Deep Learning and Artificial Intelligence

Practical Workshop

Day 1 — 21st Jan-2025

SESSION 1

T S. DR. HASAN FIRDAUS BIN MOHD ZAKI

Director for Center For Unmanned Technologies, IIUM Malaysia
Years of Exp:13

INTRODUCTION TO DEEP LEARNING

6:00PM to 7:30PM

SESSION 2

DR. AHMAD JAZLAN BIN HAJA MOHIDEEN

Associate Professor IIUM Malaysia
Years of Exp:13

PYTHON FOR DEEP LEARNING

8:00PM to 9:30PM

Day 2 — 22nd Jan-2025

SESSION 3

DR. AHMED RIMAZ FAIZABADI

Delloyd R&D Sdn Bhd, Lead AI Specialist
Years of Exp:20

OPENCV

6:00PM to 7:30PM

SESSION 4

DR.ZULKIFLI BIN ZAINAL ABIDIN

Associate Professor, MCT IIUM.
Years of Exp:14

INTRODUCTION TO PYTORCH (CLASSIFICATION)

8:00PM to 9:30PM

Day 3 — 23rd Jan-2025

SESSION 5

DR. MUHAMMAD AFIF BIN HUSMAN

Associate Professor IIUM Malaysia
Years of Exp:15

TRANSFER LEARNING

6:00PM to 7:30PM

SESSION 6

DR. AHMAD JAZLAN BIN HAJA MOHIDEEN

Associate Professor IIUM Malaysia
Years of Exp:13

INTRODUCTION TO EMBEDDED AI

8:00PM to 9:30PM

Day 4 — 24th Jan-2025

SESSION 7

T S. DR. HASAN FIRDAUS BIN MOHD ZAKI

Director for Center For Unmanned Technologies, IIUM Malaysia
Years of Exp:13

OBJECT DETECTION ON VIDEOS

6:00PM to 7:30PM

SESSION 8

DR. AHMED RIMAZ FAIZABADI

Delloyd R&D Sdn Bhd, Lead AI Specialist
Years of Exp:20

USE CASE OF VIDEO ANALYTICS IN INTELLIGENT TRANSPORT SYSTEM

8:00PM to 9:30PM

Day 5 — 25th Jan-2025

SESSION 9

DR. ZULKIFLI BIN ZAINAL ABIDIN

Associate Professor, MCT IIUM.
Years of Exp:14

DEVELOPMENT CUSTOM OBJECT DETECTOR FOR AERIAL DRONES.

6:00PM to 7:30PM

SESSION 10

MR. YOUSEF ABD ALHATTAB

Research officer, Center For Unmanned Technologies, IIUM Malaysia
Years of Exp:10 years

VIDEO SEGMENTATION APPLICATION AND EXAMPLES

8:00PM to 9:30PM

Day 6 — 27th Jan-2025

SESSION 11

DR. MUHAMMAD AFIF BIN HUSMAN

Associate Professor IIUM Malaysia
Years of Exp:15

INTELLIGENT ANALYTICS FOR TRACKING & COUNTING MINI PROJECTS.

2:00PM to 3:30PM

SESSION 12

MR. YOUSEF ABD ALHATTAB

Research officer, Center for Unmanned Technologies, IIUM Malaysia
Years of Exp:10 years

INTRODUCTION OF MLOPS

3:30PM to 5:00PM

SESSION 13

DR. ASIF AFZAL

Research professor & Luxembourg University
Years of Exp:14

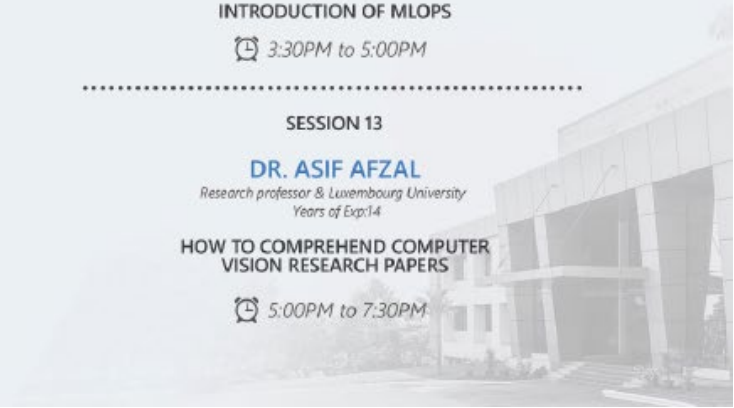
HOW TO COMPREHEND COMPUTER VISION RESEARCH PAPERS

