

CS5330

PATTERN RECOGNITION & COMPUTER VISION

PROF . RYAN BOCKMON

SÛRVUE

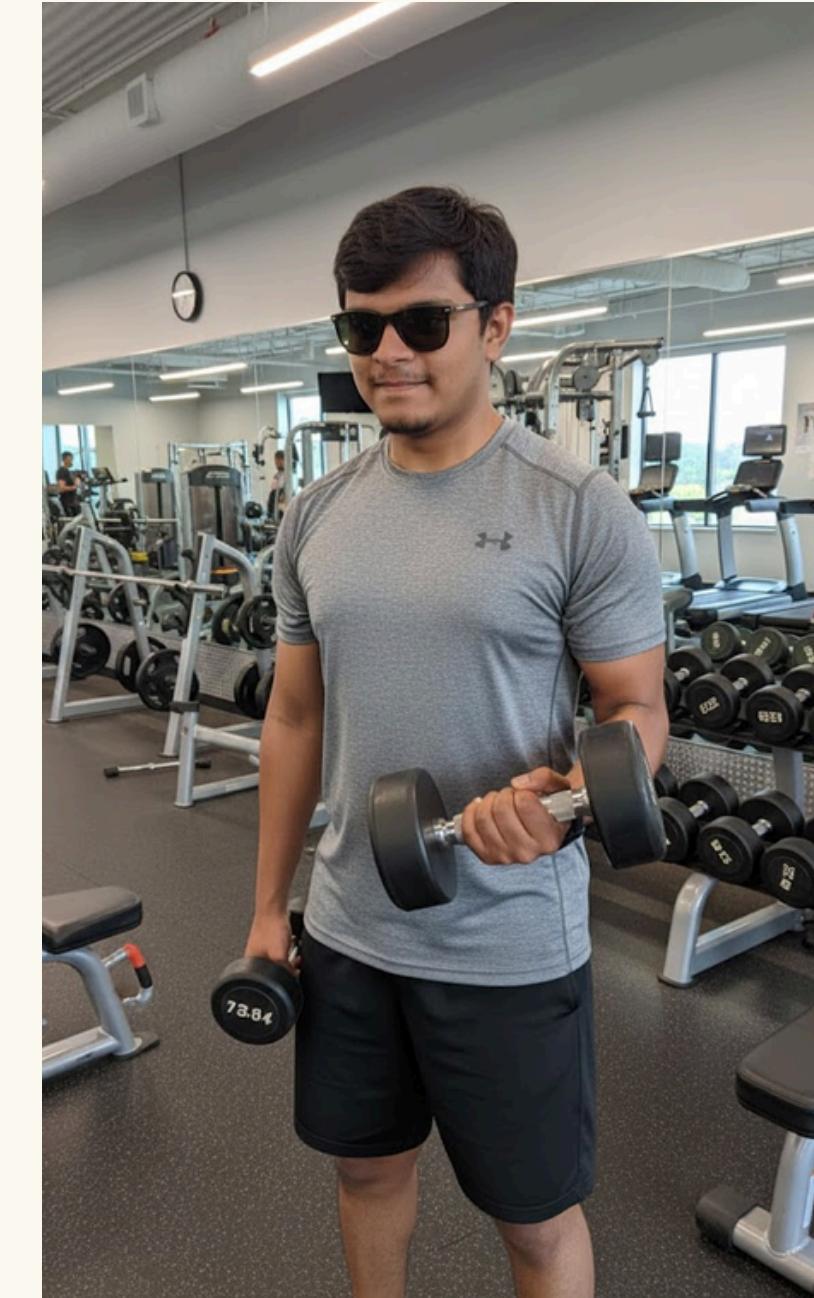
BY:

- HARSHIT KHATTAR
- TEJAS PHANSE
- HARSHIL PATEL

MEET OUR TEAM



TEJAS PHANSE
(BEACH LOVER)



