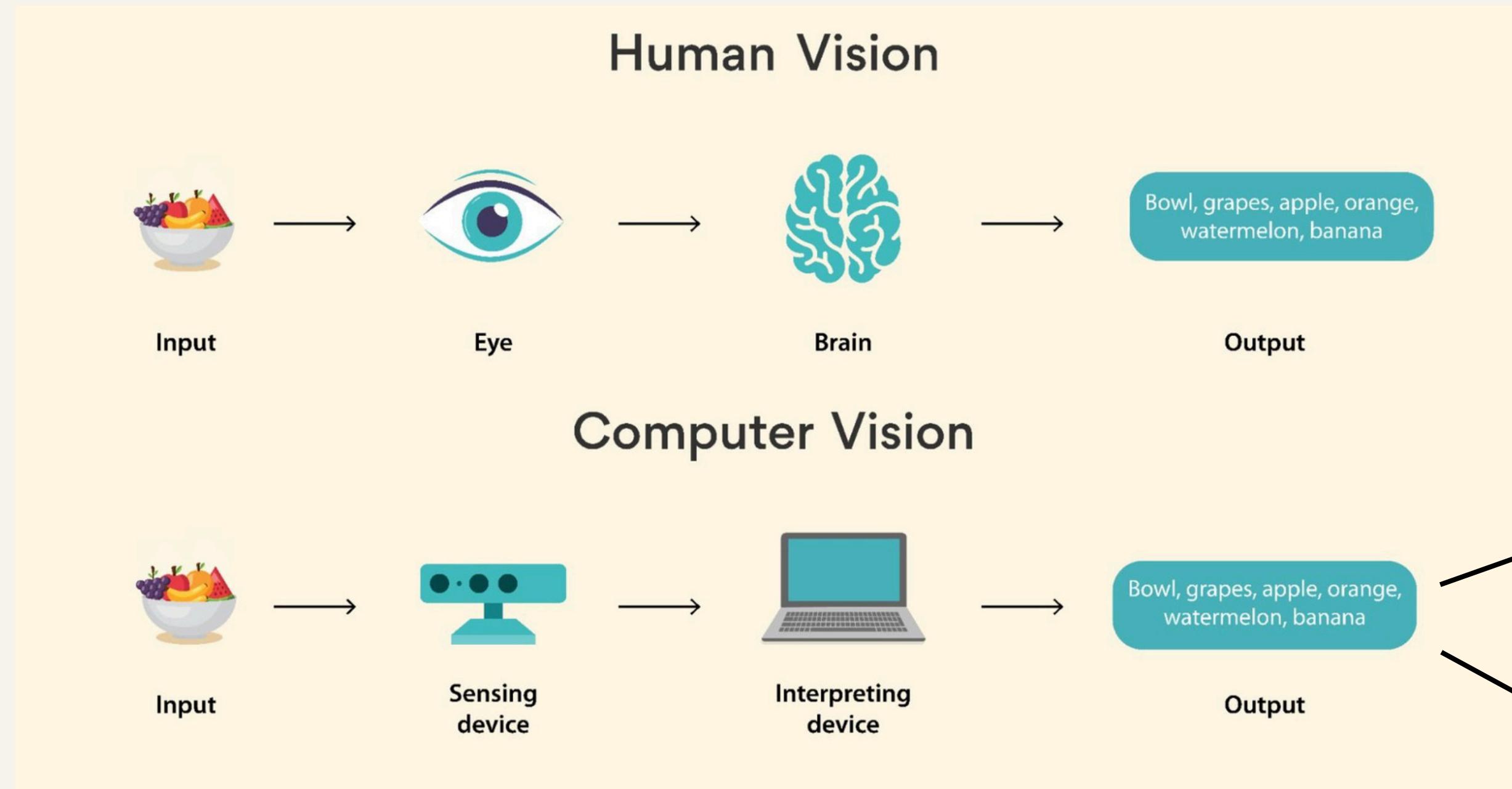


# **YOLO**

**(You Only Look Once)**

**Presented By: Thanh Dang**

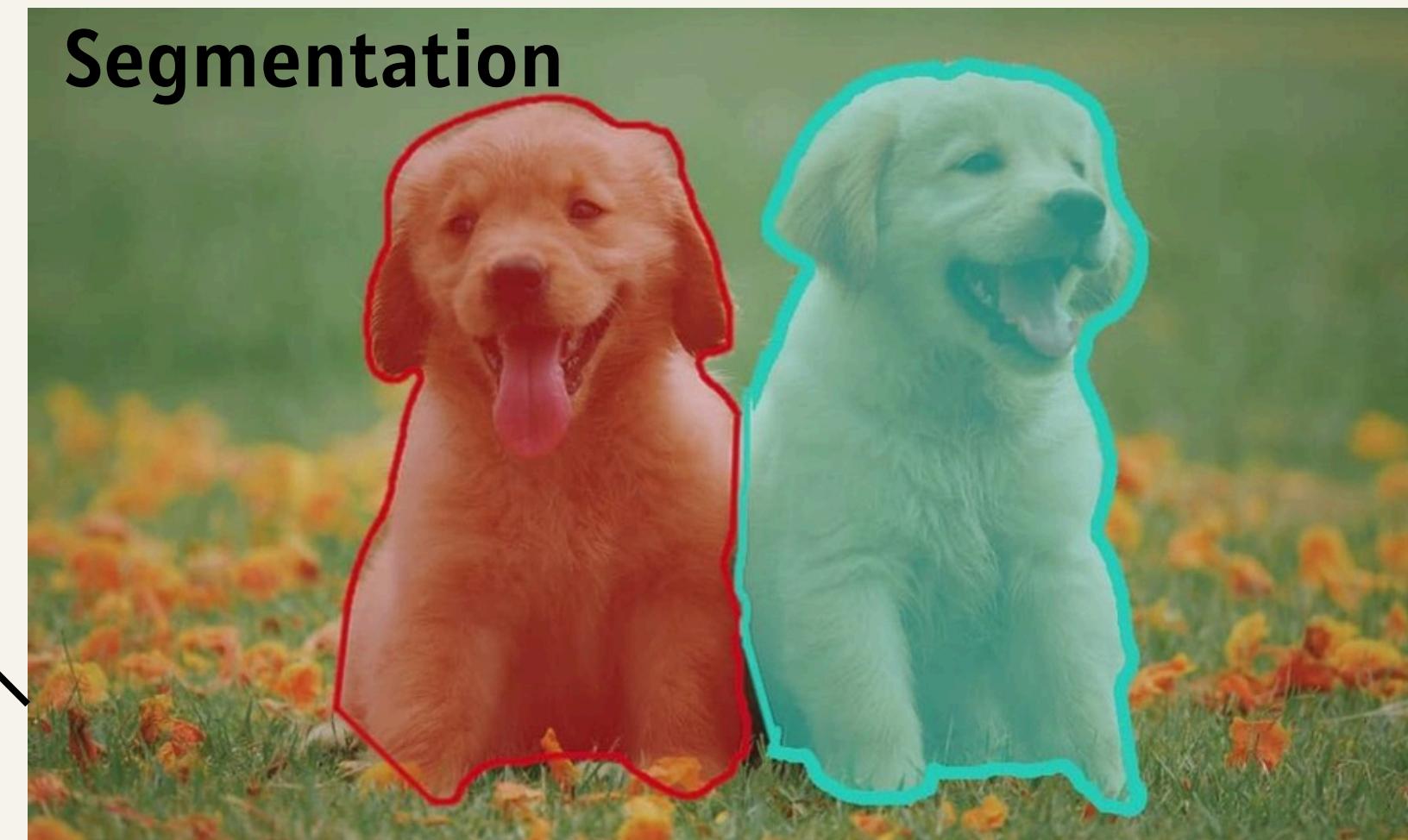
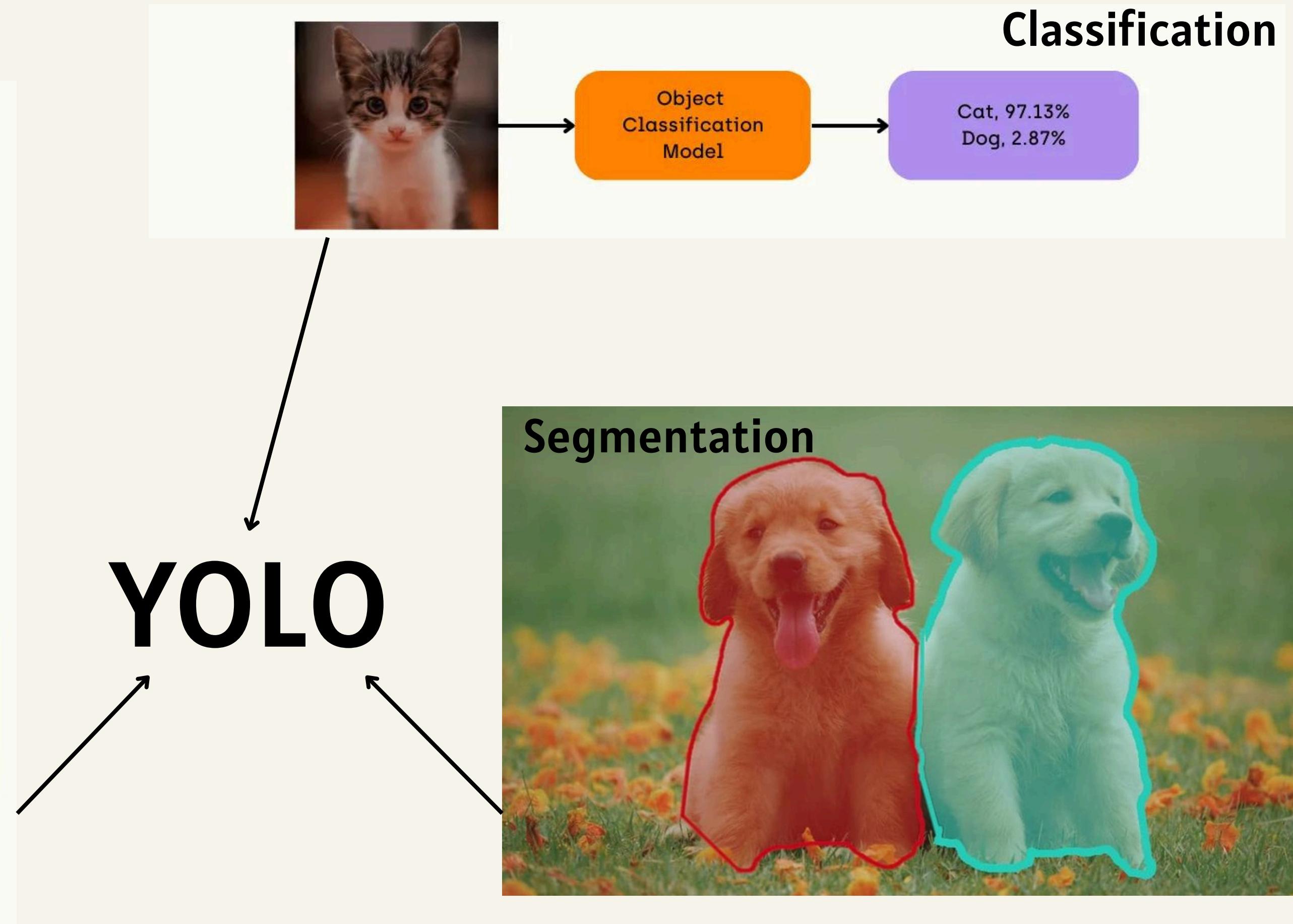
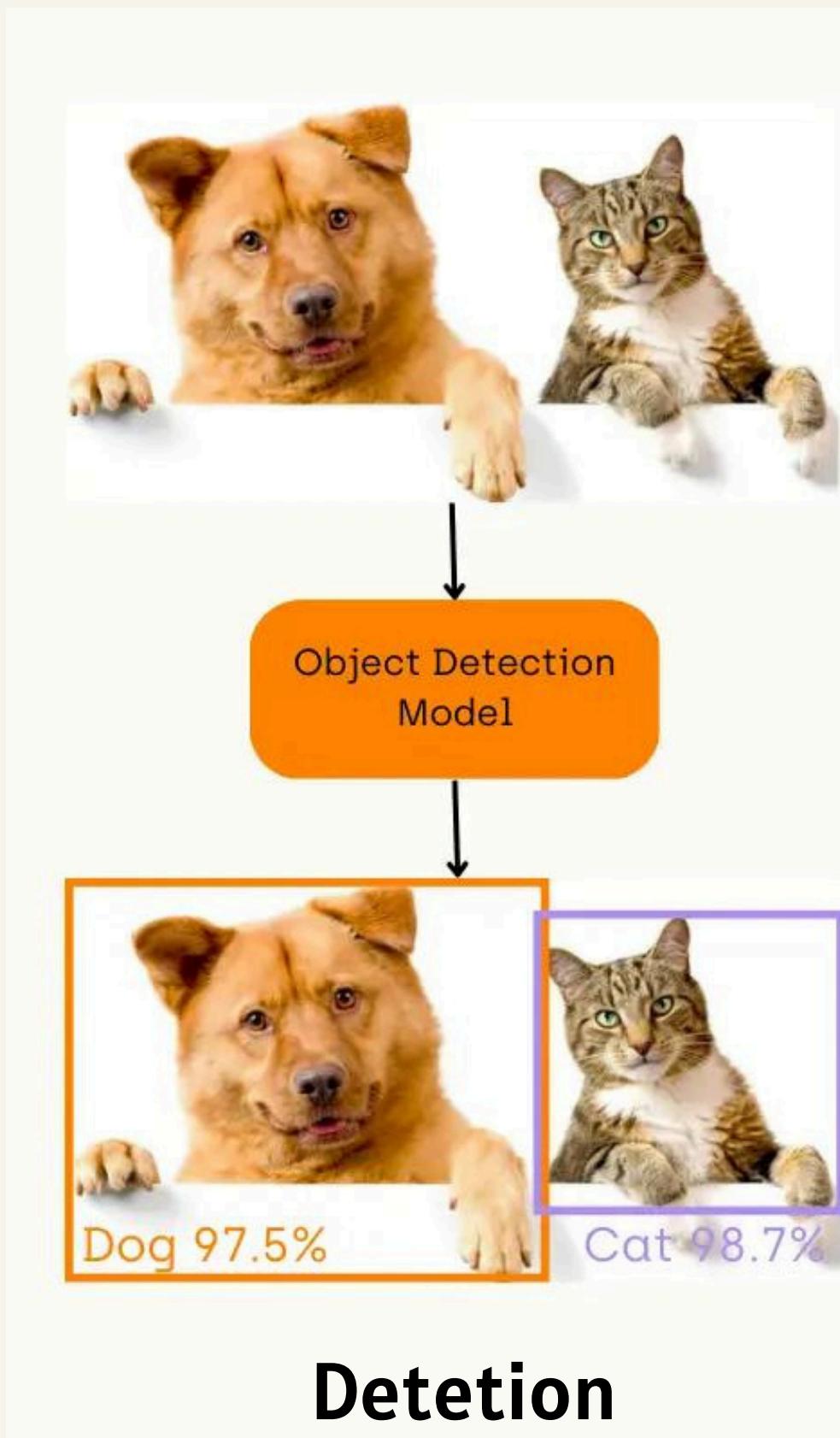
# INTRODUCTION



