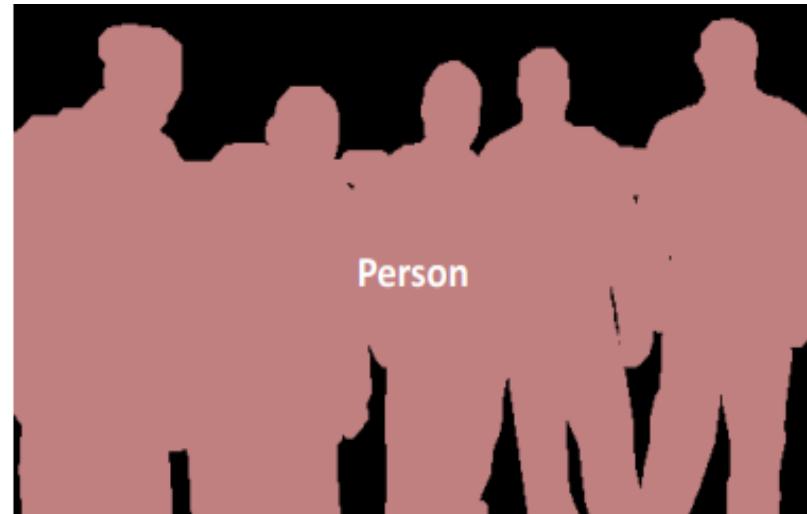
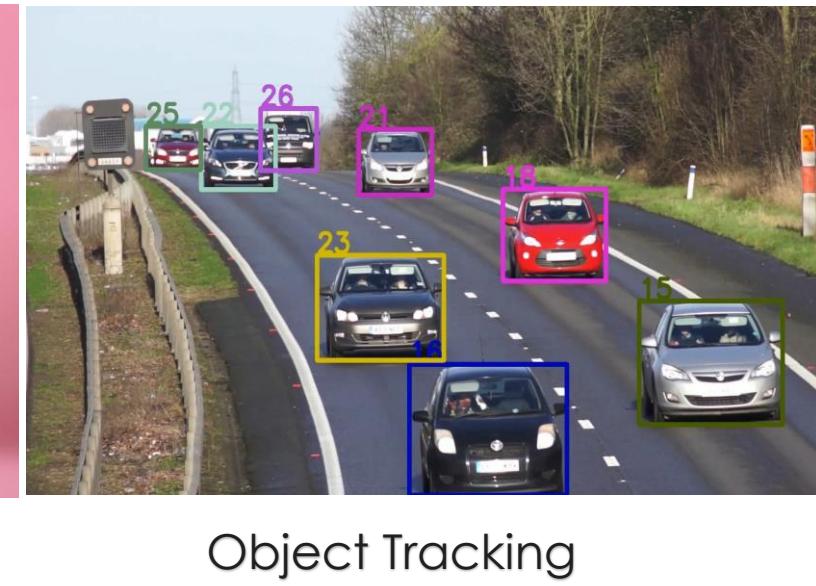
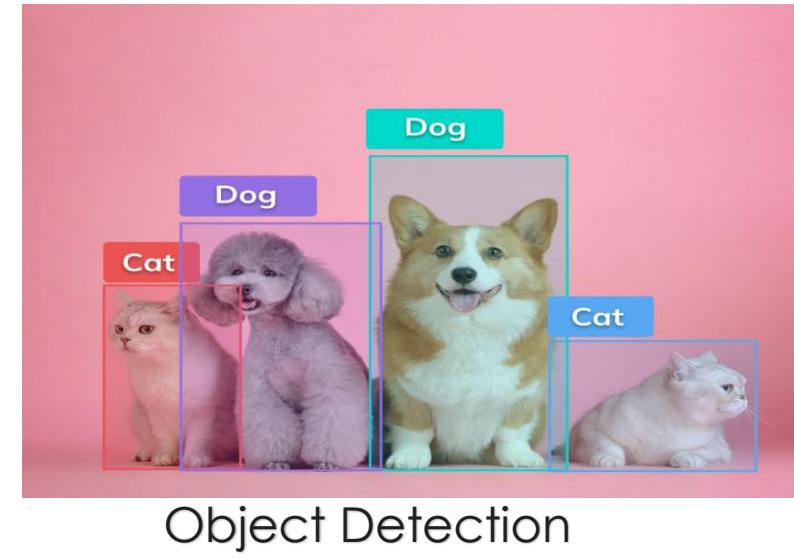
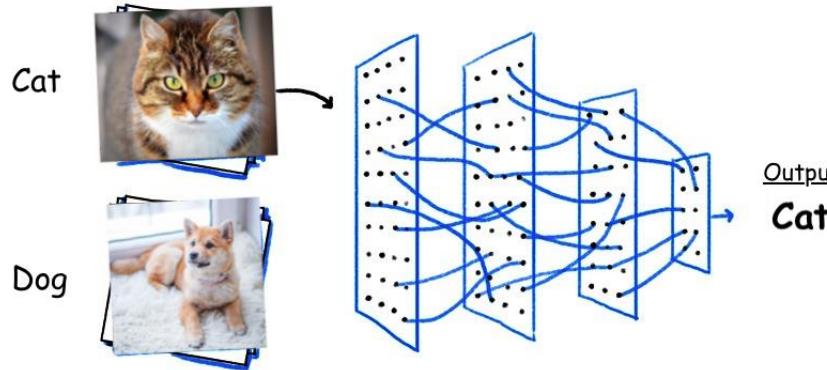
- One object and label per image