5:00PM to 7:30PM

6:30PM TO 7:30PM
ONLINE TEST & FEEDBACK

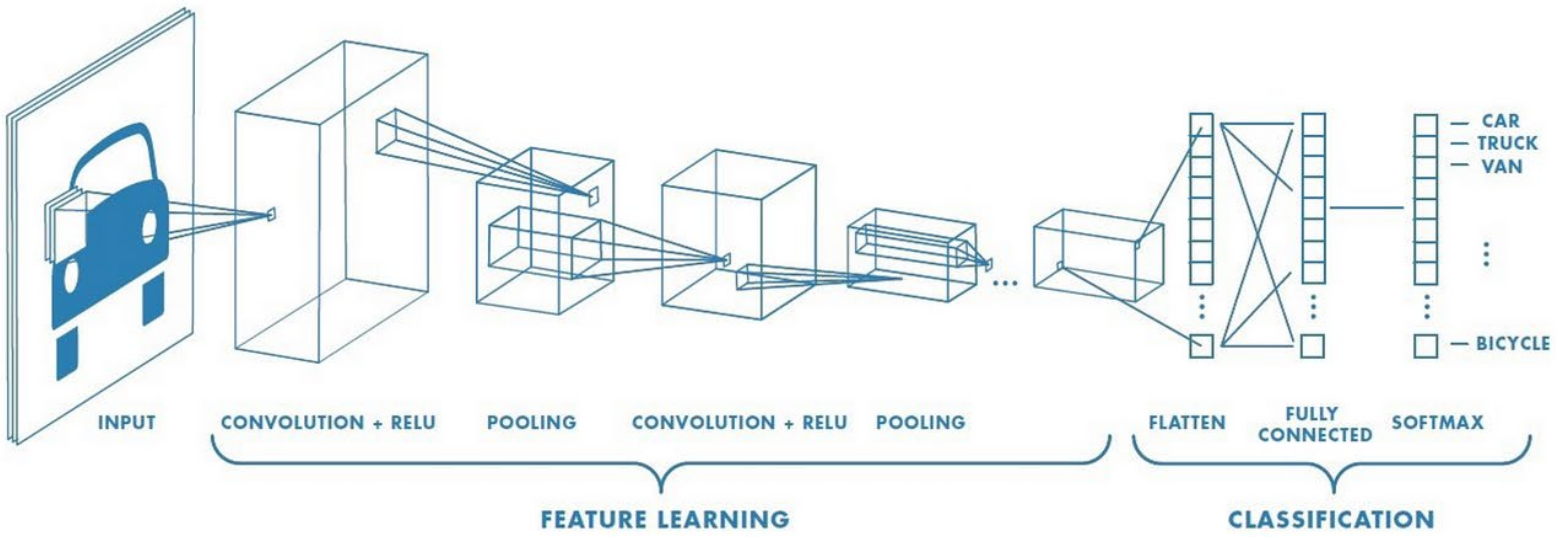
7:30PM TO 8:00PM
VALEDICTORY SESSION

NOTE: 26th JAN IS HOLIDAY

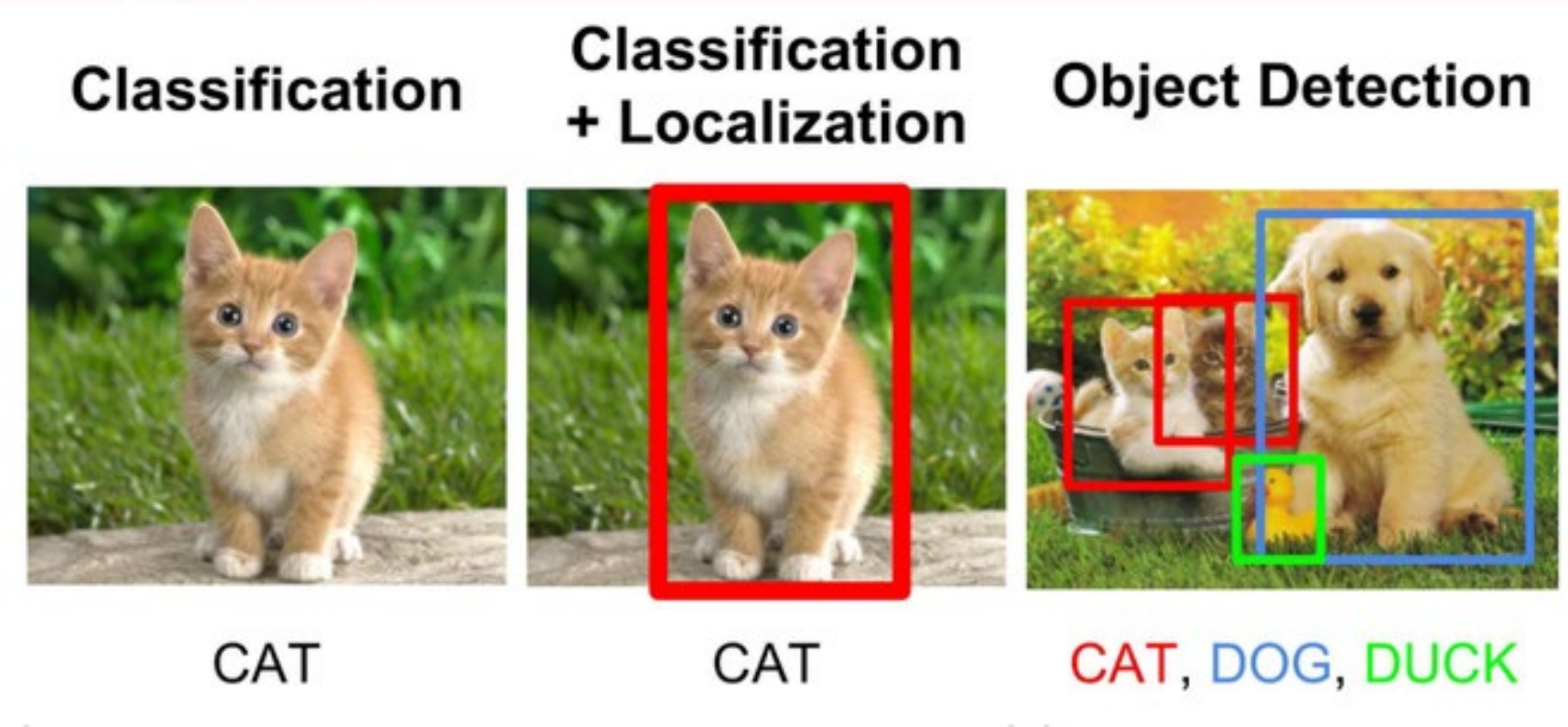


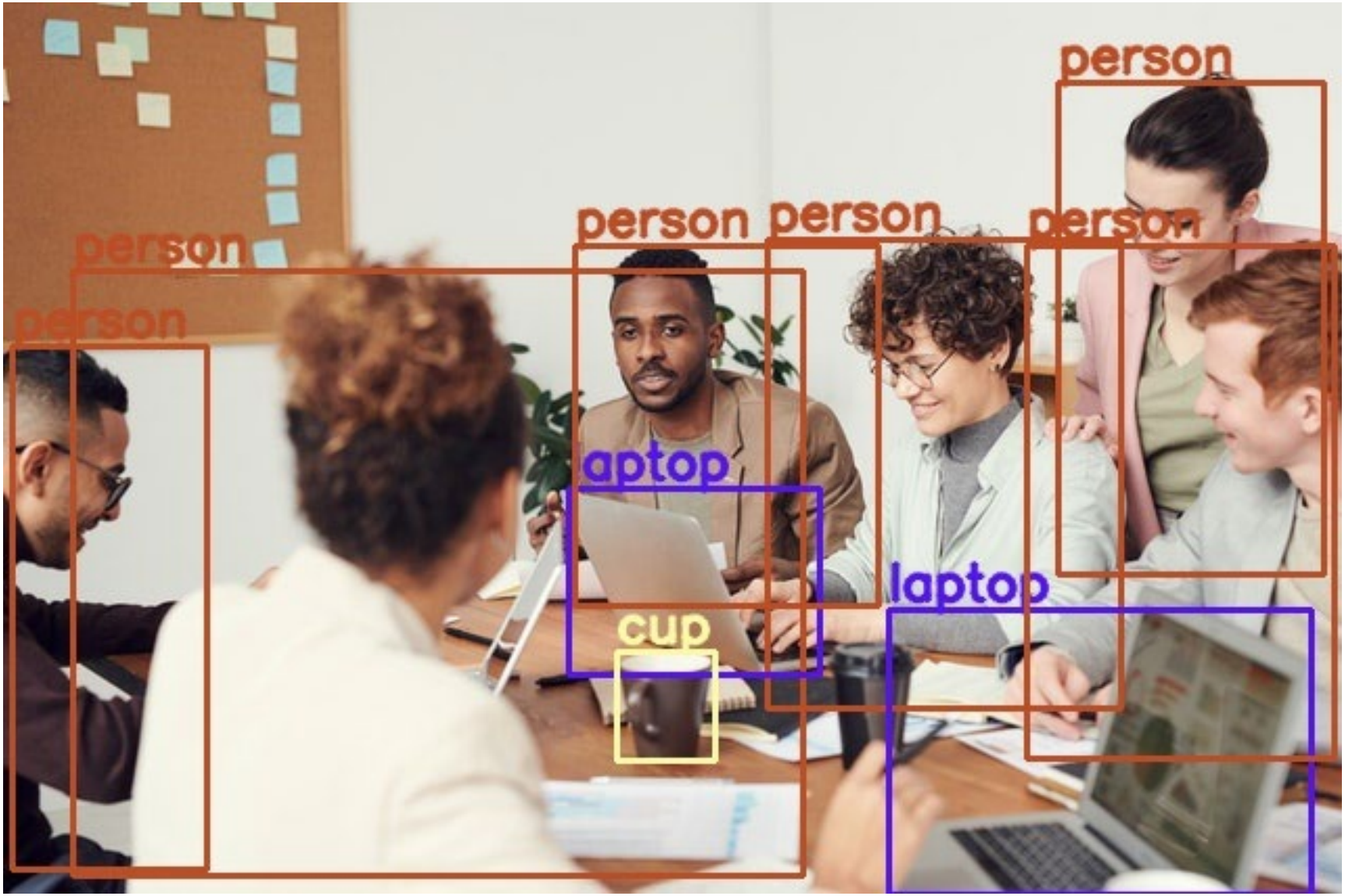
What is object detection?