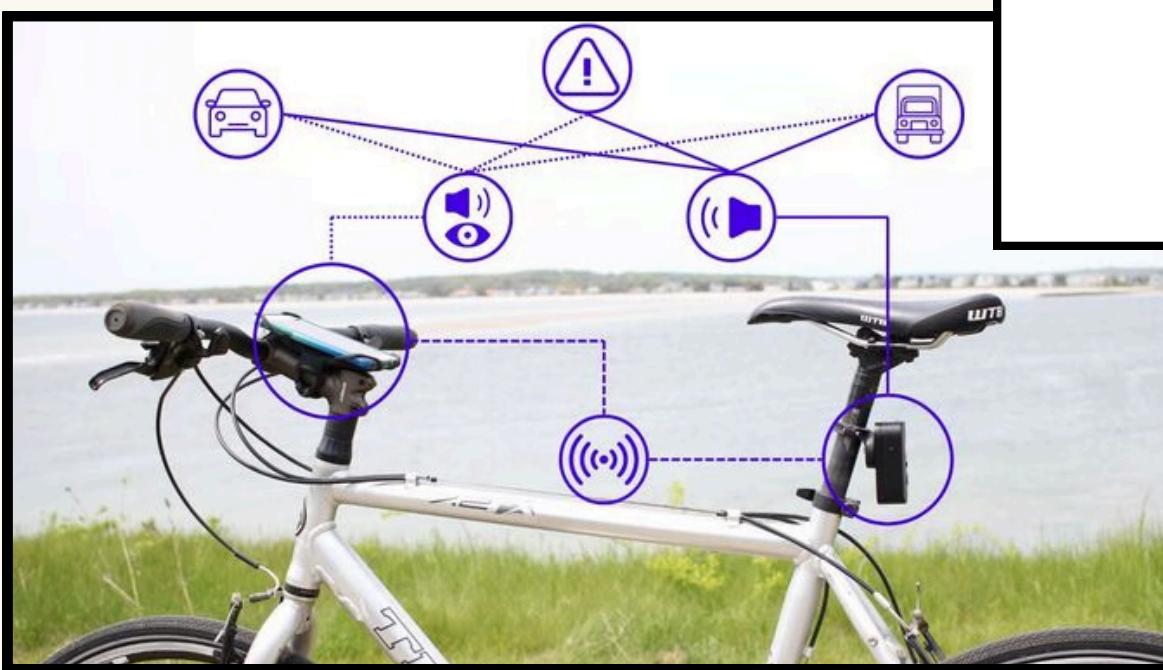
HARSHIL PATEL
(GYM FREAK)