**Object Classification**

**Object Detection**

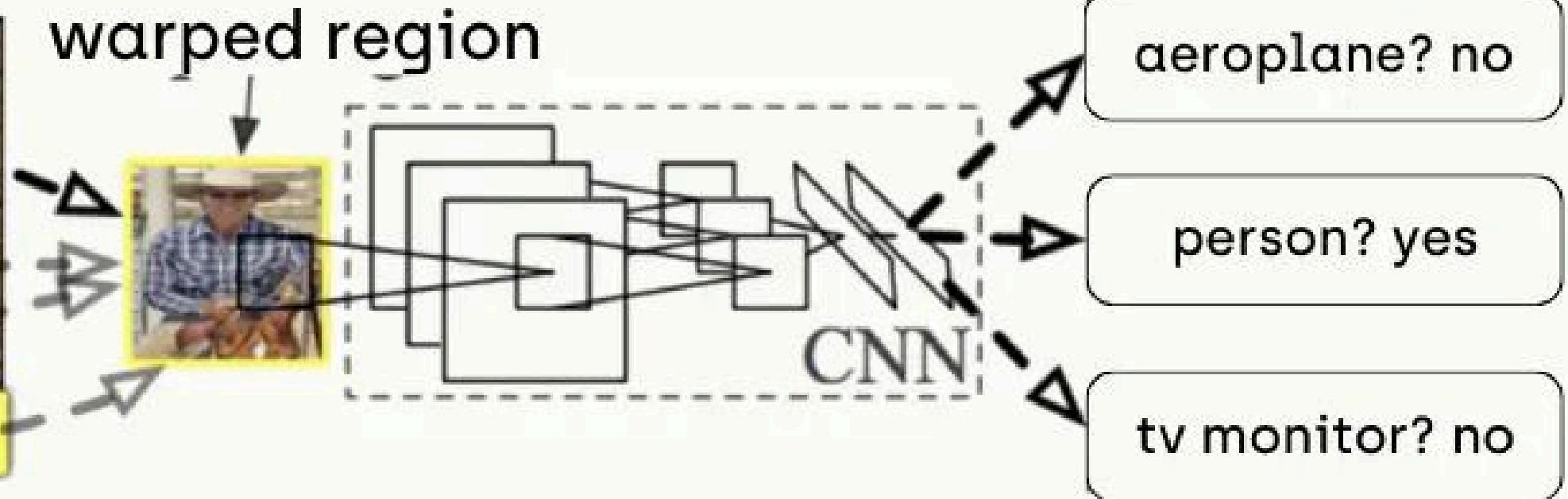
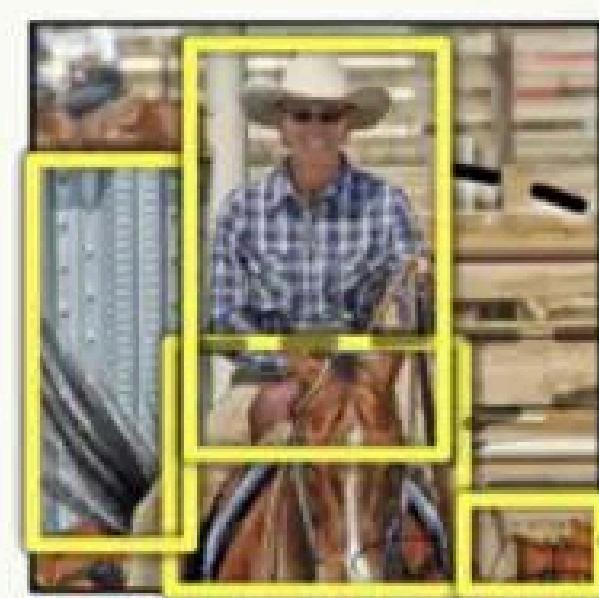
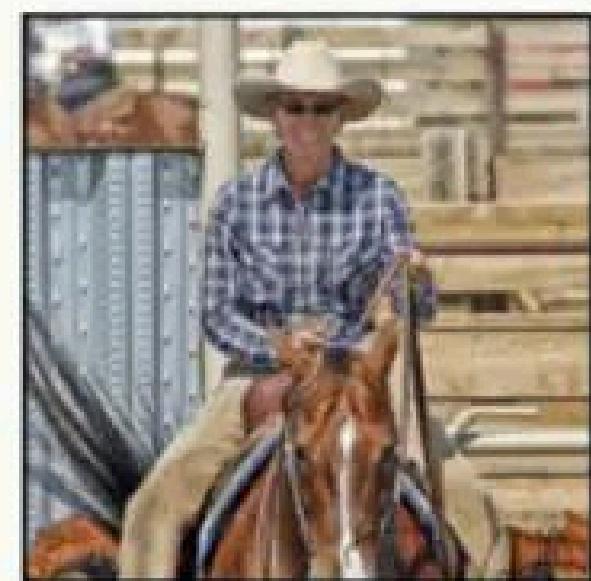
# Classification



YOLO

# YOLO Detection

## R-CNN: Regions with CNN features



1

Input  
image

2

Extract Region  
proposals (~2K)