Image Classification



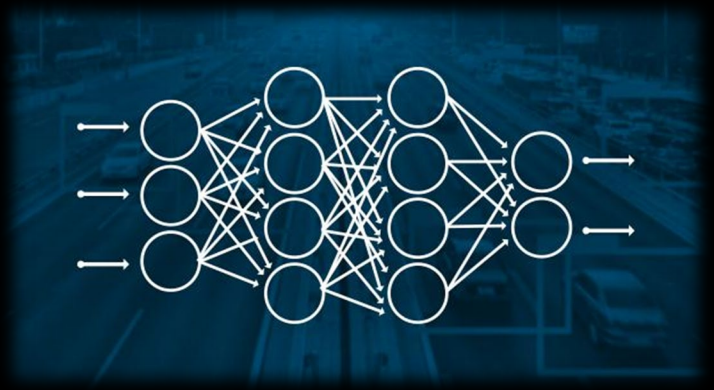
Classification VS Detection




person
person
person
person
person
person
aptop
laptop
cup

Neural Networks

Input



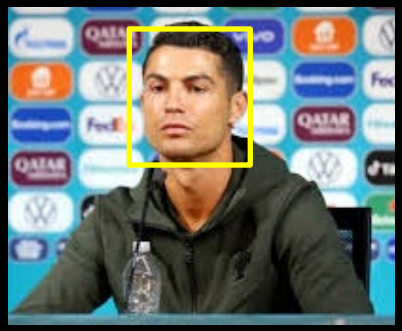
DL Model/ Network/ Architecture

Classification

"Ronaldo"

Regression

Nose tip (x,y)



Object Detection

- Regression (x,y,w,h)
- Classification ("face")

Instance Segmentation

Pixel-wise
Classification ("face")

Object Detection

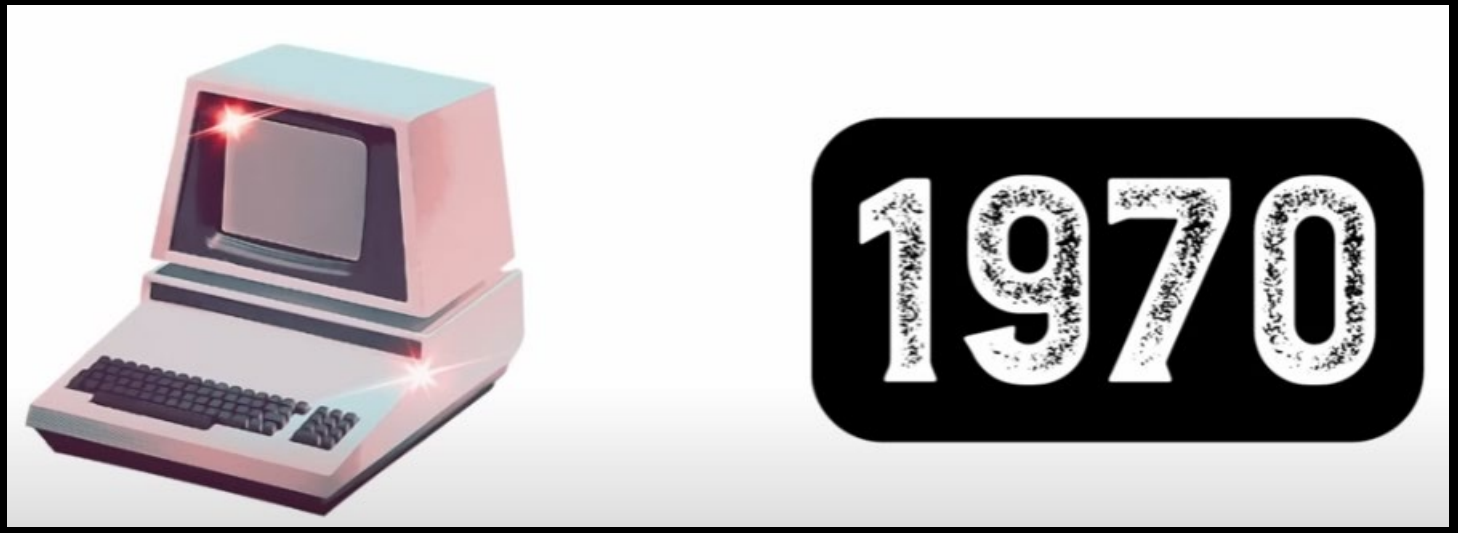
Bounding box

x, y, w, h

Class

Car

Brief History



Brief History

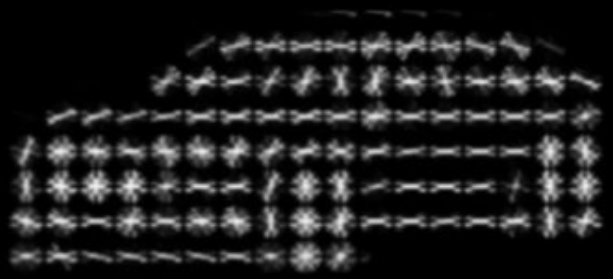
First detector

Viola Jones

2001

First detector

Histogram of Oriented Gradients (2005)



Alexnet (2012)

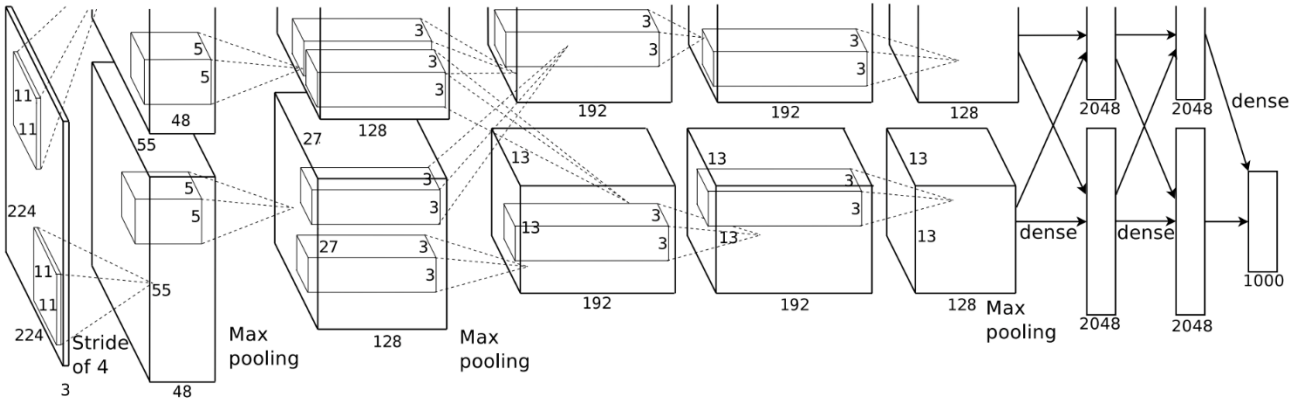


Figure 2: An illustration of the architecture of our CNN, explicitly showing the delineation of responsibilities between the two GPUs. One GPU runs the layer-parts at the top of the figure while the other runs the layer-parts at the bottom. The GPUs communicate only at certain layers. The network's input is 150,528-dimensional, and the number of neurons in the network's remaining layers is given by 253,440–186,624–64,896–64,896–43,264–4096–4096–1000.