Object Detection

- Multiple objects per image
- Determine objects' location







Computer Vision

Semantic Segmentation



GRASS, CAT,
TREE, SKY

No objects, just pixels

Classification + Localization



CAT

Single Object

Object Detection



DOG, DOG, CAT

Multiple Object

Instance Segmentation



DOG, DOG, CAT

This image is CC0 public domain

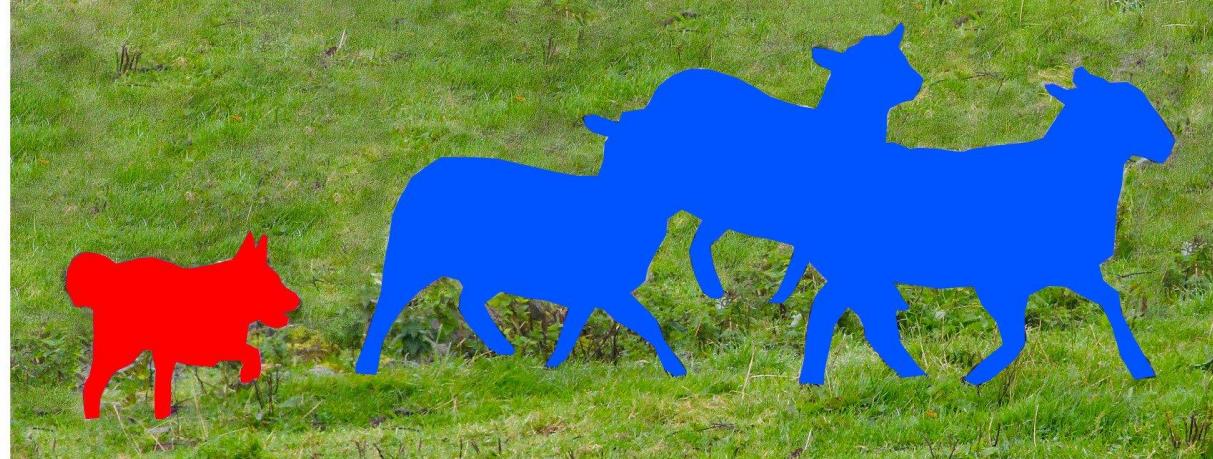


Computer Vision

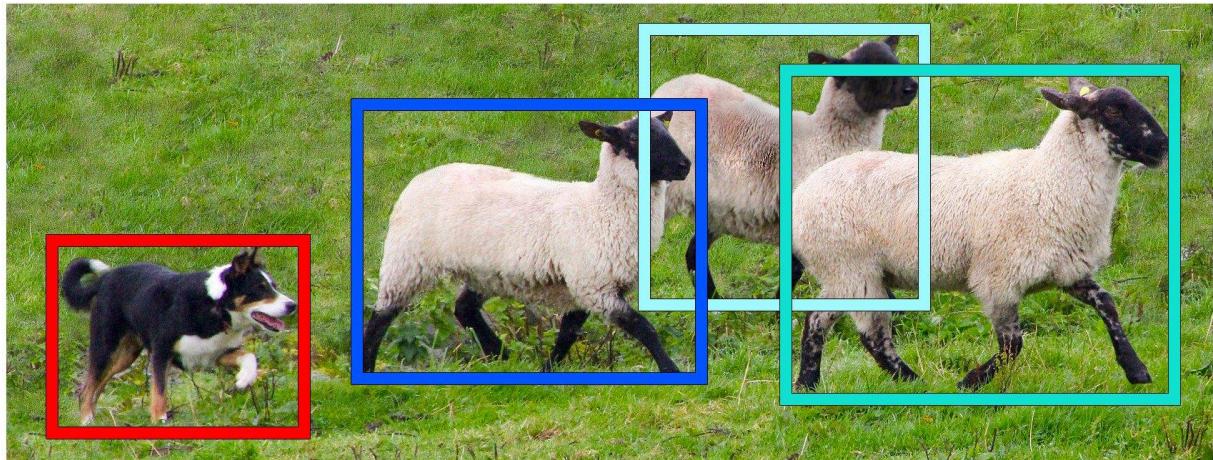
P 0.6 sheep
P 0.3 dog
P 0.1 cat
P 0.0 horse