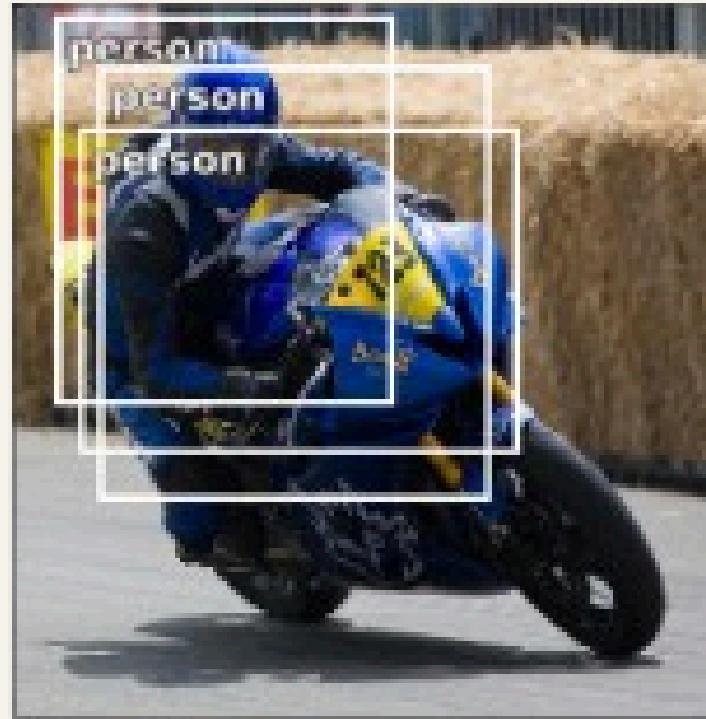
3

Compute CNN  
features

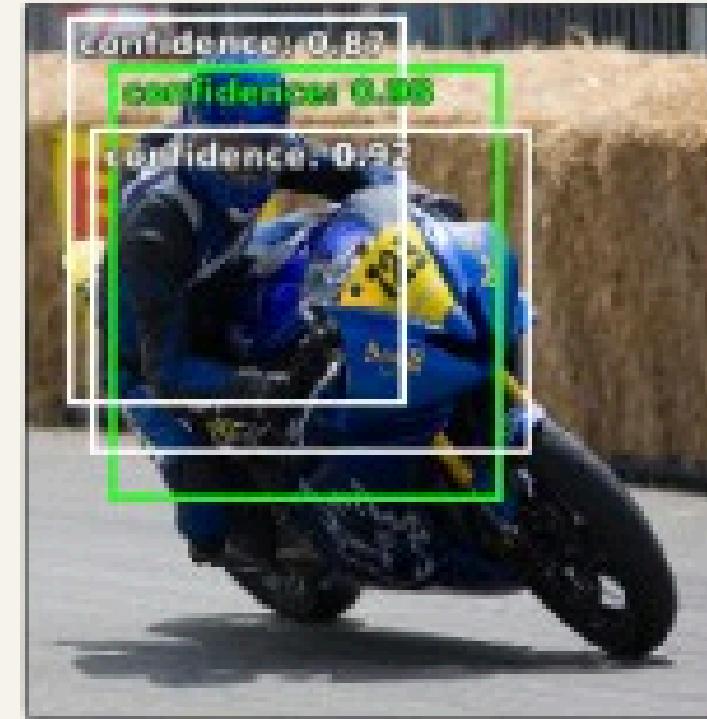
4

Classify  
Regions

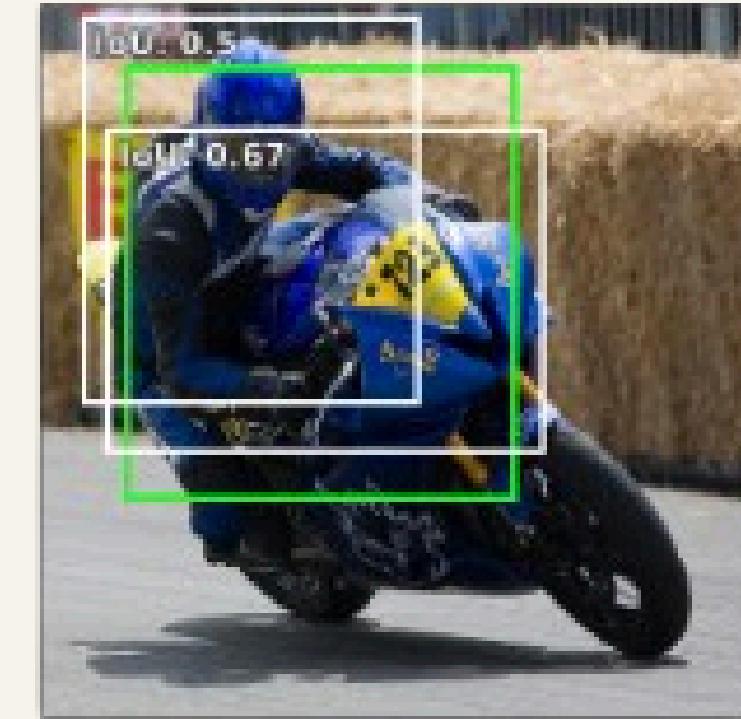
# Non-max suppression



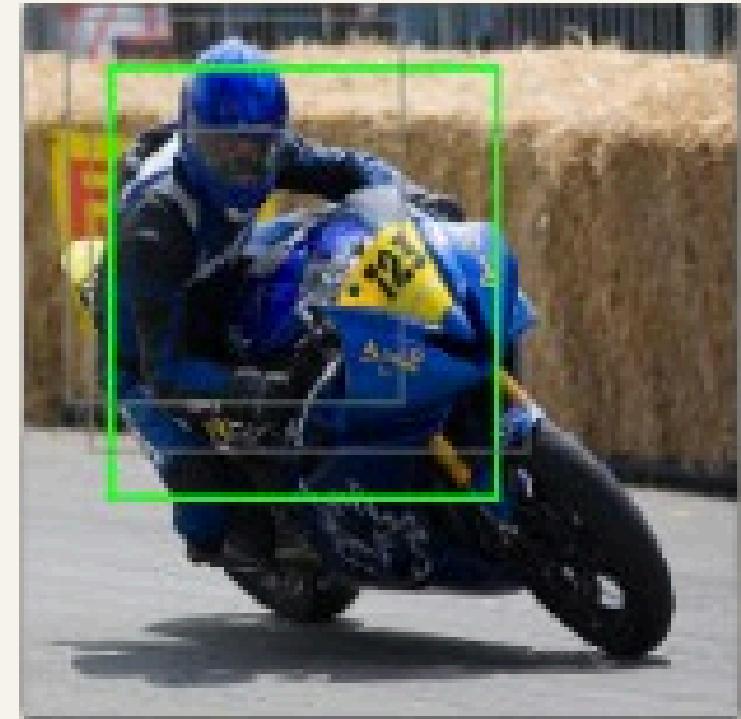
After filtering out low confidence predictions, we may still be left with **redundant detections**



Select the bounding box prediction with the **highest confidence**



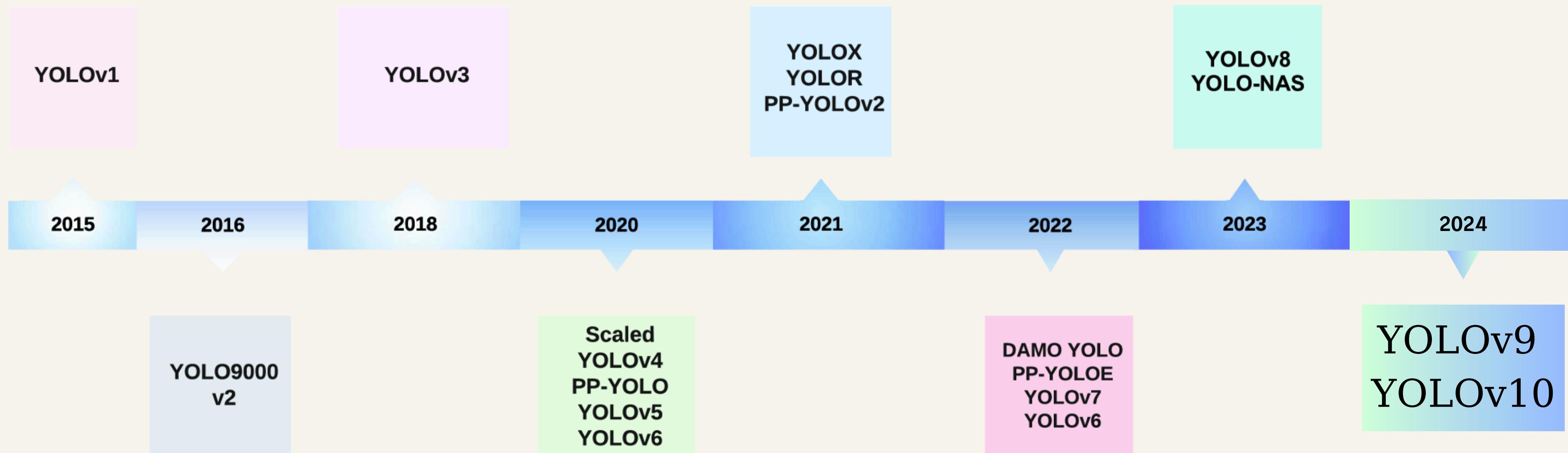
Calculate the **IoU** between the selected box and all. remaining predictions



Remove any boxes which have an IoU score above some defined threshold

$$\text{(Intersection over Union)} \text{ IOU} = \frac{\text{area of overlap}}{\text{area of union}} = \frac{\text{area of overlap}}{\text{area of union}}$$
A diagram showing two overlapping rectangles. The smaller blue rectangle is completely contained within the larger red rectangle. The overlapping region is highlighted in green.