AlexNet (2012)

Classification 

Detection 

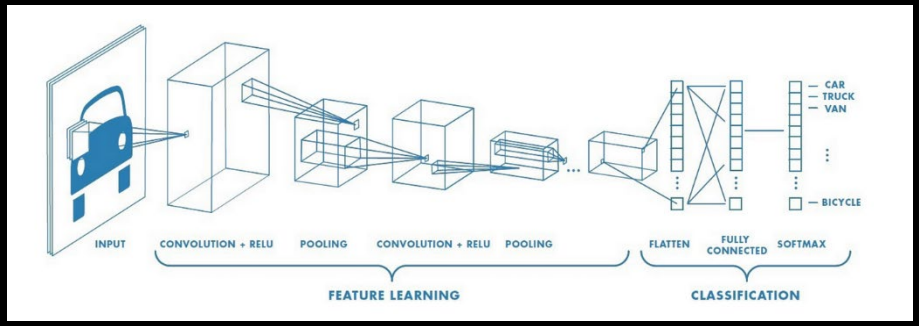
AlexNet (2012)

Classification 

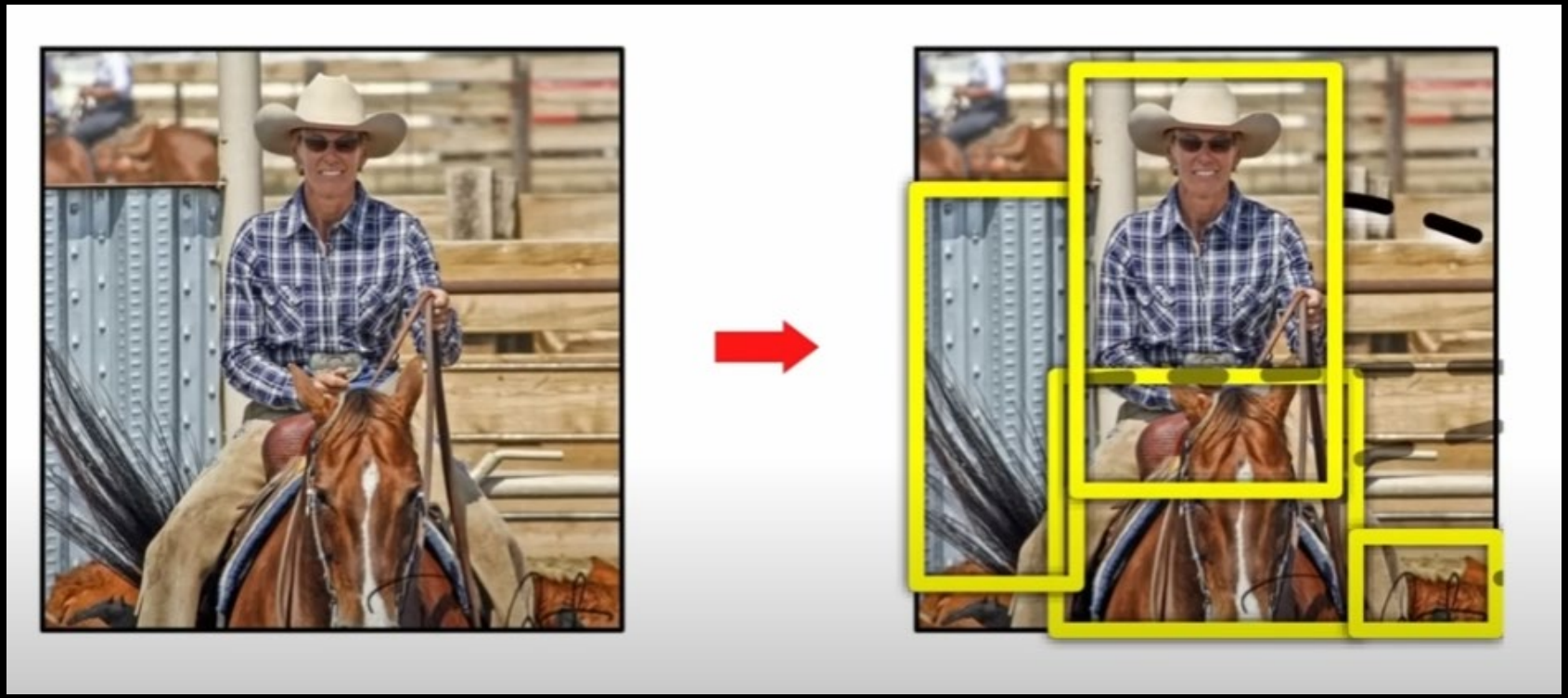
Detection 

How to use AlexNet for object detection?

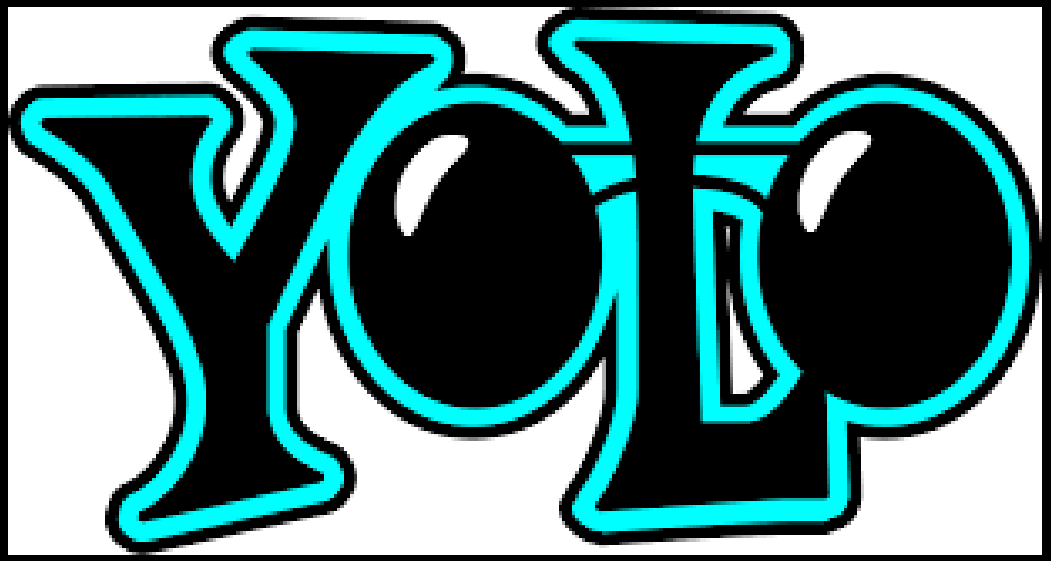
Alexnet (2012)



RCNN (2014)



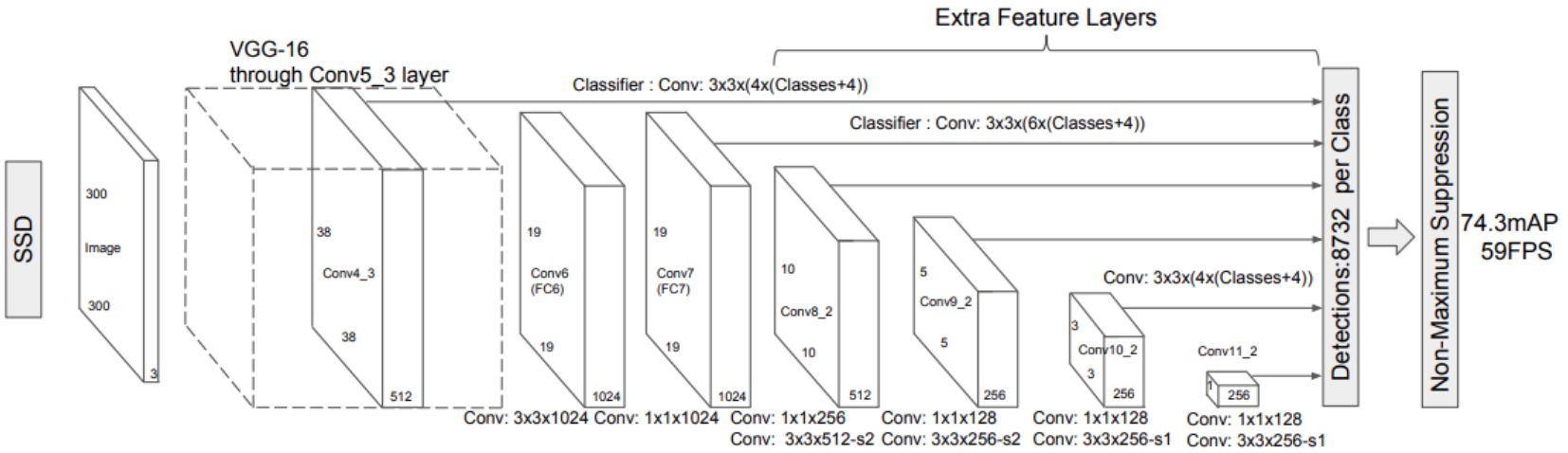
Yolo (2016)