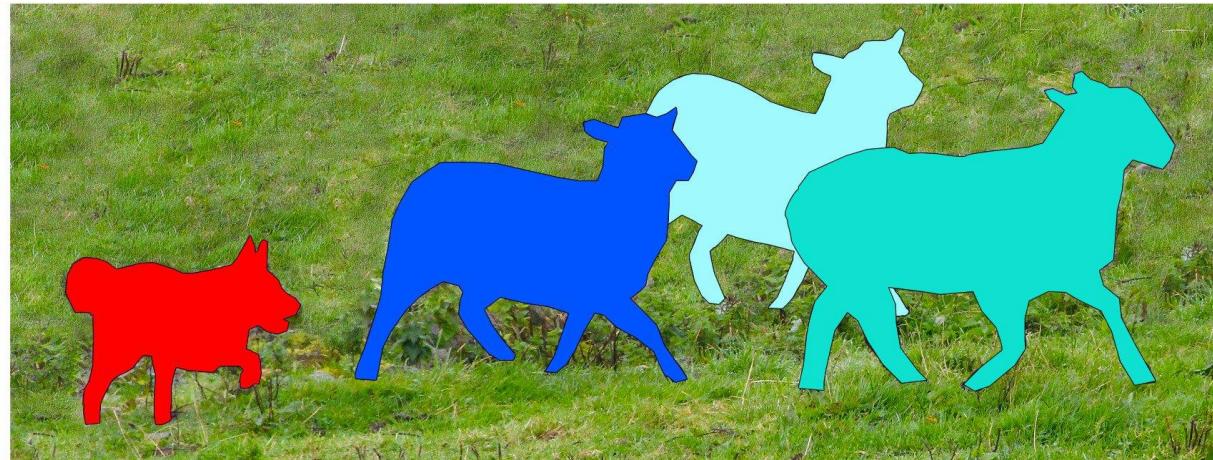
Image Recognition



Semantic Segmentation



Object Detection



Instance Segmentation



Computer Vision

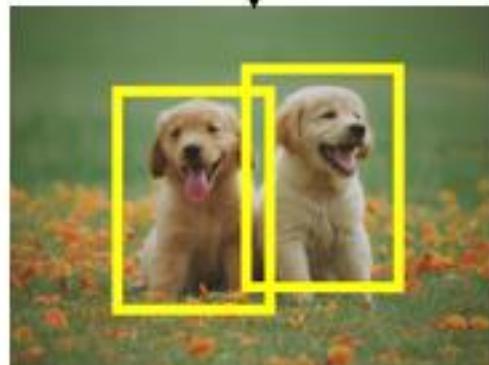
Input Image



Image Classification



Object Detection



Instance Segmentation





IMAGE CLASSIFICATION



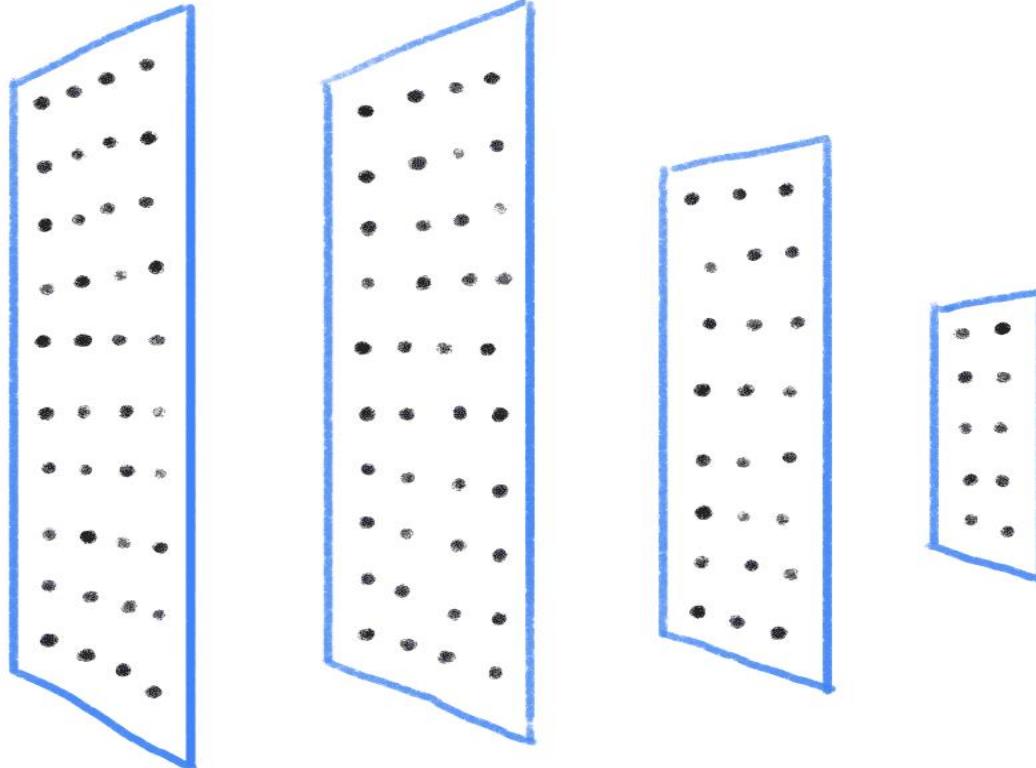
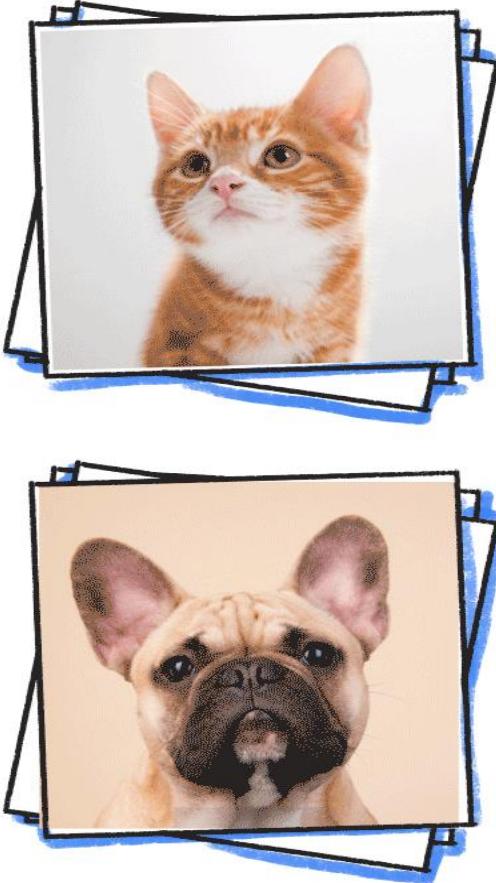