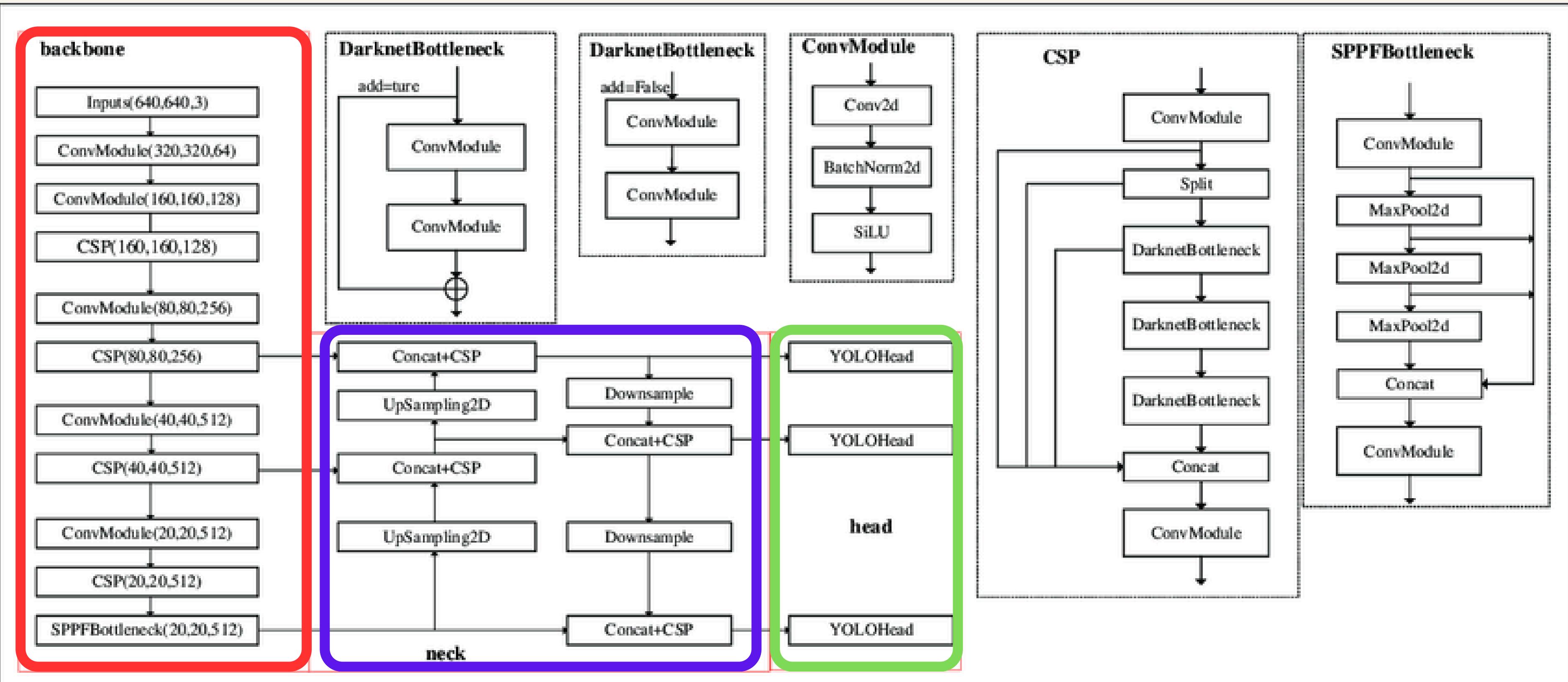
# Timeline of YOLO versions



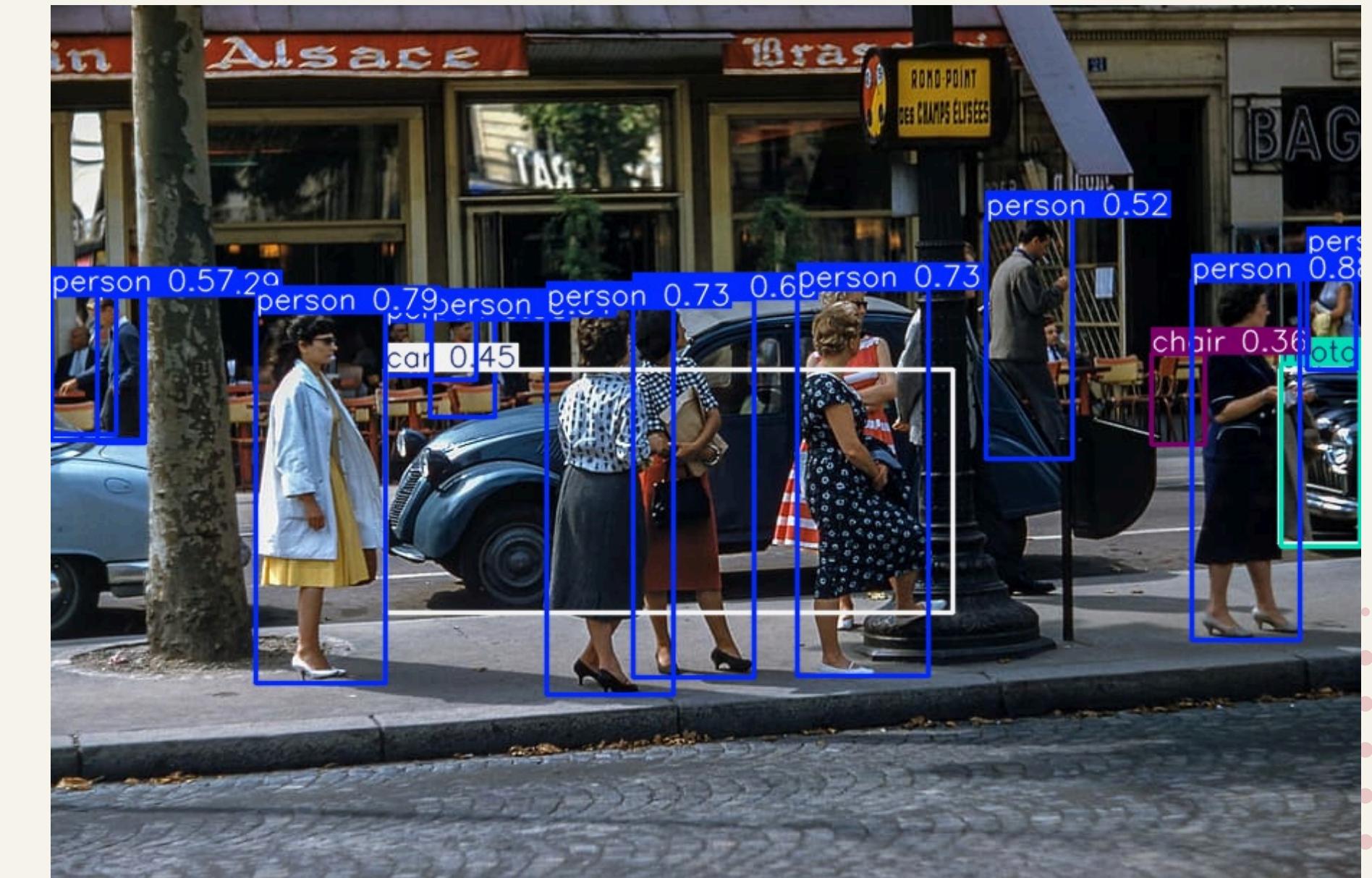


**ultralytics**  
YOLOv8

# YOLO v8 Architecture



# OBJECT DETECTION



# Object Detection

Models trained on **coco**, which include **80 pre-trained classes**

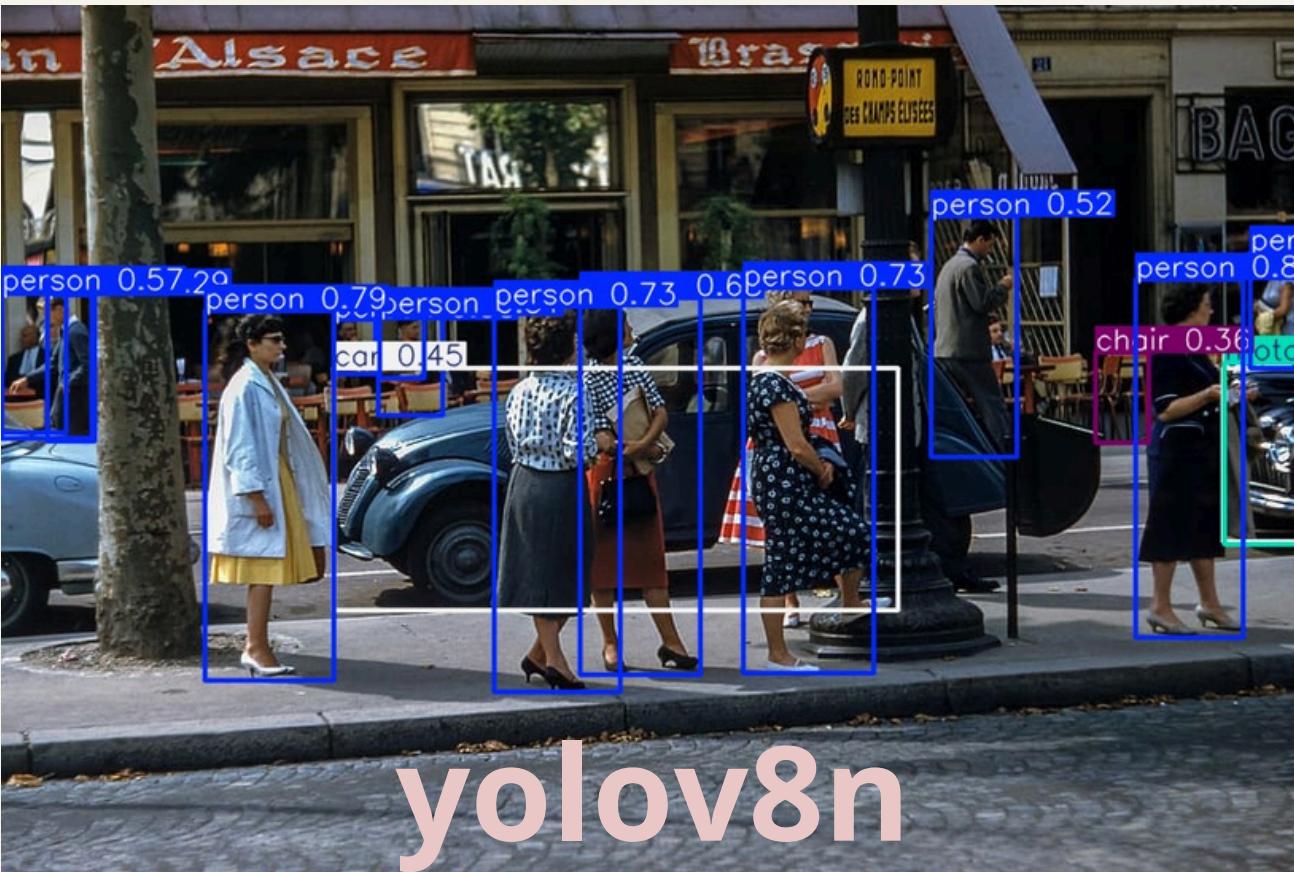
	Model	Speed	Layers	Parameters	GFLOPs
nano	YOLOv8n	191.1ms	168	3151904	8.7
small	YOLOv8s	308.4ms	168	11156544	28.6
medium	YOLOv8m	1114.8ms	218	25886080	78.9
large	YOLOv8l	1303.4ms	268	43668288	165.2
Xtra large	YOLOv8x	2070.3ms	268	68200608	257.8

Environment: Python-3.9.13 torch-2.3.1+cpu  
CPU (12th Gen Intel Core(TM) i5-1240P)