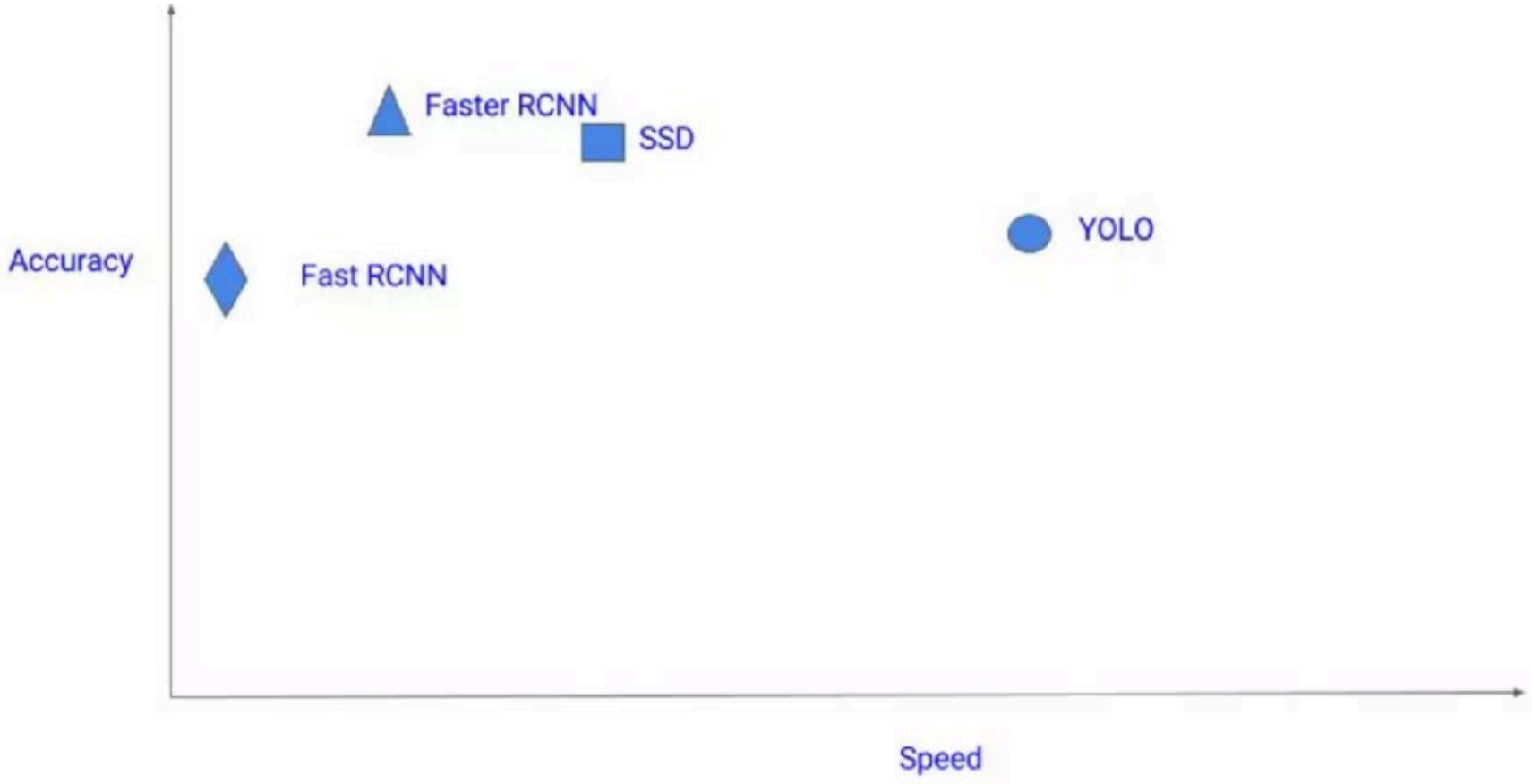
Yolo (2016)

Single Pass for object detection (one-stage)

Single-shot detectors



Comparison



Performance Metrics

Performance Metrics

1) Classification: Car or not?
2) Localization: How accurate is the location?

Performance Metrics

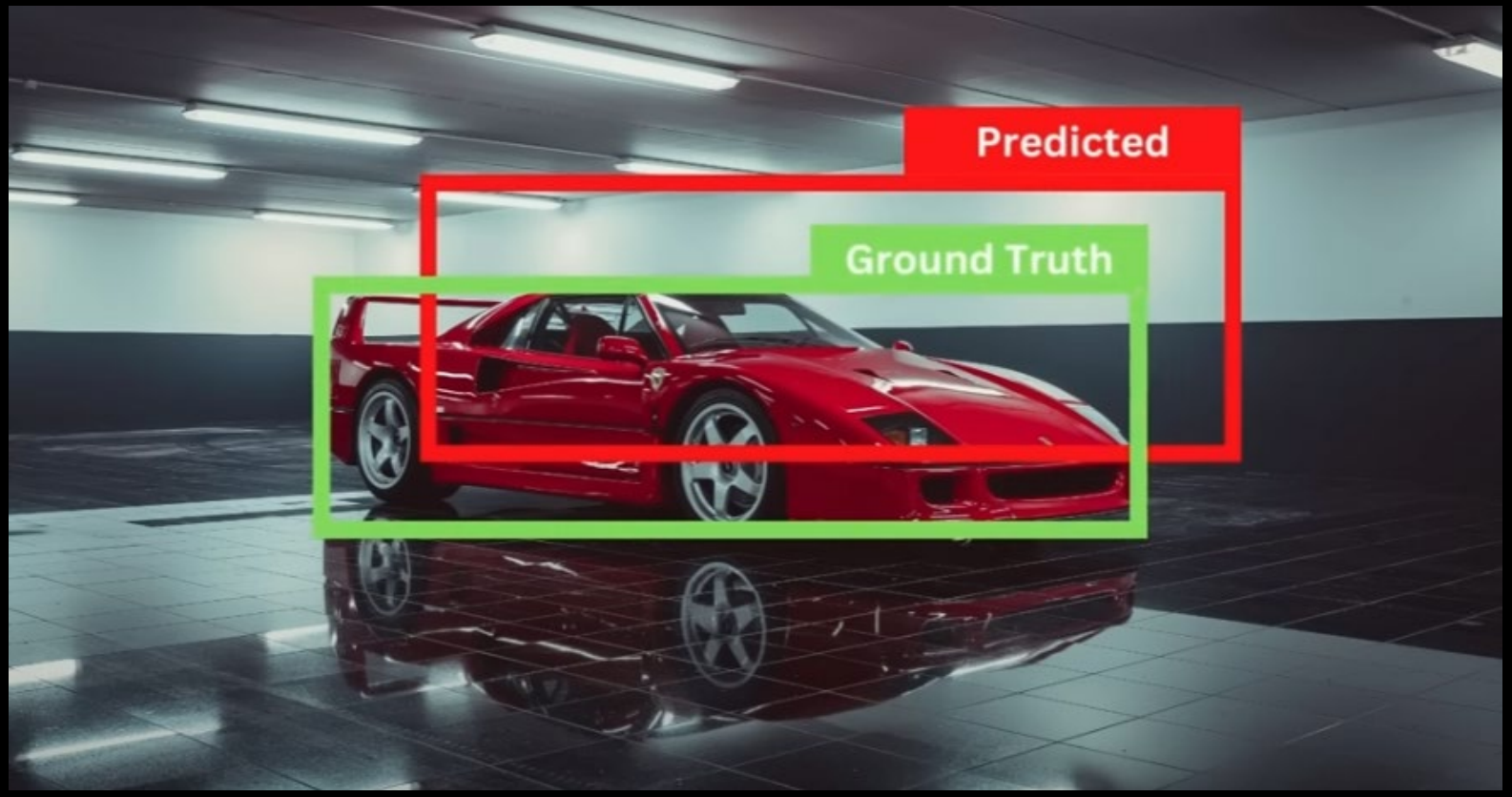
1) Car or not?