IMAGE CLASSIFICATION

CAT

(LABLED)
PHOTOS

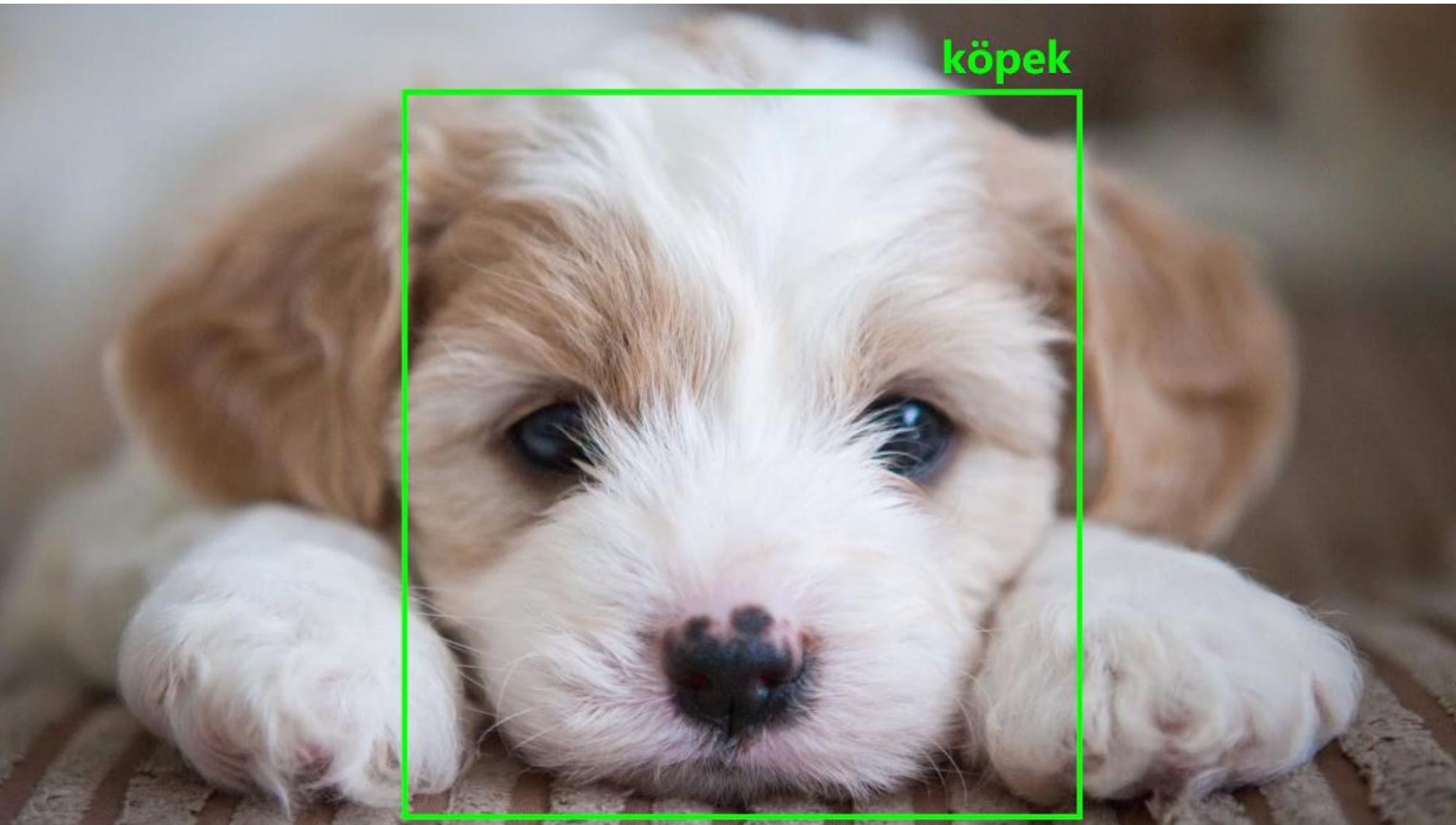
DOG







OBJECT DETECTION



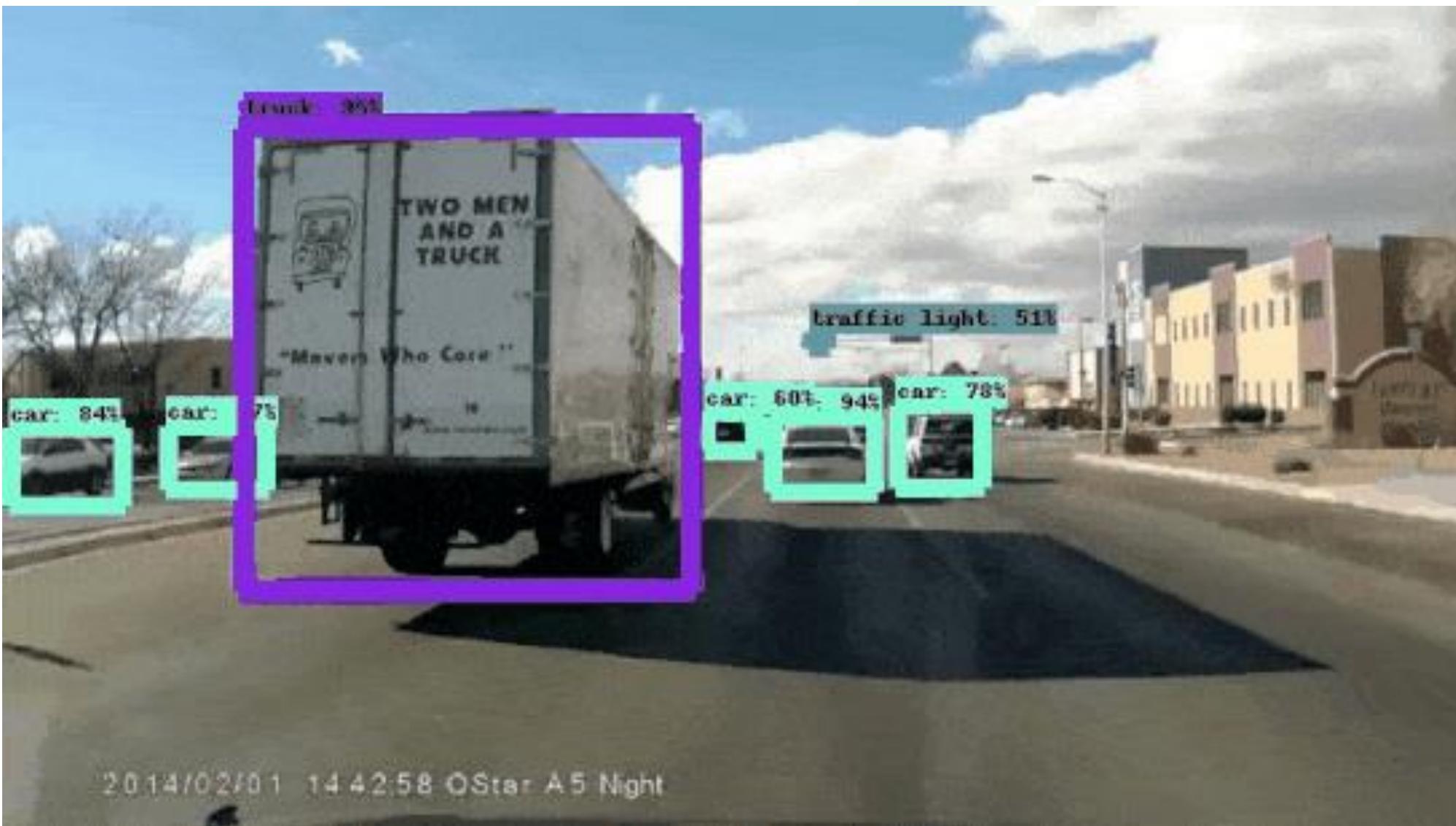