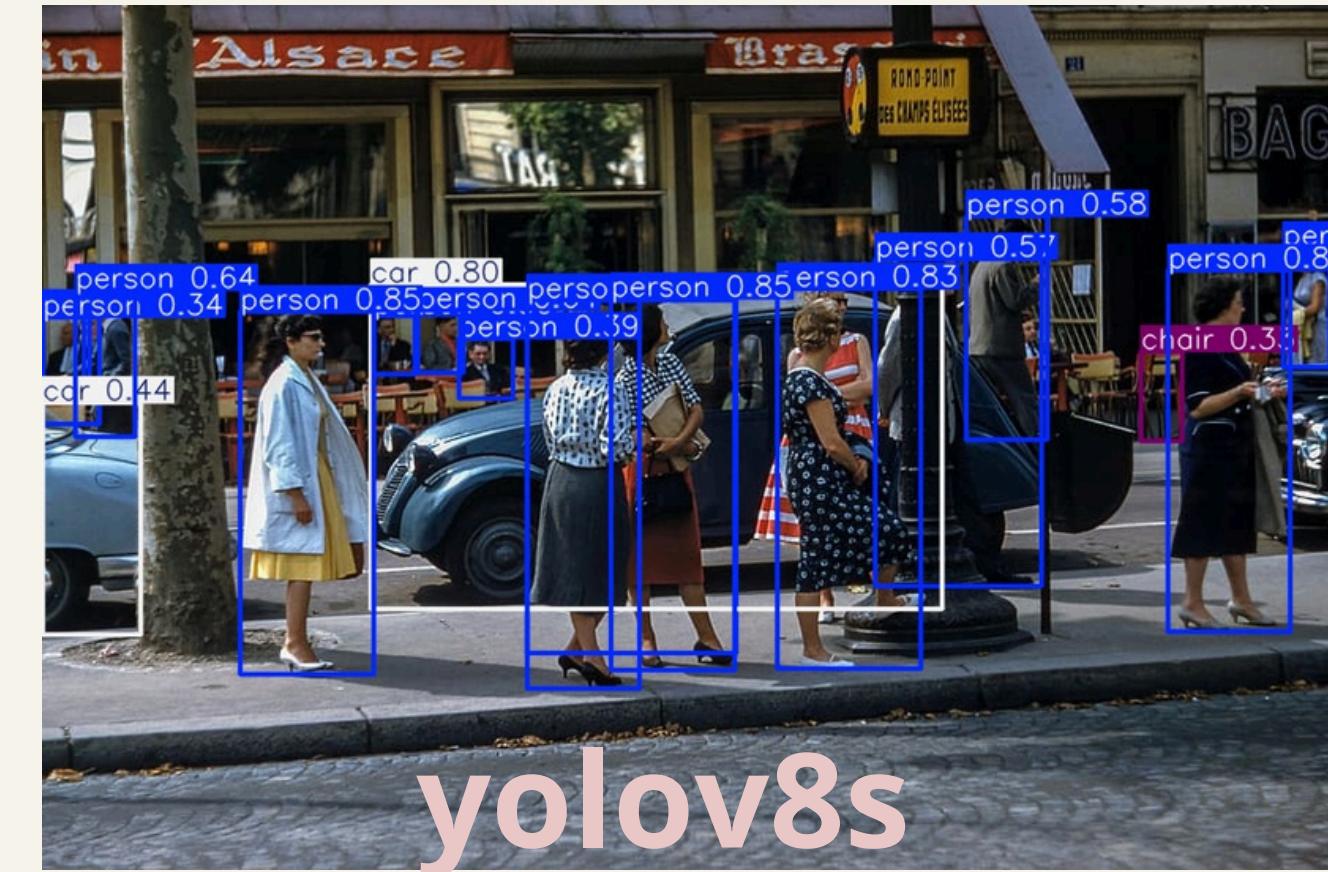
GFLOPs: Giga Floating Point  
Operations Per Second