Classification mAP

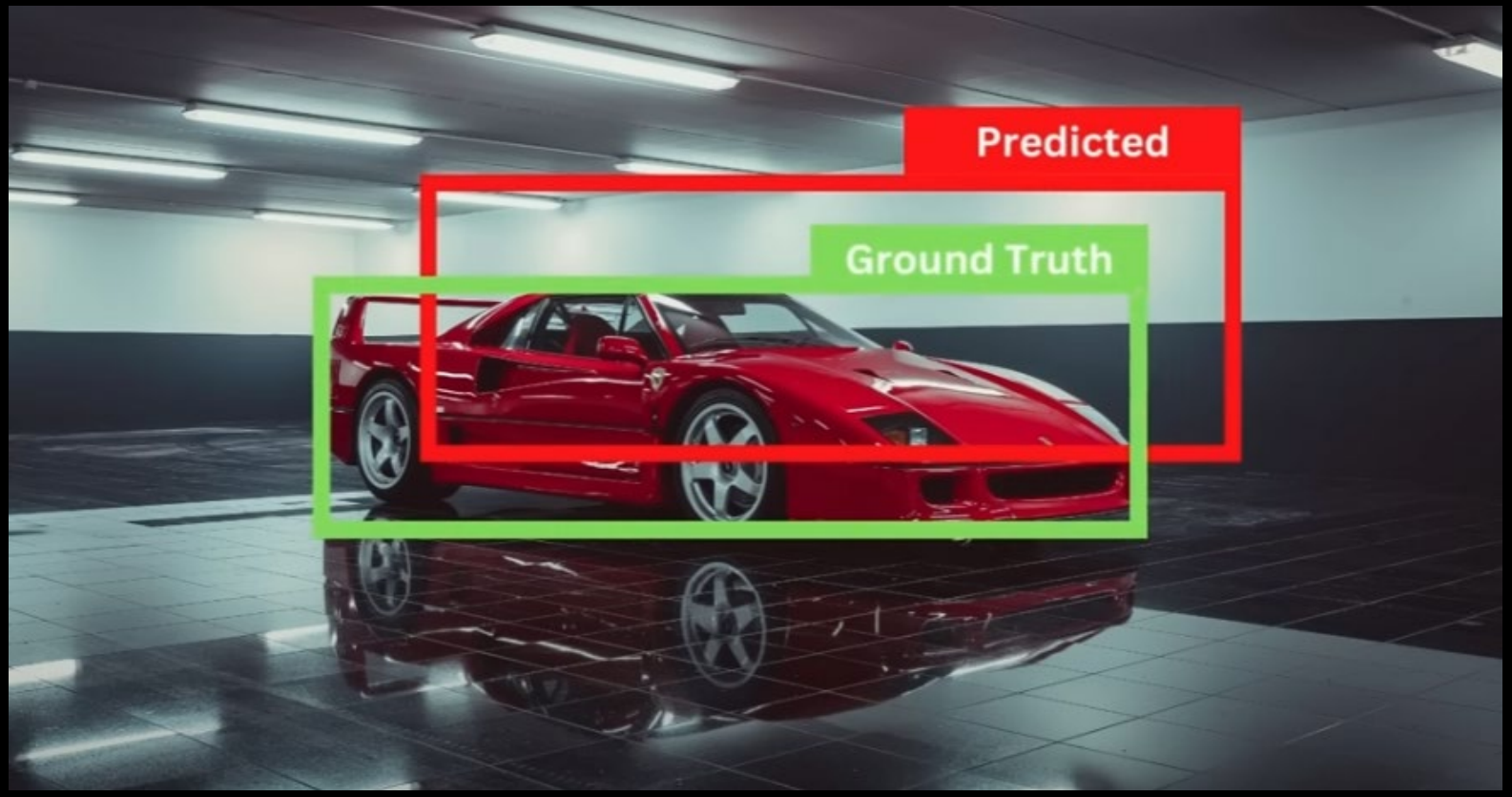
2) How well is the localization

Localization IoU

Intersection over union (IoU)

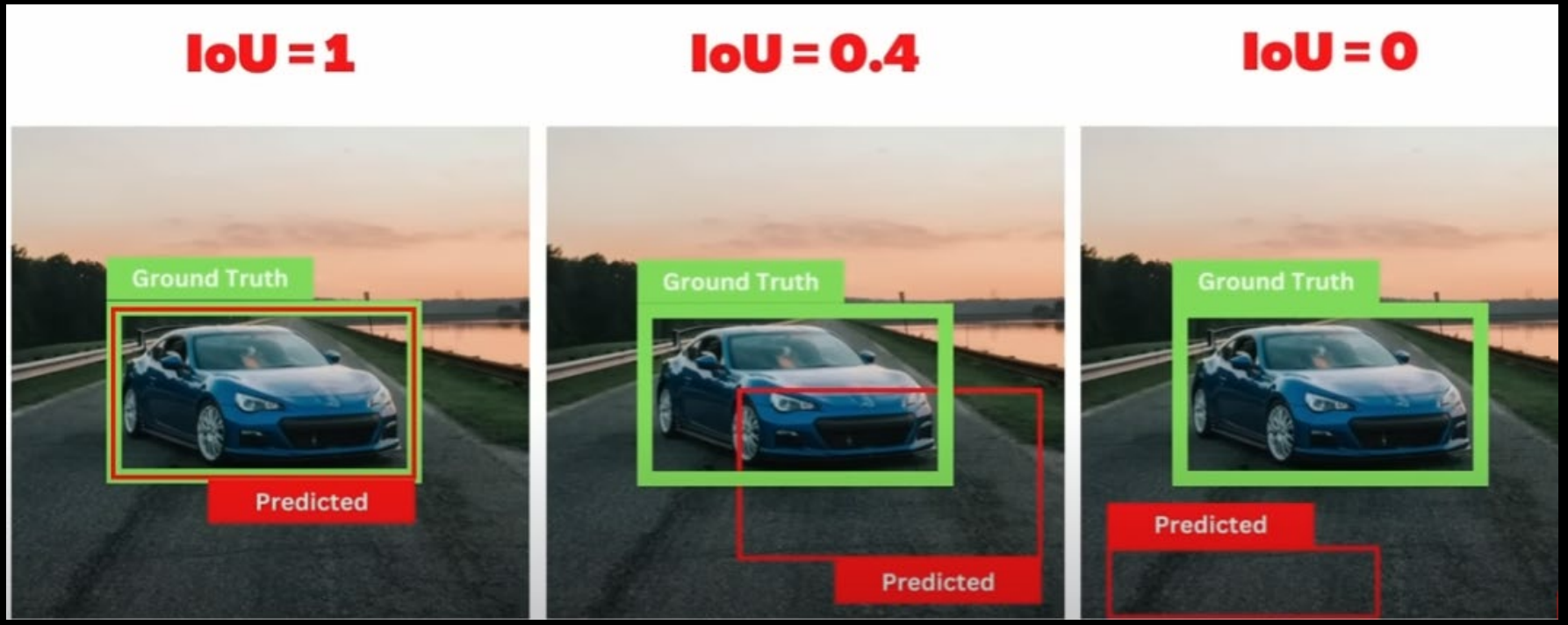


Intersection over union (IoU)