Cow

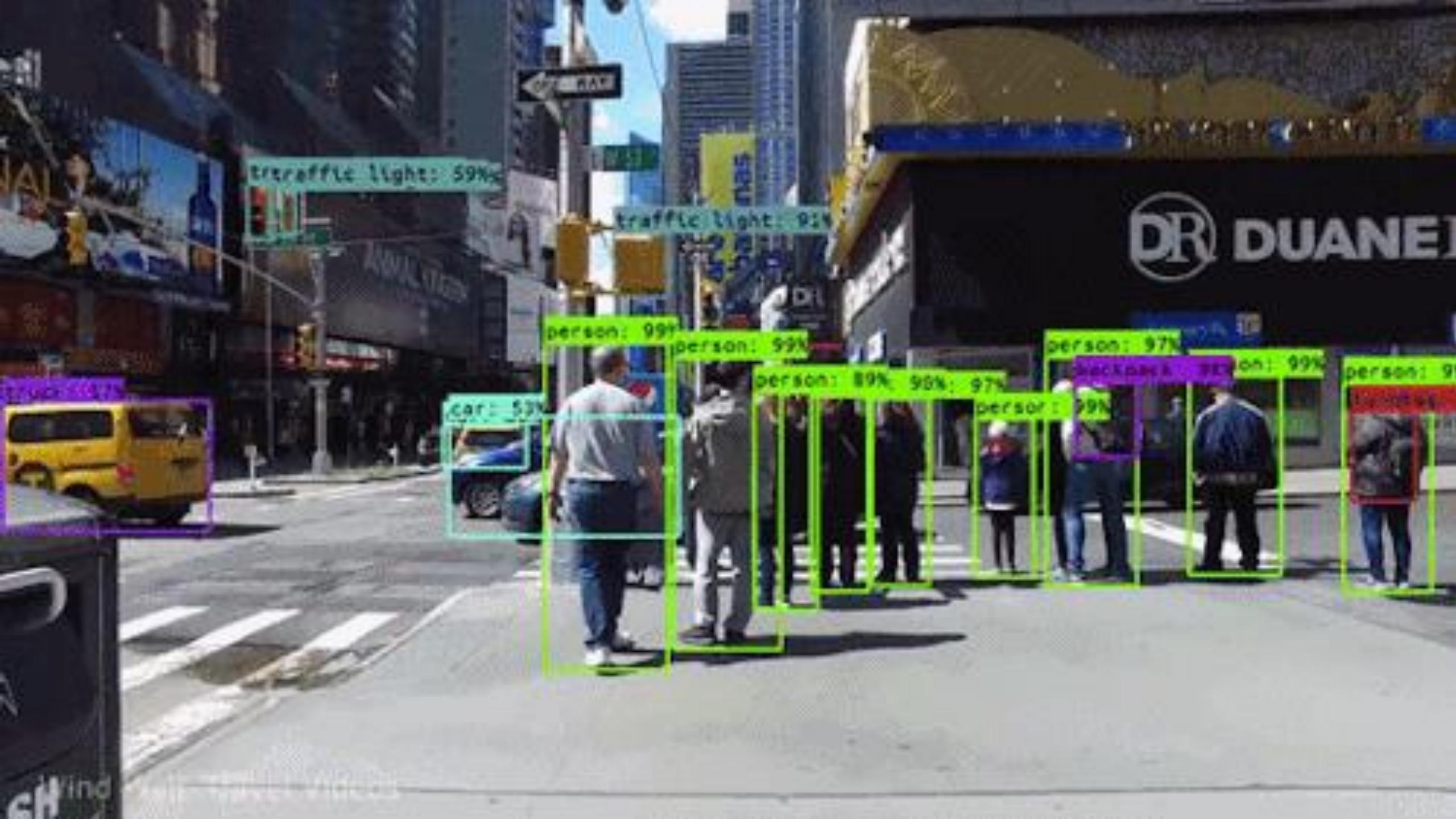
Height: 1.7 meter
Length: 5.2 meter





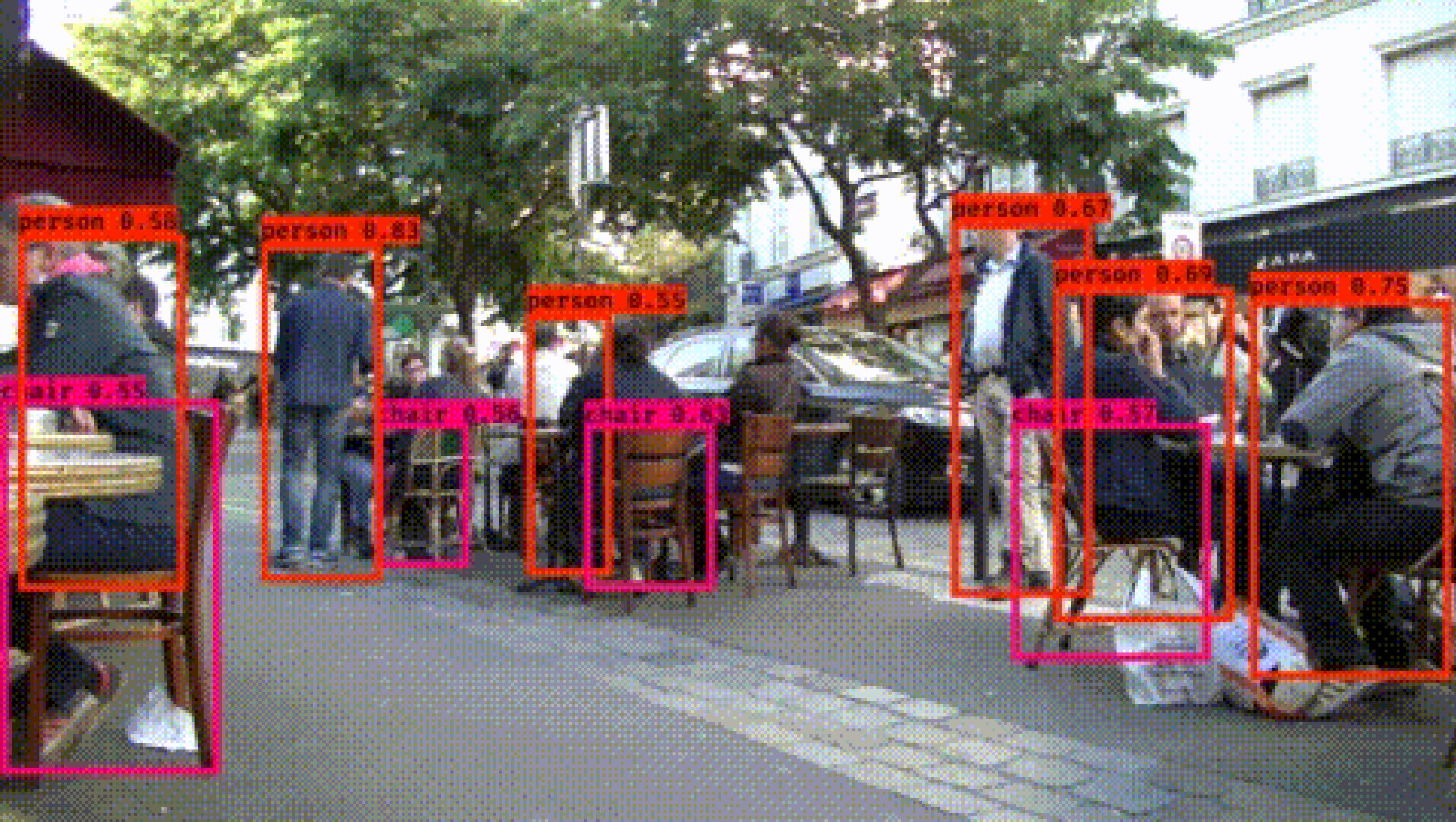