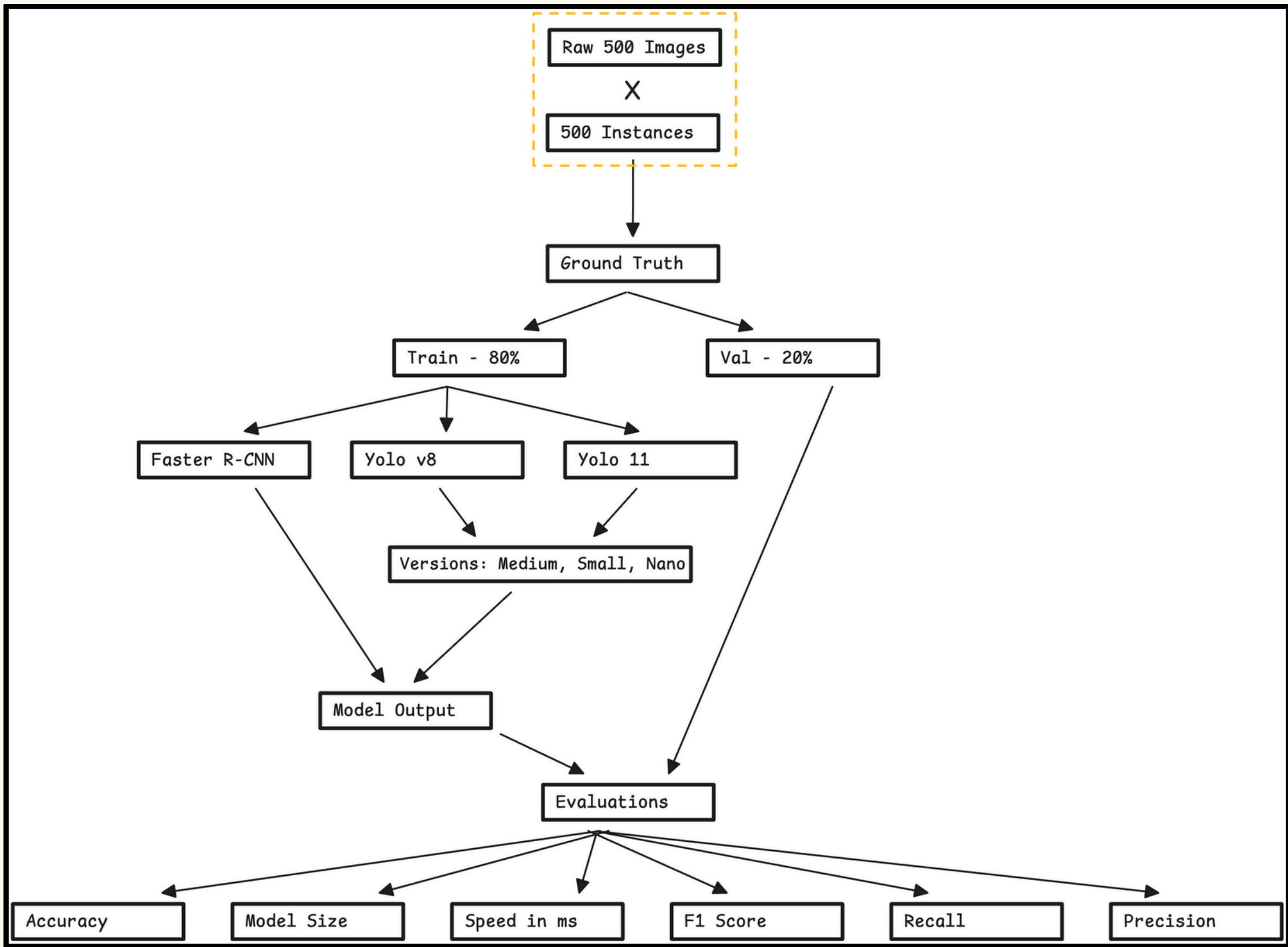
HARSHIT KHATTAR
(F1 ENTHUSIAST)

ABOUT SURVUE

- Survue is a sensor-driven cycling safety system that measures lateral vehicle proximity, using continuous distance detection.
- Its onboard models forecast vehicle trajectories in realtime, trigger proximity alerts when thresholds are breached, and autonomously log near-miss events for post-ride analysis.
- Survue delivers audio warnings for vehicles that approach at high speed, at unsafe lateral distances, or with oversized profiles, ensuring you're aware before the threat becomes a problem.