Values between 0-1

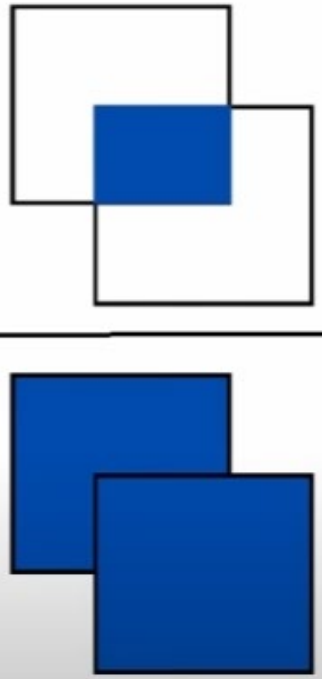
Intersection over union (IoU)



Values between 0-1

Intersection over union (IoU)

$$\text{IoU} = \frac{\text{Area of Intersection}}{\text{Area of Union}}$$



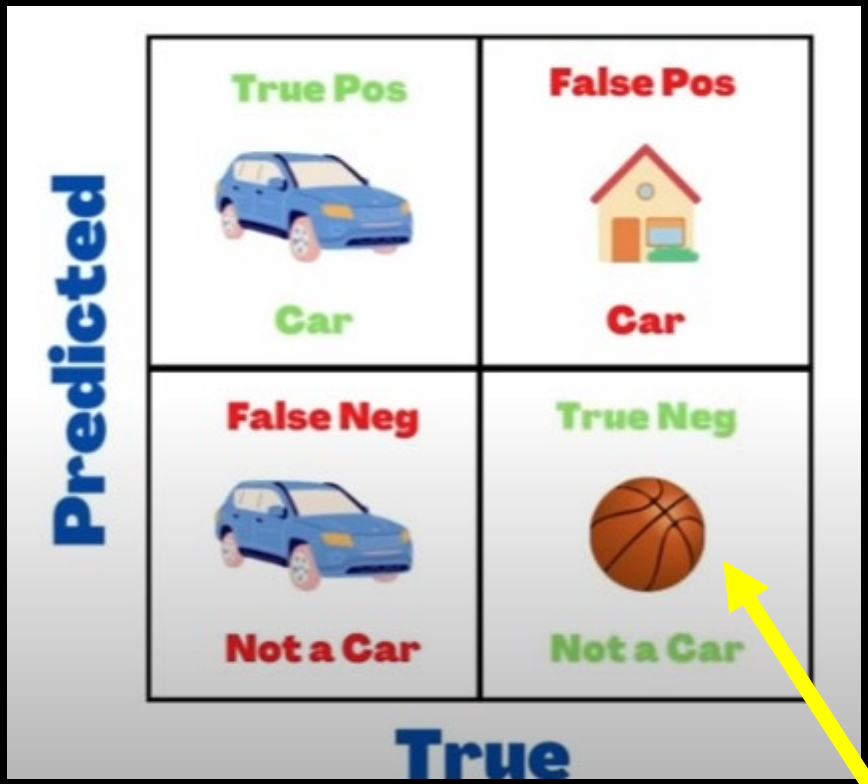
Average Precision

Confusion Matrix

Precision

Recall

Confusion Matrix



True Positive: You predicted positive and it's true.

False Positive: You predicted positive and it's false.

False Negative: You predicted negative and it's false.

True Negative: You predicted negative and it's true.

Corresponds to not predicting a bounding box,
Usually a background, so not used in metrics calculation

Precision/ Recall

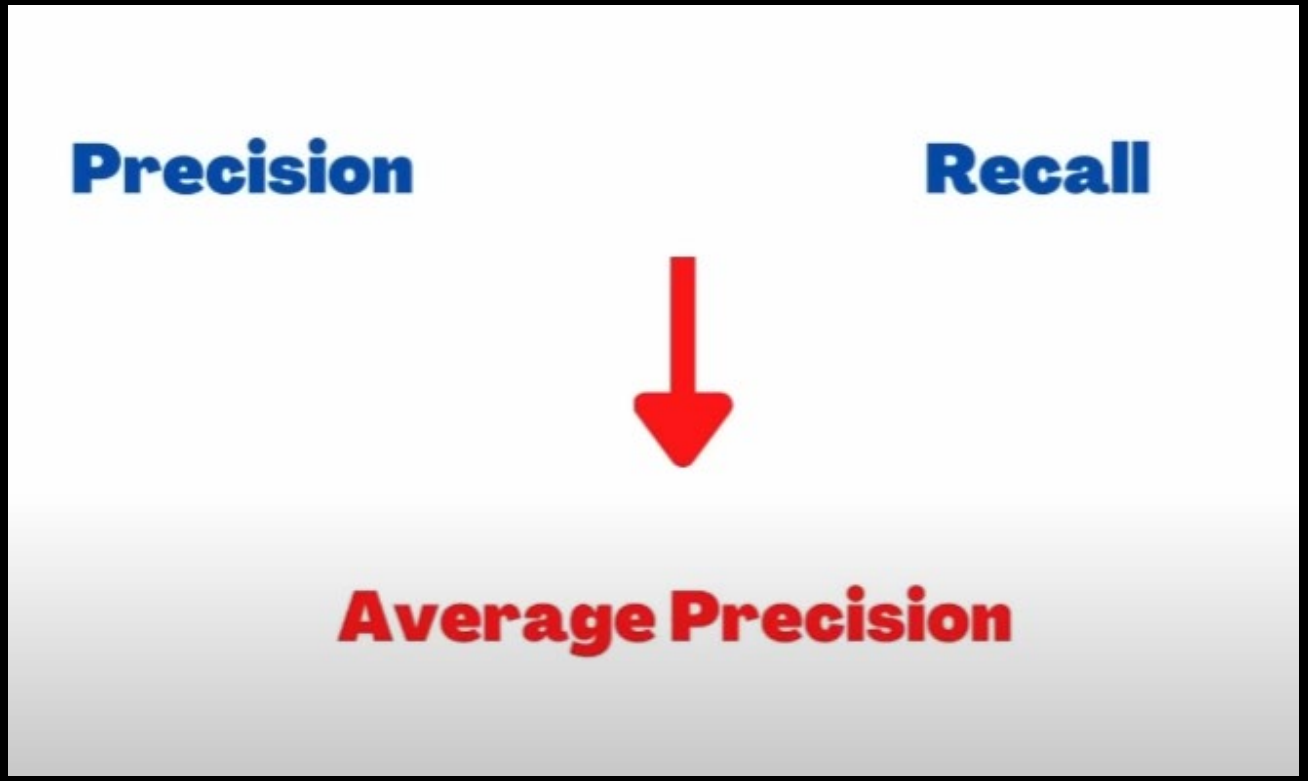
Precision — Actual Positives out of the total positive predictions

$$\text{Precision} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Positives}}$$