OBJECT DETECTION





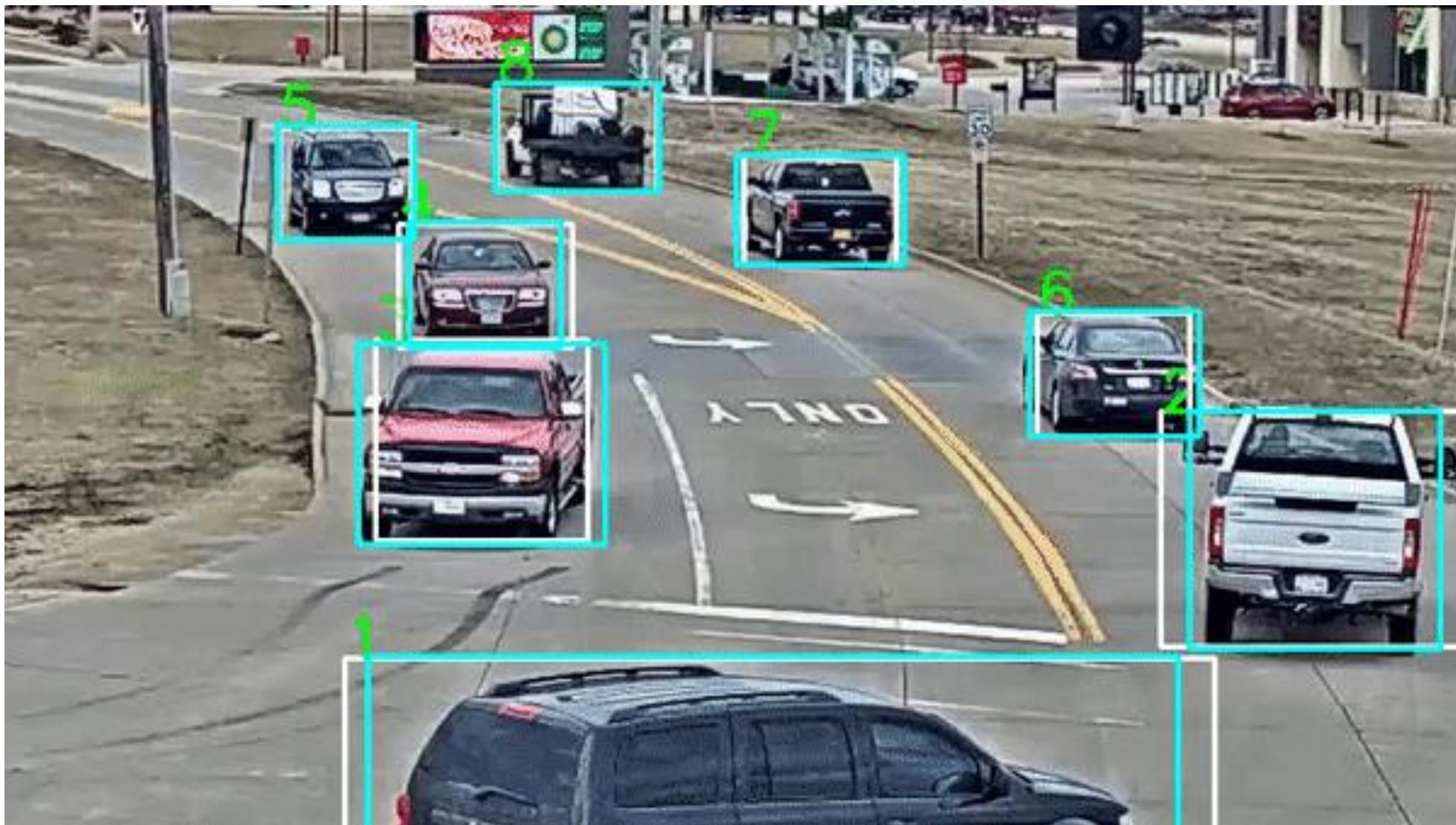


gifs.com



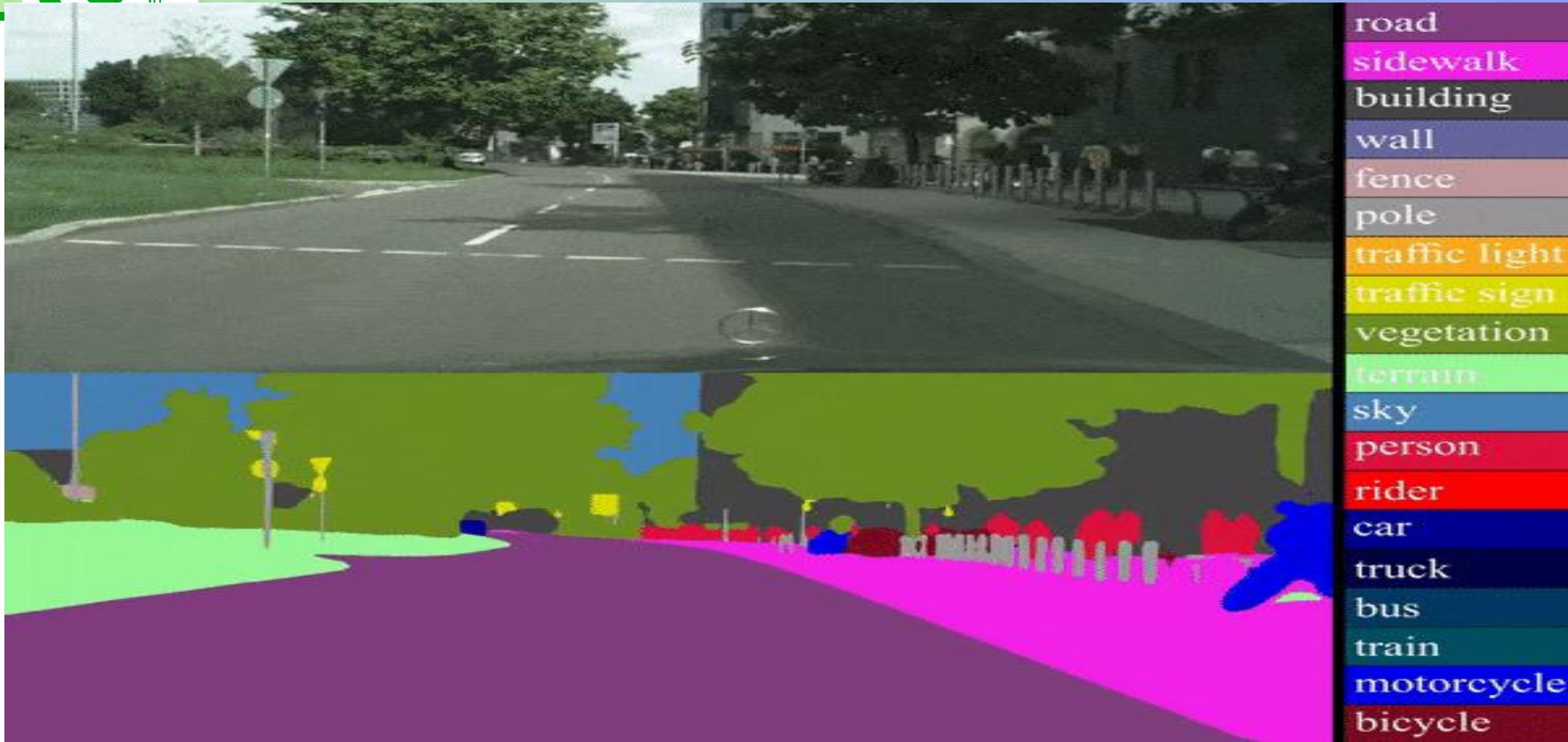


OBJECT TRACKING