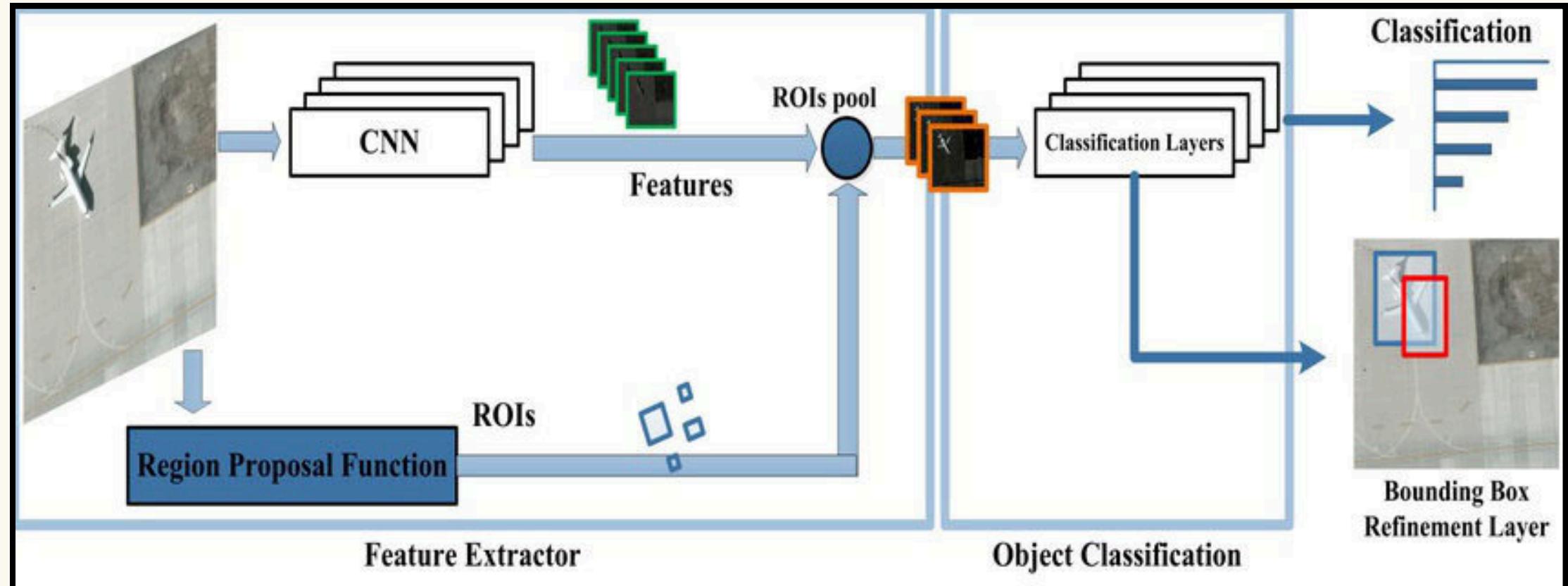
WHAT ARE WE DOING ?



FASTER - RCNN ?

WHAT IS IT?