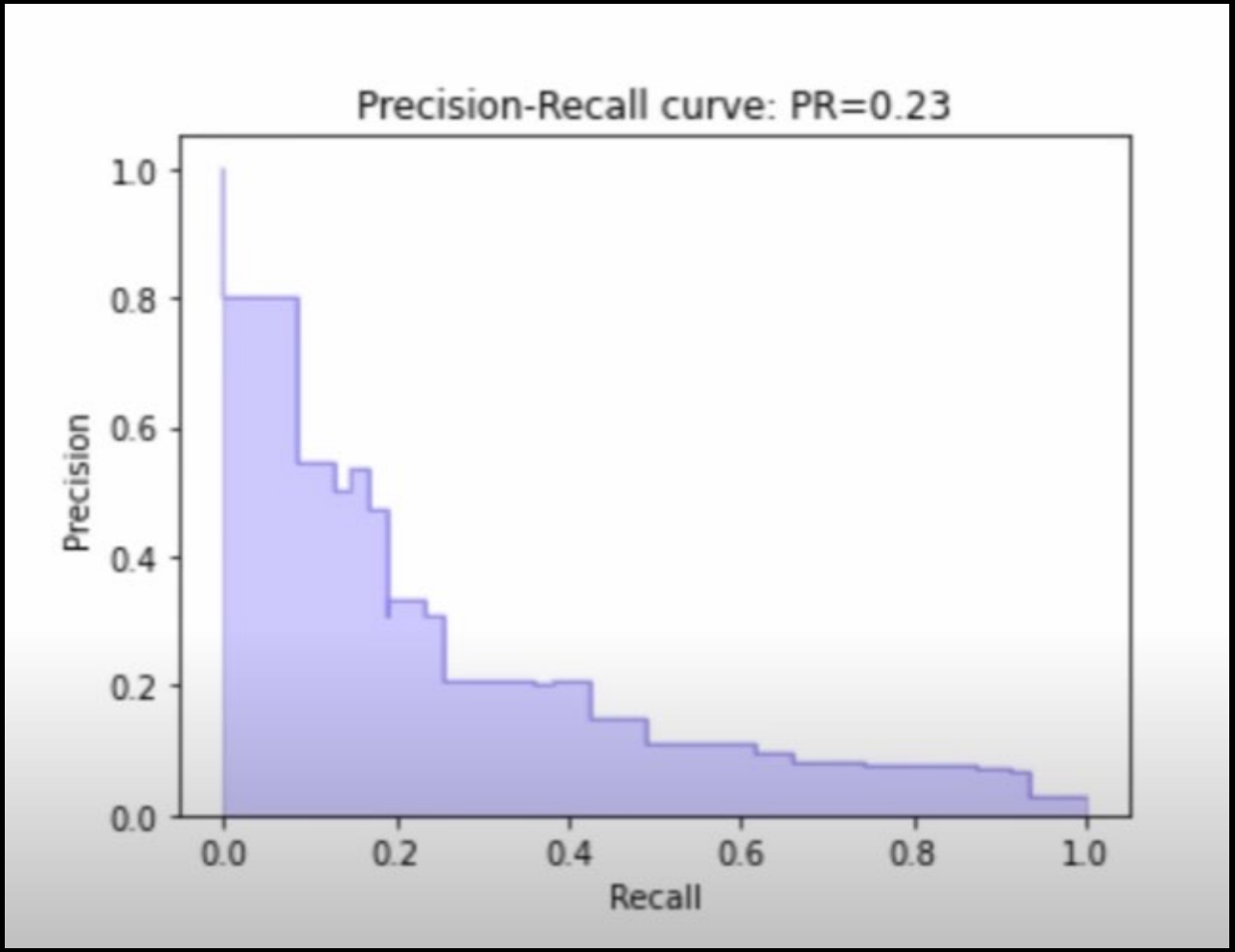
Recall — Actual Positives out of all predictions

$$\text{Recall} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Negatives}}$$

Average Precision



Average Precision



Average Precision

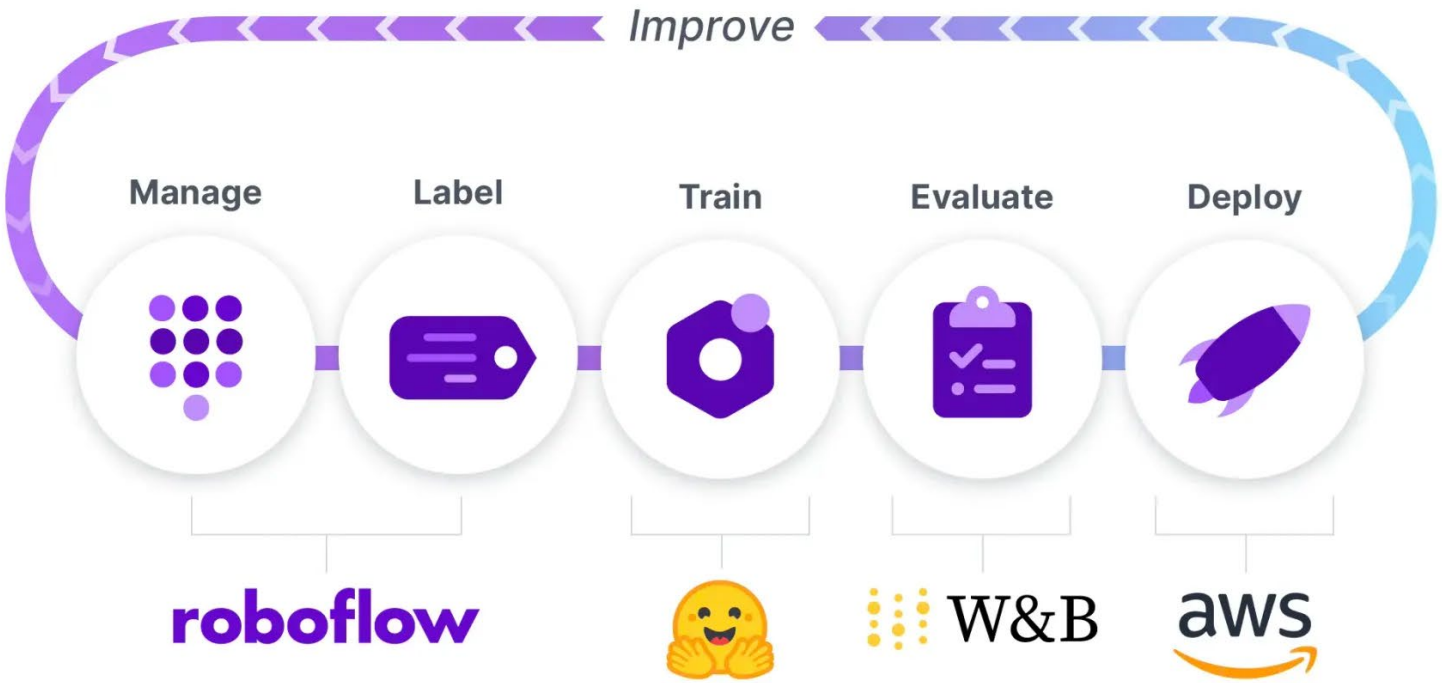
Single class → AP

Multi class → mAP

Object detection

1. **Data collection** – download images
2. **Annotate** using Roboflow
3. **Generate** dataset → download to google colab
4. **Train** the model using the dataset
5. Download the model and **test** on our python script

Object detection



Virtual Environment

1. Install anaconda & VSCode
2. Anaconda prompt: conda create --name ATAL python=3.8
3. conda activate ATAL

YOLOv11 Ultralytics

1. Go to https://docs.ultralytics.com/
2. Go to Quickstart
3. pip install ultralytics
4. Install PyTorch with GPU
5. Run CLI: yolo predict model=yolo11n.pt source=<source file>

Run YOLOv11 in VSCode

1. Select Interpreter: CTRL+SHIFT+P
2. Select your virtual env (e.g. “ATAL)
3. Go to https://docs.ultralytics.com/modes/predict/#streaming-source-for-loop
4. Paste the code in VSCode
5. Change the Source, Model and execute the code