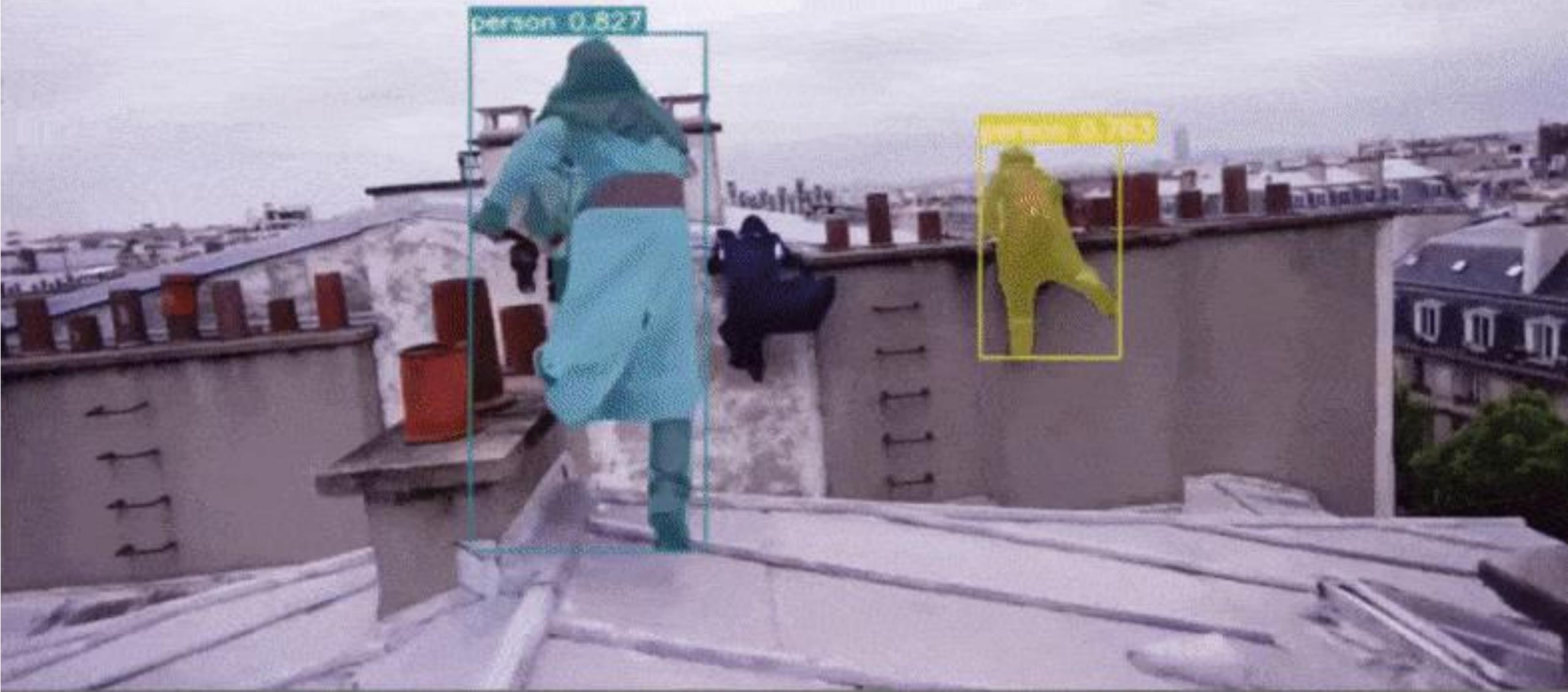




SEMANTIC SEGMENTATION



FPS: 8



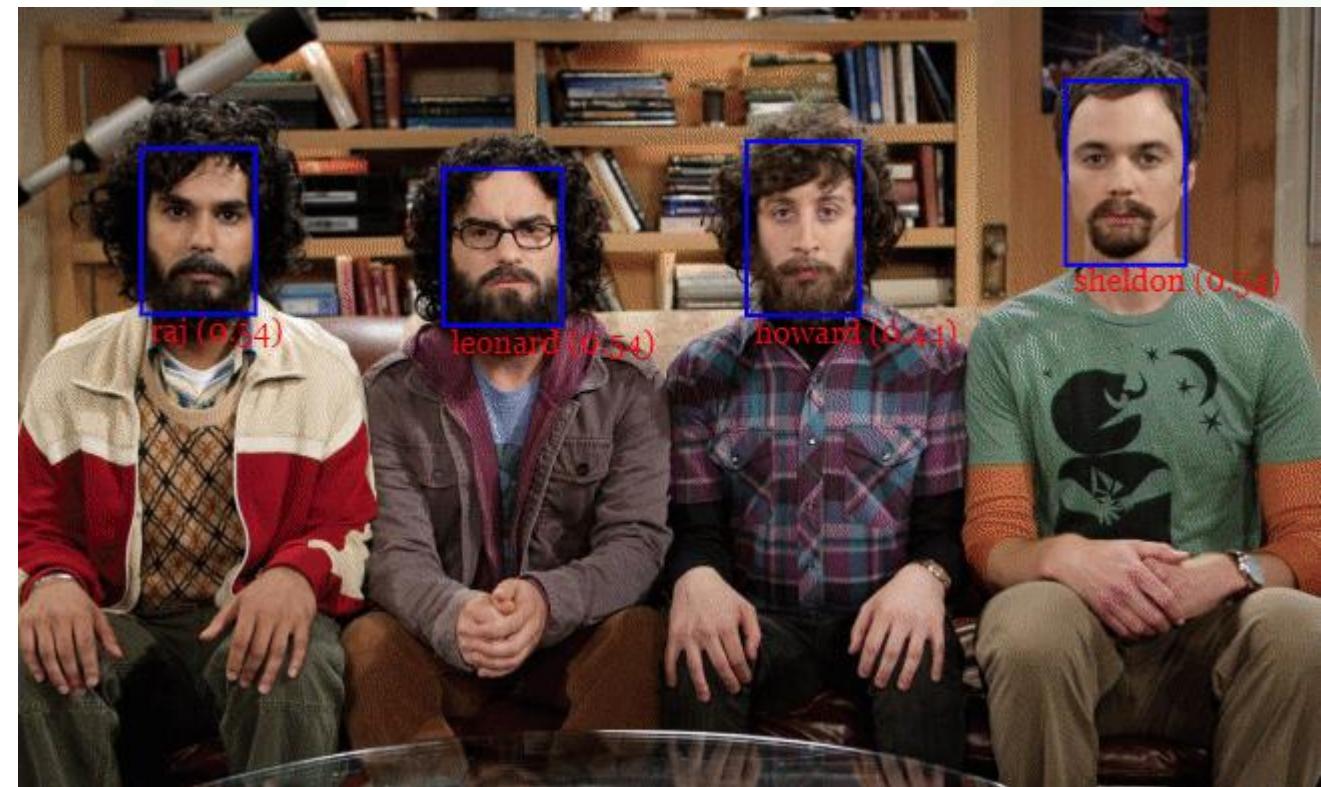
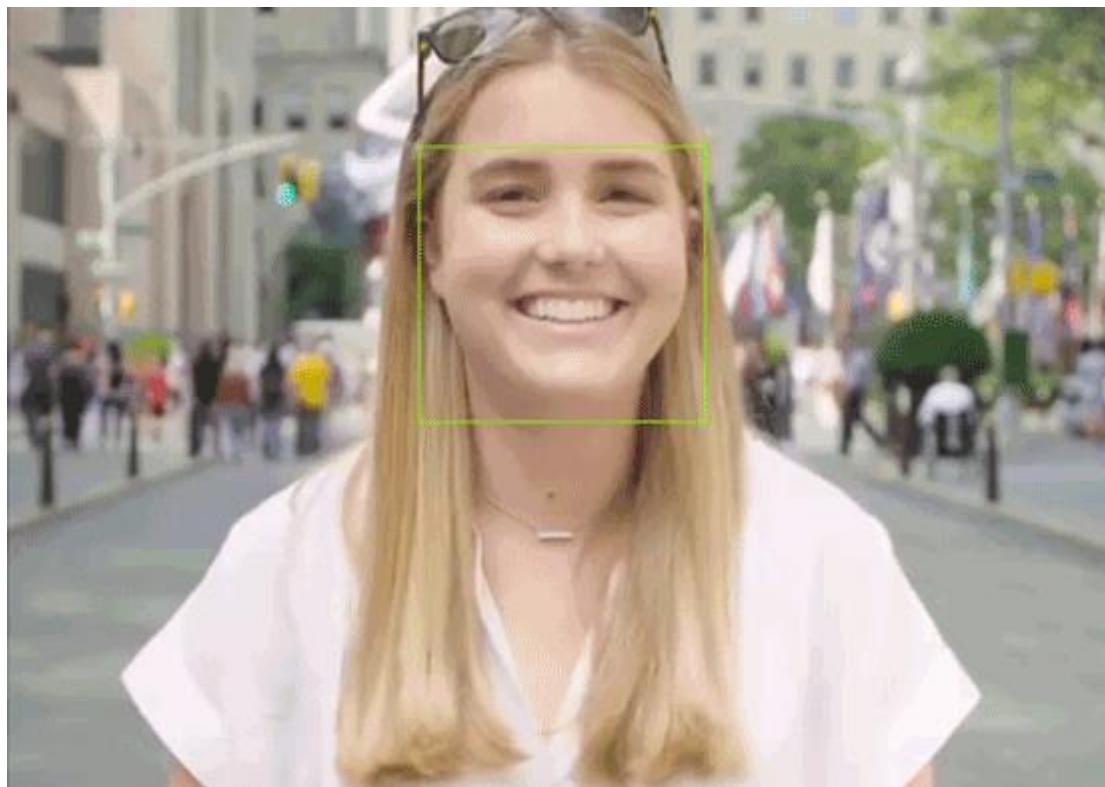