# Result

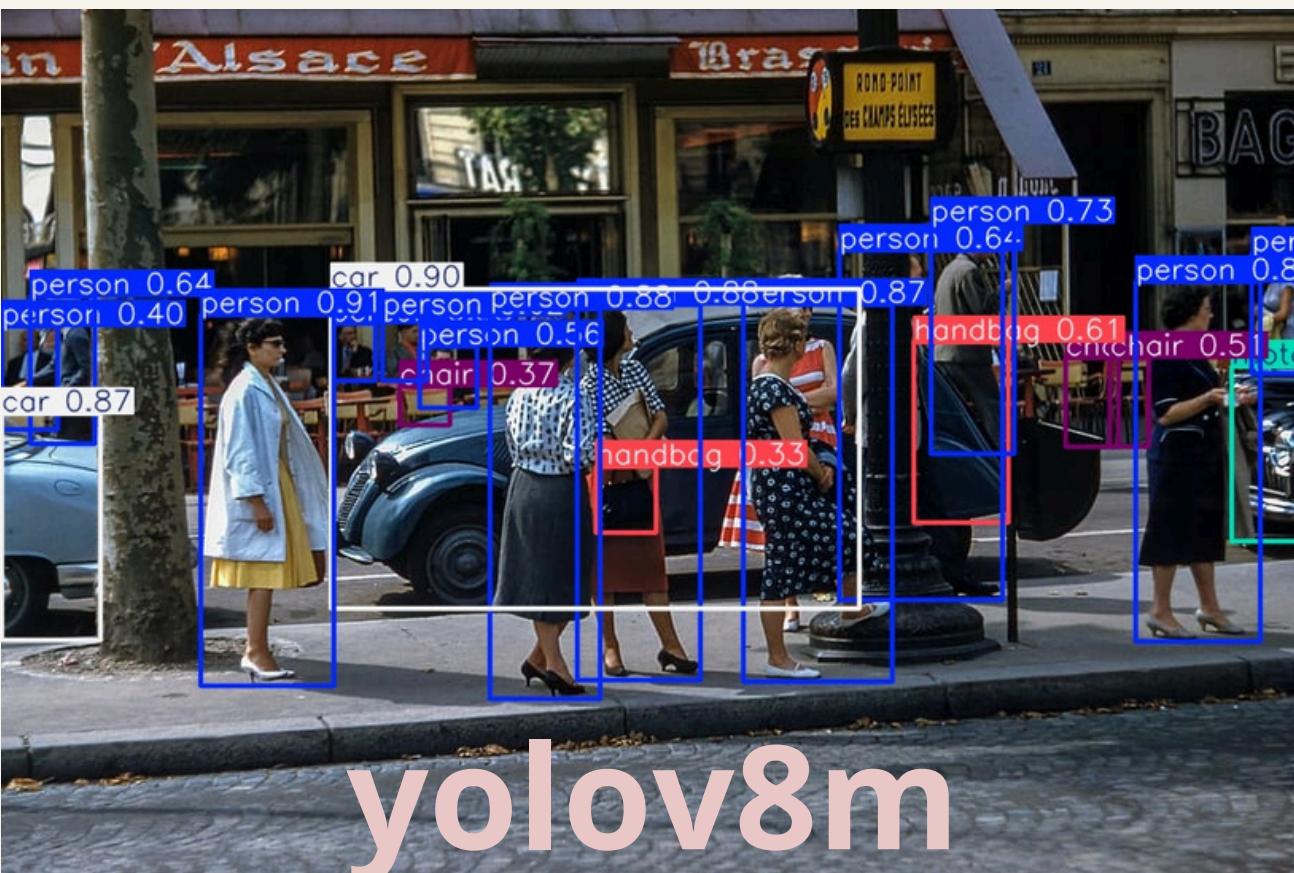
yolov8



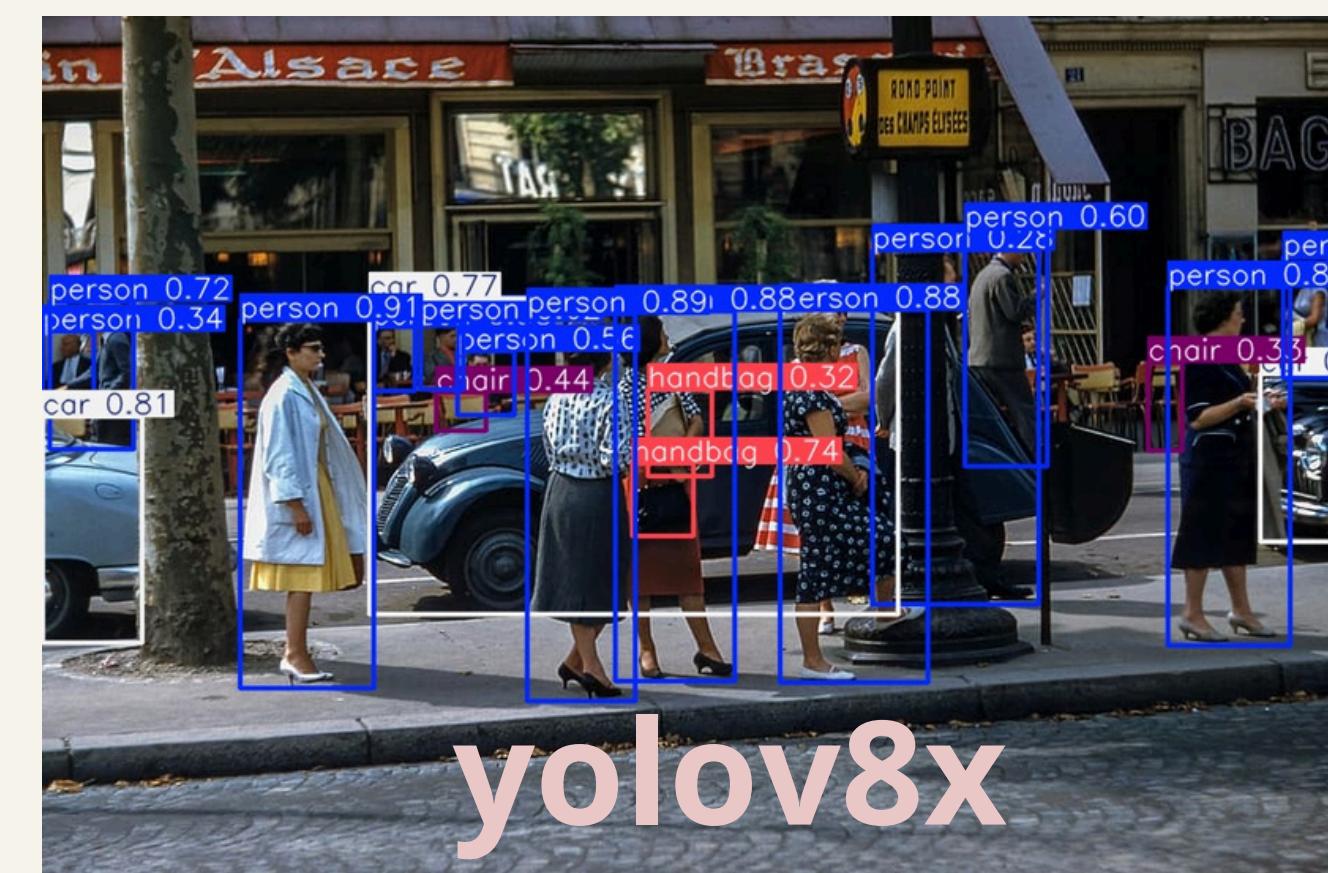
yolov8n



yolov8s



yolov8m



yolov8x

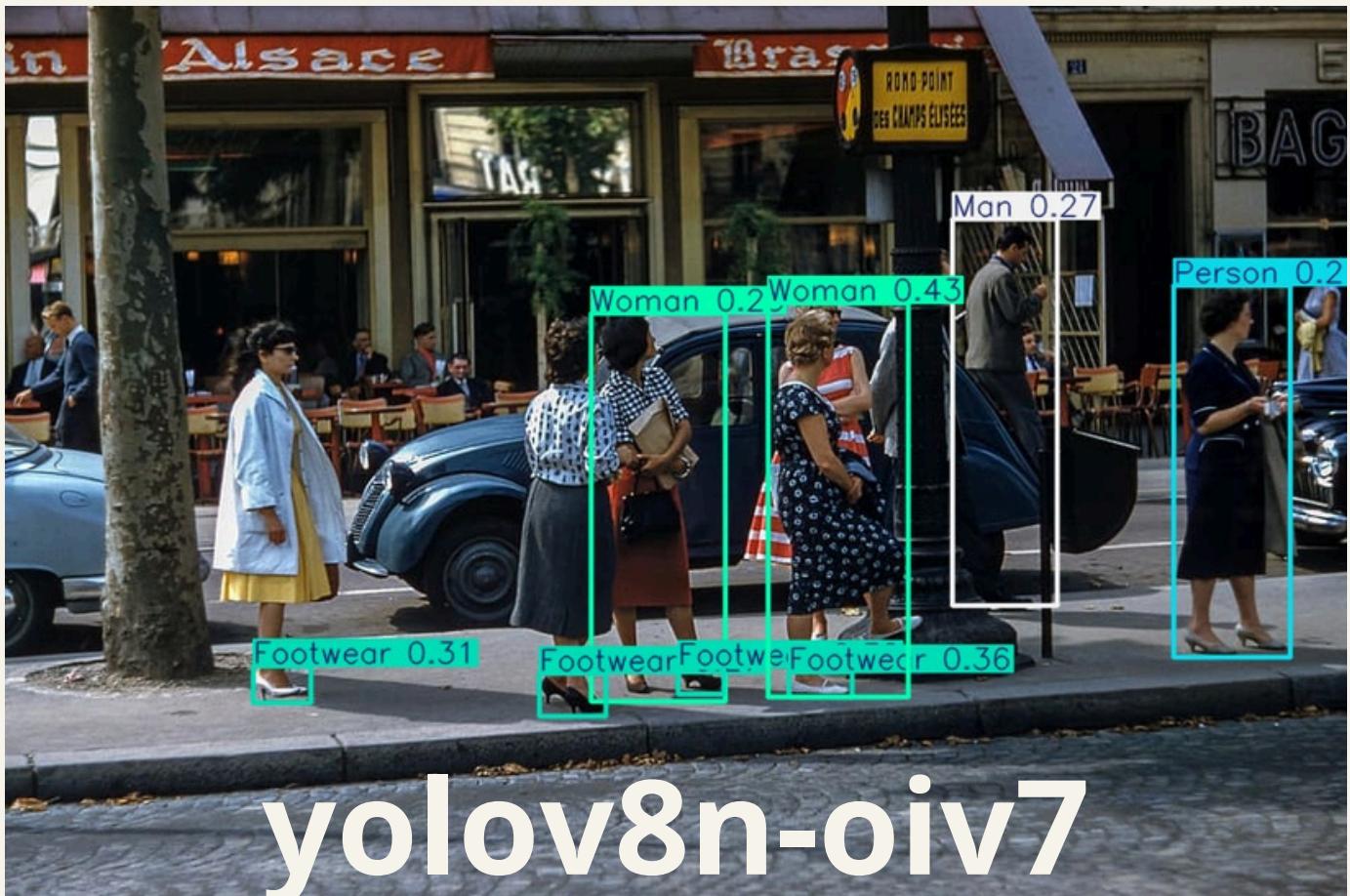
# Object Detection

Models trained on **OpenImage v7**,  
which include **600 pre-trained classes**

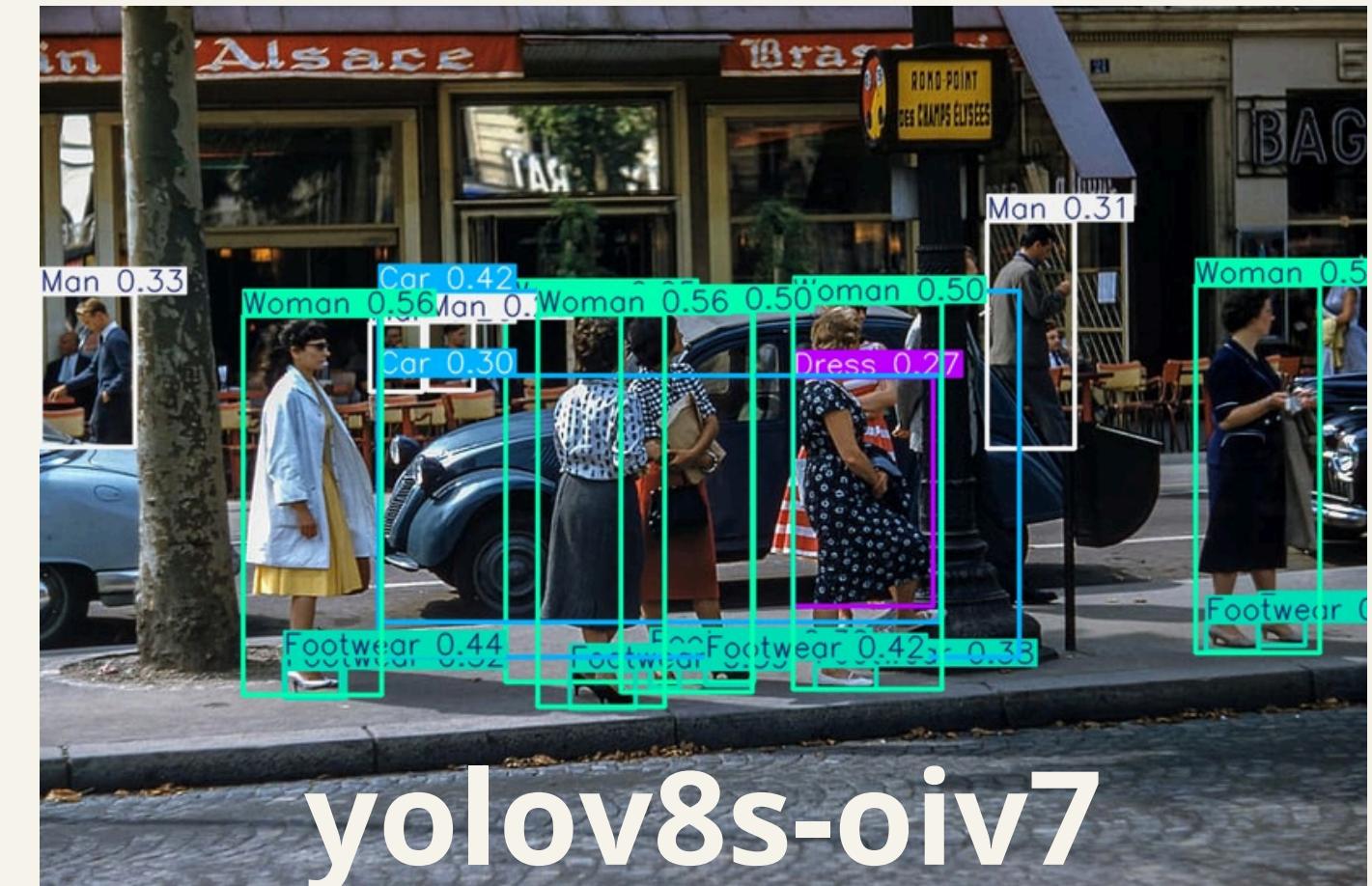
Model	Speed	Layers	Parameters	GFLOPs
YOLOv8n	252.7ms	168	3492527	10.5
YOLOv8s	566.0ms	168	11358171	29.7
YOLOv8m	727.8ms	218	26187739	80.6