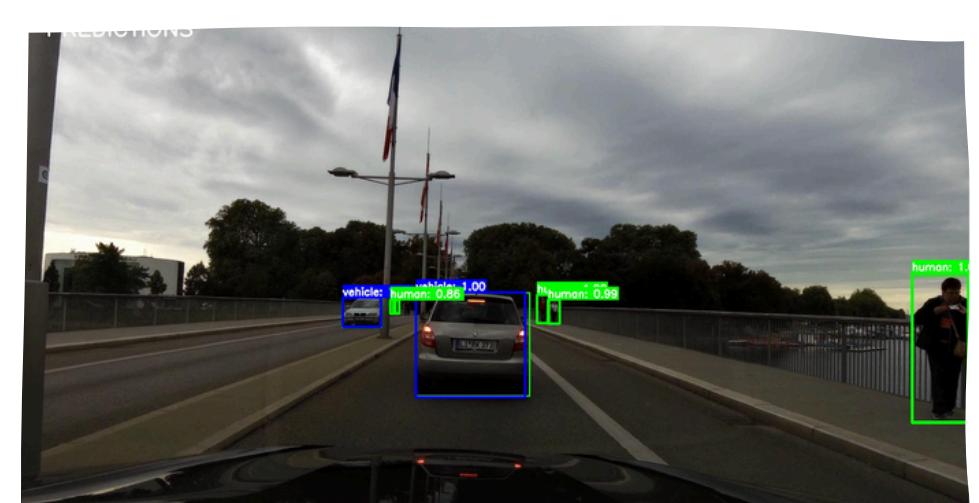
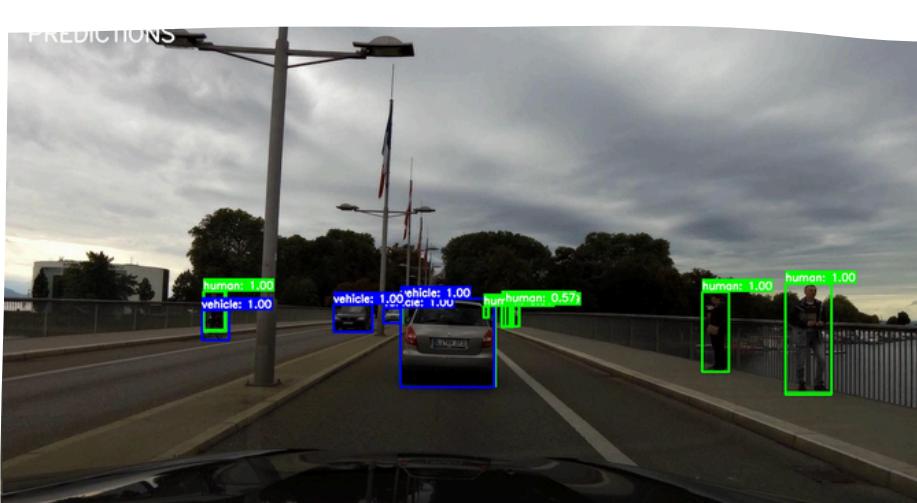
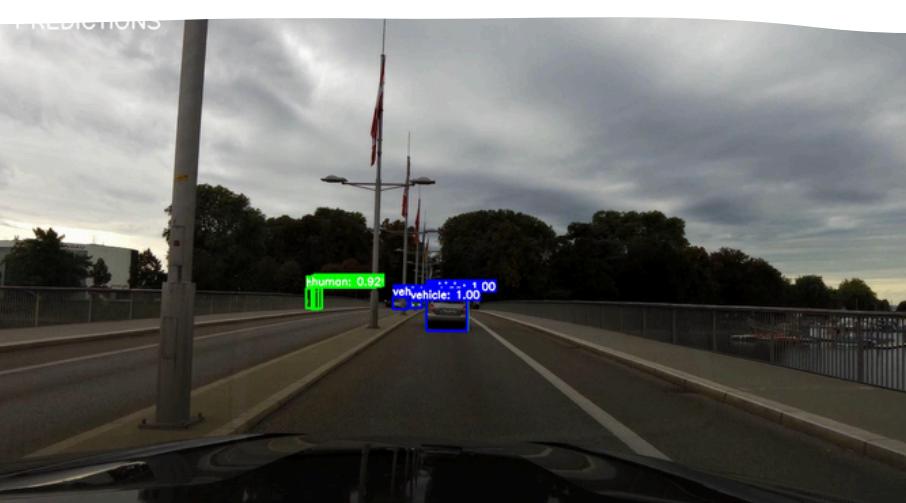