FACE DETECTION AND RECOGNITION





FACE DETECTION AND RECOGNITION





Despite the successes, computer vision still has a long way to go



IMAGE PROCESSING



technology

exchange step chart environment professional label tech search engineering reusable
social inspiration world dramatic creative design website nature future people illustration options information presentation job business process innovation advertising solution travel modern responsibility choice laptop exploration work success devices concept software media shape layout element occupation art share web

image processing





IMAGE PROCESSING

1

Process an Image to generate another image

2

Input and output is image

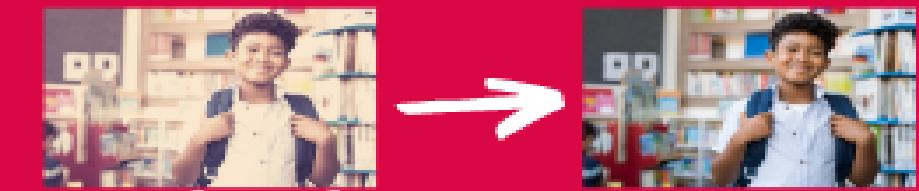


Input [image]



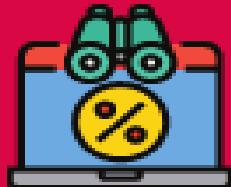
output [image]

3



4

Smoothening, sharpening, compression, contrast, watermarking, brightness, edges, region.



COMPUTER VISION

Process an Image to produce desired result in real time

**Input as an image
Output as desired result**



Input [image]



**Position, Action, Identification,
Measure, Label, Projection**

Image Processing

Focuses on processing the image.
Both input and output are images.



SMOOTHING &
SHARPENING

HIGHLIGHT EDGES
& REGIONS

COMPRESSION

CHANGE
CONTRAST &
BRIGTNES

WATERMARKING

CALIBRATION

VS

Computer Vision

Focuses on making sense of what a
machine sees. The system inputs
an image and outputs task-specific
knowledge.



LABELLING

IDENTIFICATION

ACTION

POSITION

MEASUREMENT

PROJECTION



Senior AI/ML Engineer - Computer Vision Specialty

- Experience working in a specialized Computer Vision role within the last 2 years required.
- Experience with working in a collaborative CI/CD software development environment, including use of git.
- Experience with developing deep learning models for diverse computer vision tasks (e.g., segmentation, recognition, classification, domain adaptation) using PyTorch, Tensorflow, or other deep learning frameworks.
- Experience in machine learning, software engineering, and Python.
- Experience with one or more open-source computer vision libraries such as Pillow, scikit-image, and OpenCV.

Analyze, design, code, and test multiple components of application code across one or more clients for enterprise-level identity management software. Perform maintenance, enhancements and/or development work. Must be proficient developing software with Python programming language, experience developing algorithms and software on Linux and Windows, and familiar with image processing concepts, file formats, and tools and python packages like PIL/Pillow and Scikit-Image

Required: PyTorch, Tensorflow, Keras, Numpy, OpenCV/Pillow.
Additionally Preferred: Scikit-Learn, Pandas, etc.



OpenCV and Image Processing Engineer

Computer Vision Engineer

Requirements:

- Strong experience with OpenCV and image processing algorithms
- Proficient in Python
- Experience with image processing libraries such as OpenCV, Scikit-image, scikit-learn, Tensorflow, Pytorch, Keras.
- Strong understanding of computer vision concepts such as feature detection, object recognition, and image segmentation
 - Passion or Experience in Computer Vision / Machine Learning technologies and tools
 - Experience with computer vision tools like OpenCV, YOLO, PIP, Tensorflow, PyTorch . Experience with Deep Learning, Neural Networks and Artificial Intelligence
 - Technical understanding of computer vision and machine learning
 - Familiar with state-of-the-art CV/ML models and tools