YOLOv8l	1980.8ms	268	44069979	167.4
YOLOv8x	2155.7ms	268	68702331	260.6

# Result

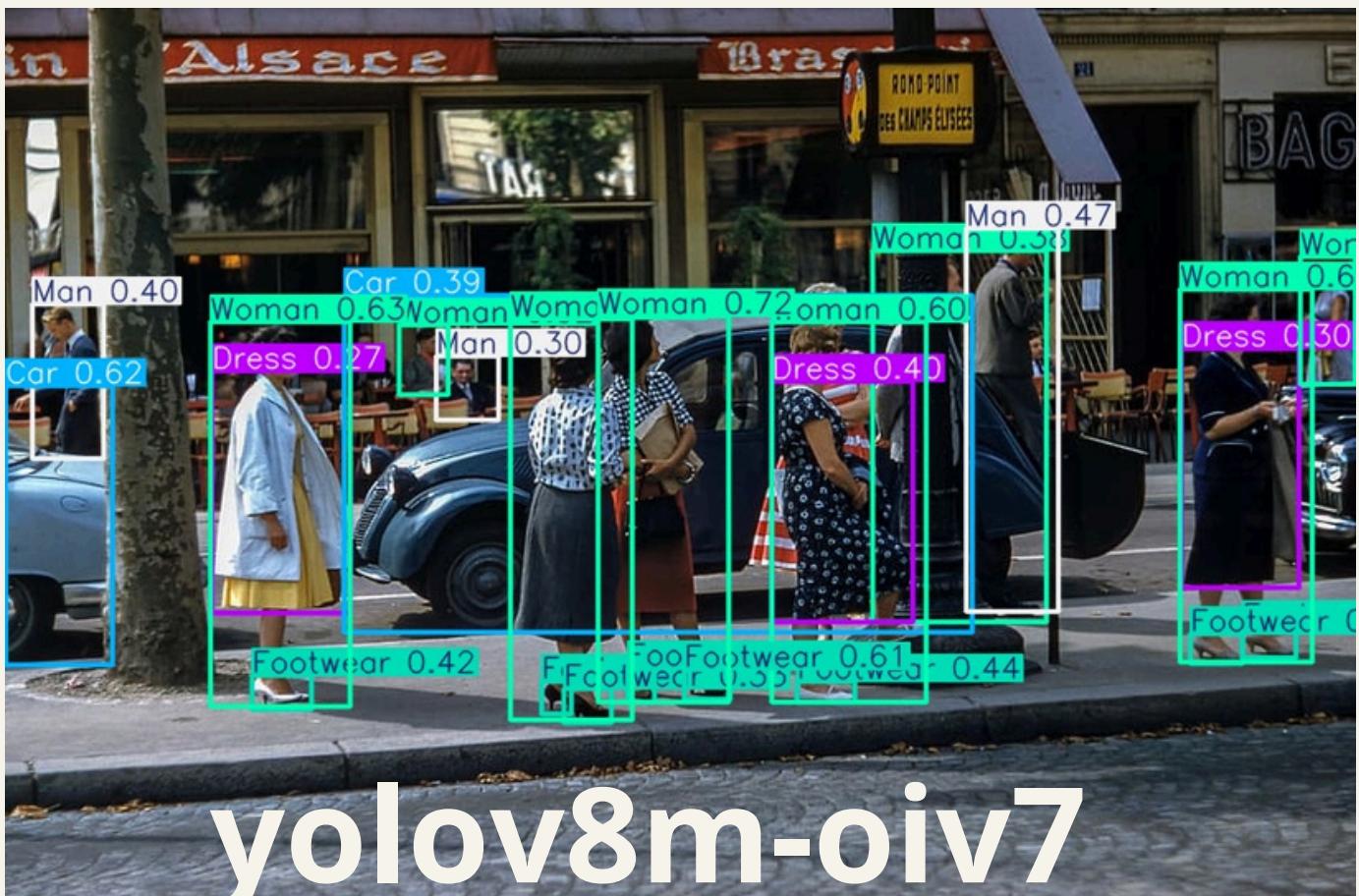
yolo v8



yolov8n-oiv7



yolov8s-oiv7



yolov8m-oiv7



yolov8l-oiv7

# Segmentation

Models trained on **coco-Seg**, which include **80 pre-trained classes**

Model	Speed	Layers	Parameters	GFLOPs
YOLOv8n	231.8ms	195	3404320	12.6
YOLOv8s	413.9ms	195	11810560	42.6
YOLOv8m	955.6ms	245	27268704	110.2
YOLOv8l	1705.2ms	295	45973568	220.5
YOLOv8x	3079.0ms	295	71797696	344.1

# Result

YOLOv8



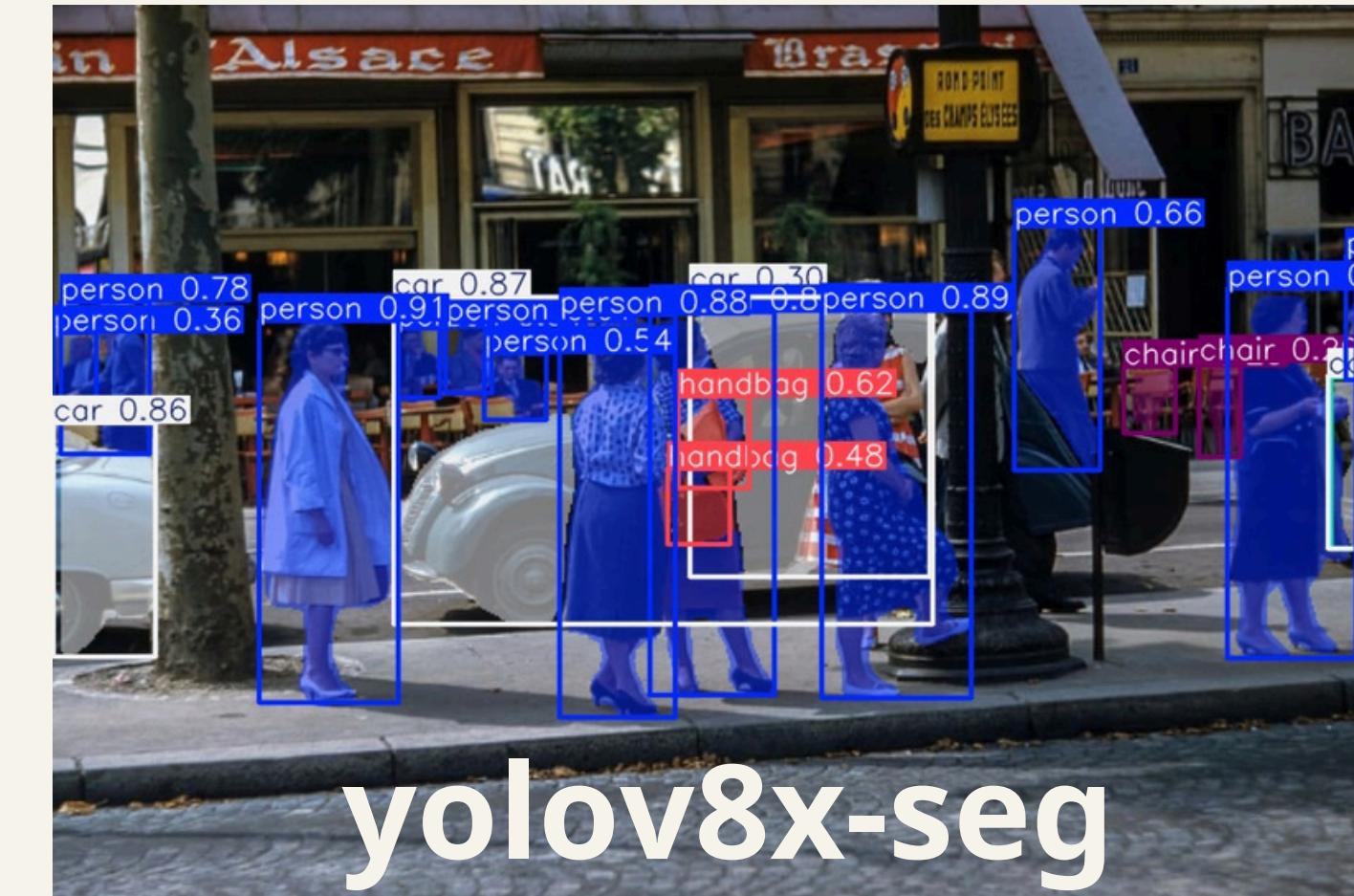
yolov8n-seg



yolov8s-seg



yolov8m-seg



yolov8x-seg

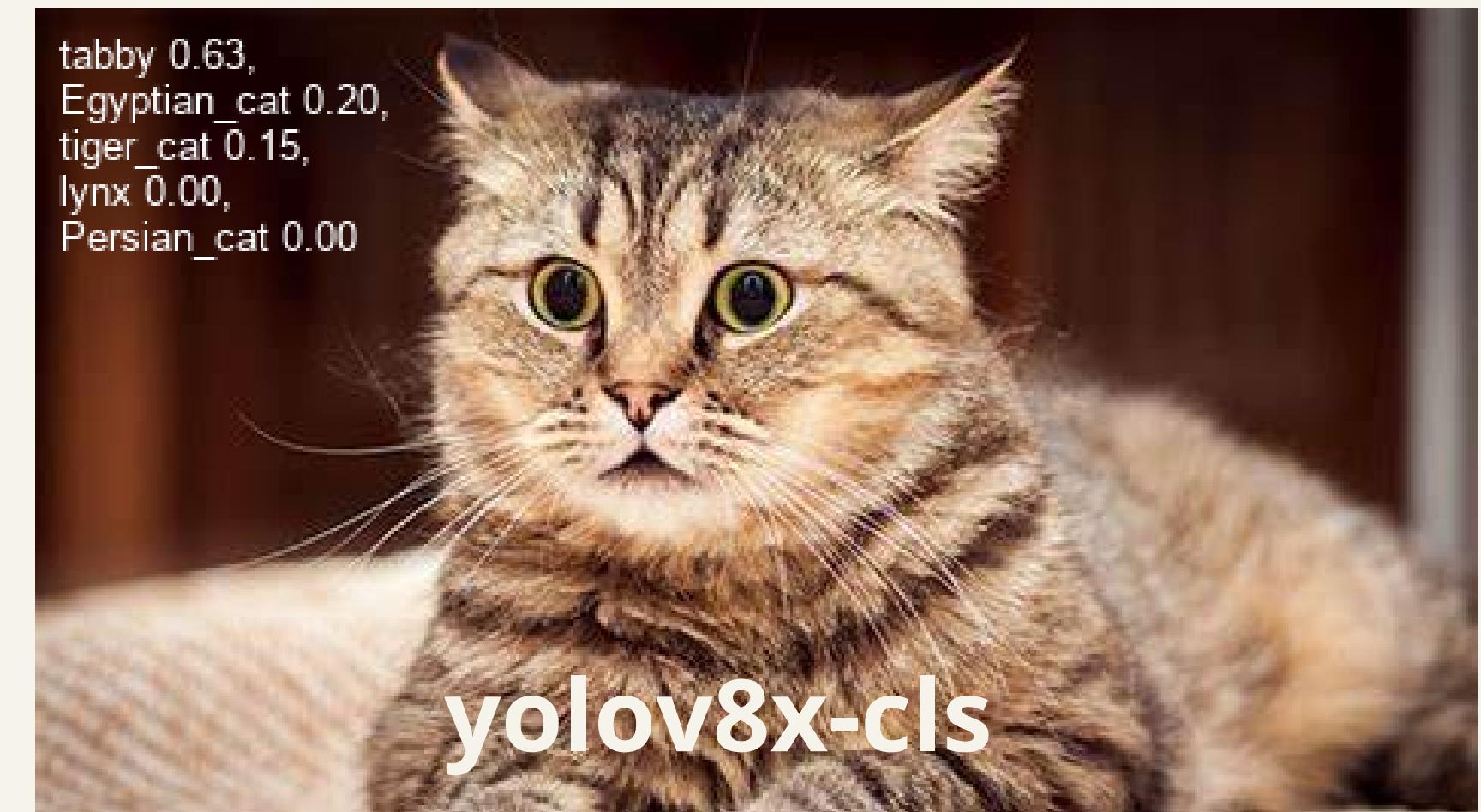
# Classification

Models trained on **ImageNet**, which include **1000 pre-trained classes**

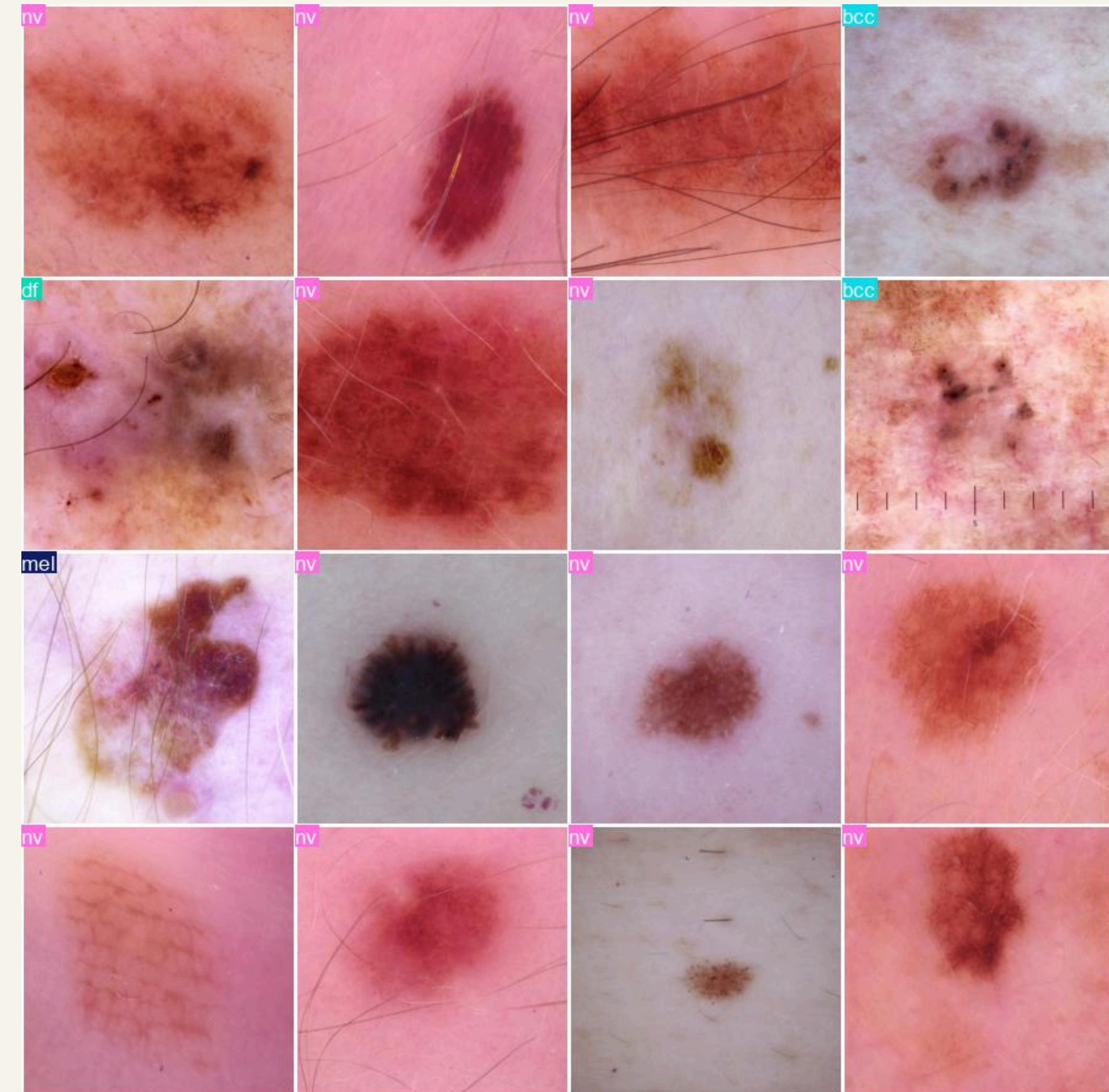
Model	Speed	Layers	Parameters	GFLOPs
YOLOv8n	19.1ms	73	2715880	4.3
YOLOv8s	31.0ms	73	6356200	13.5
YOLOv8m	73.2ms	103	17043656	42.7
YOLOv8l	167.1ms	133	37465576	99.7
YOLOv8x	306.8ms	133	57404200	154.8

# Result

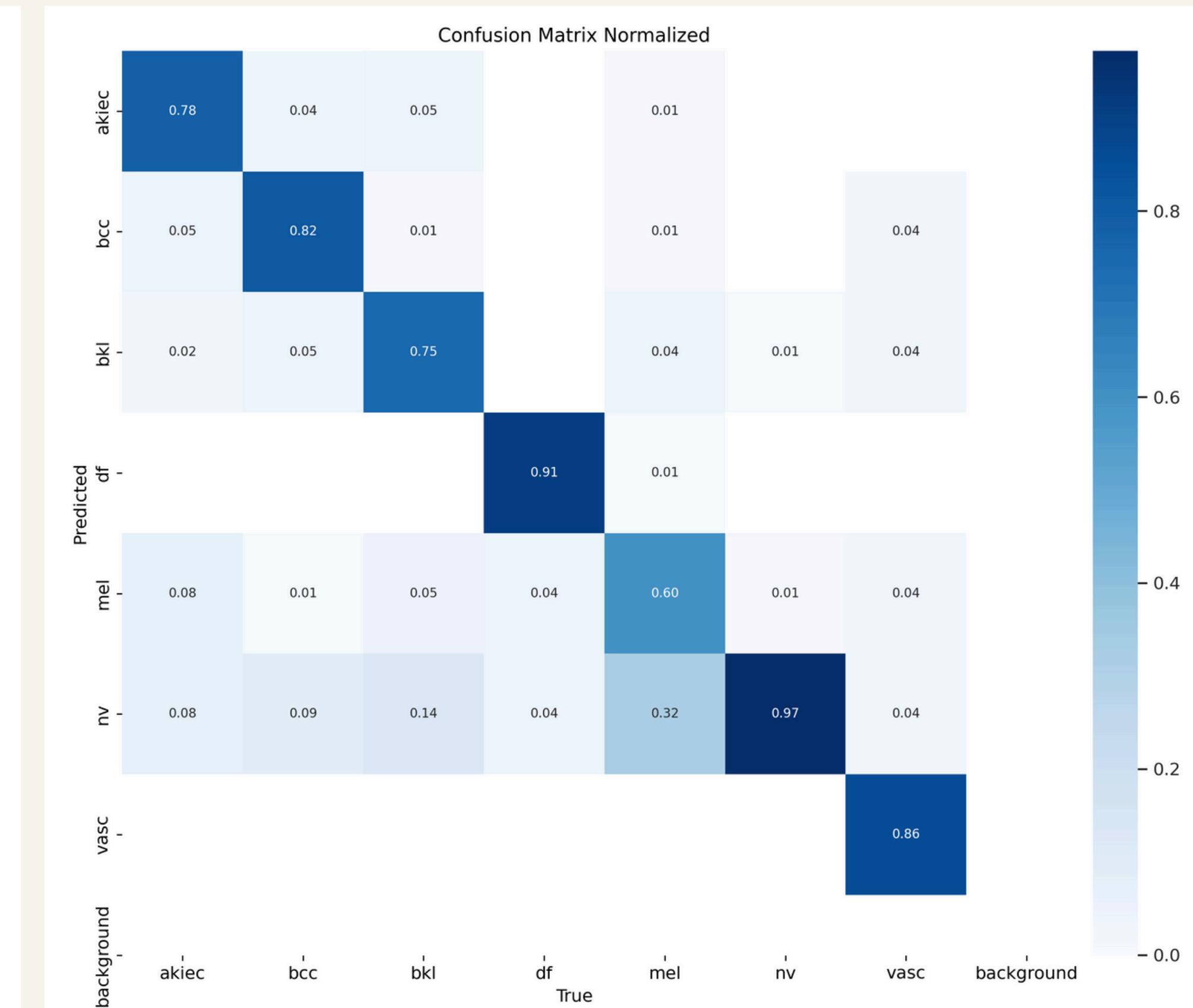
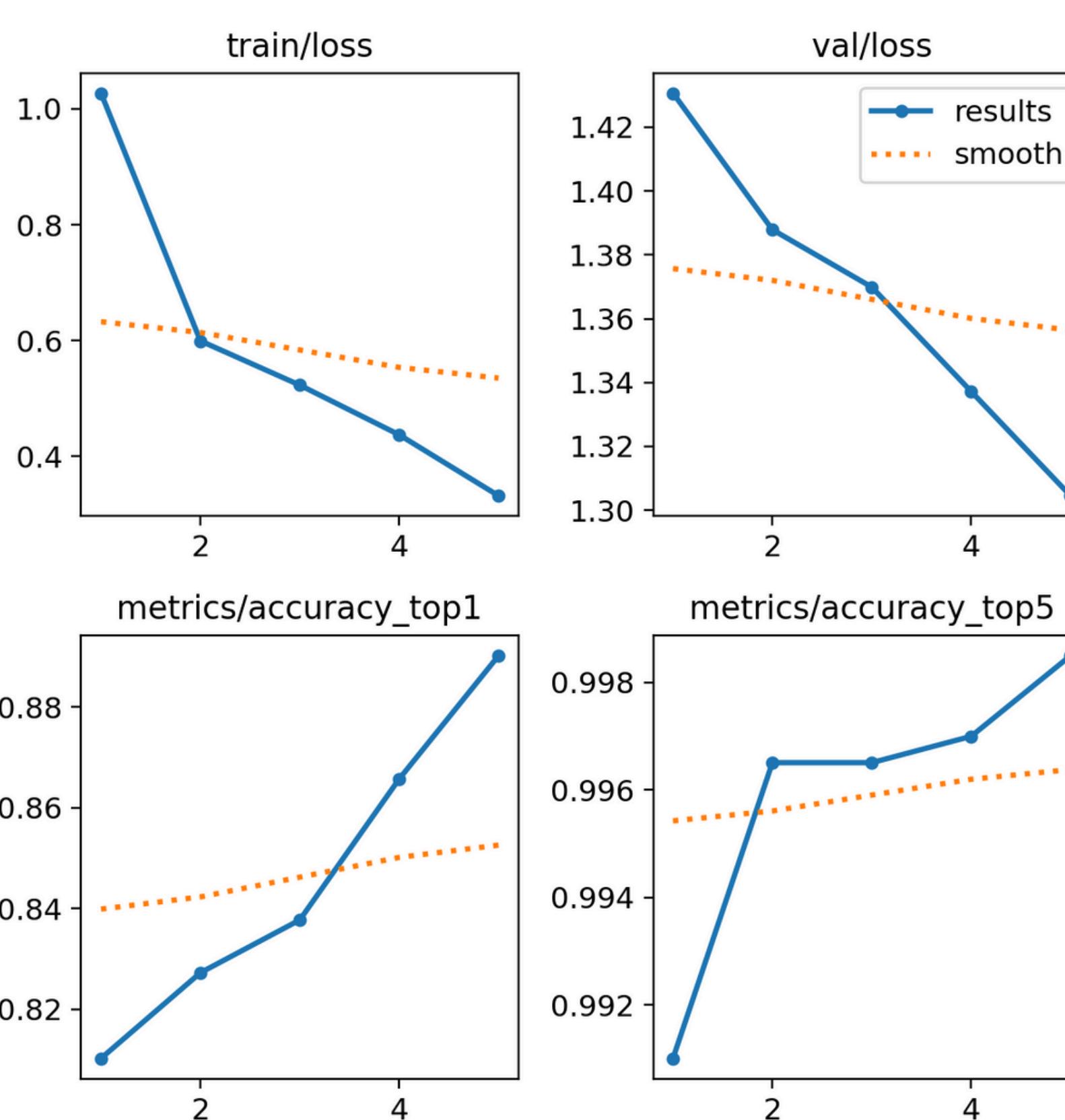
YOLOv8



# Skin Cancer MNIST: HAM10000



# Result



Larana University | 2024

# THANK YOU

Presented By : Adeline Palmerston