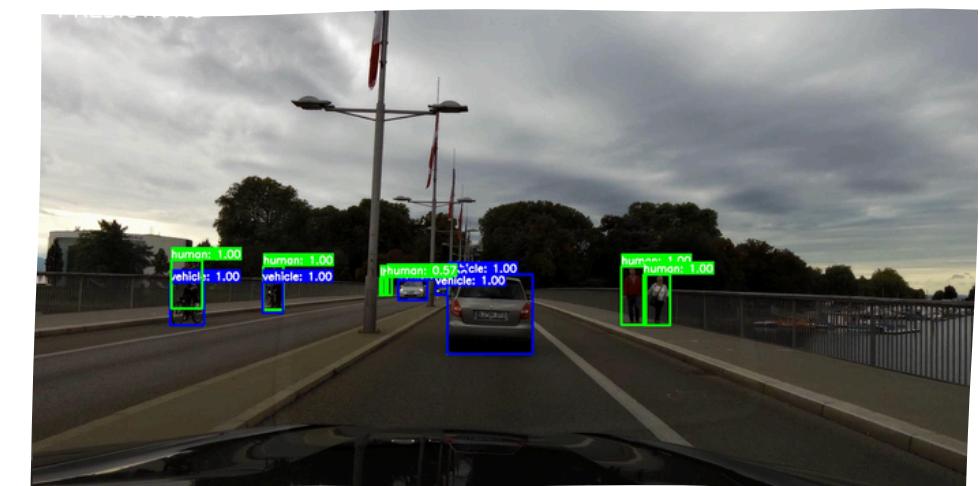
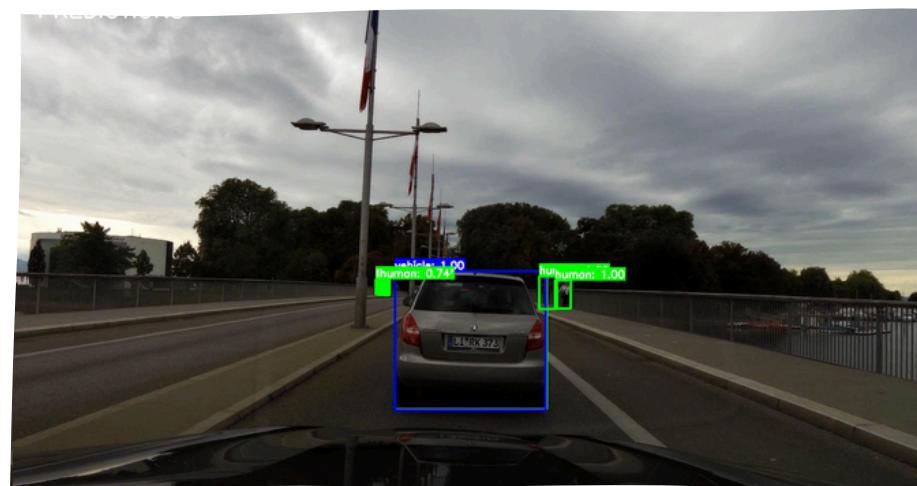
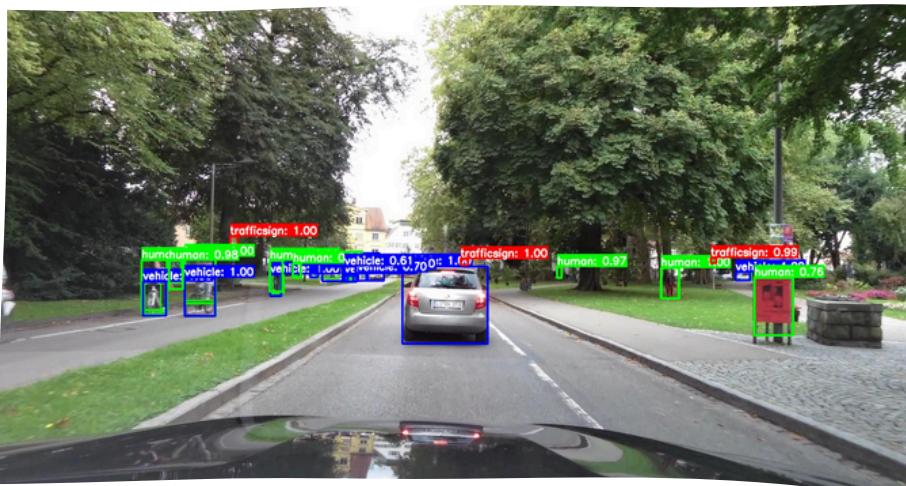
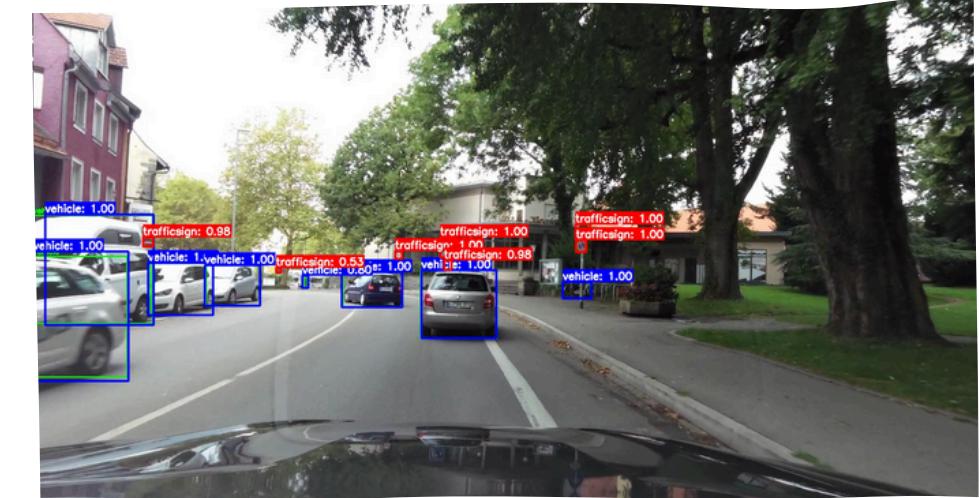
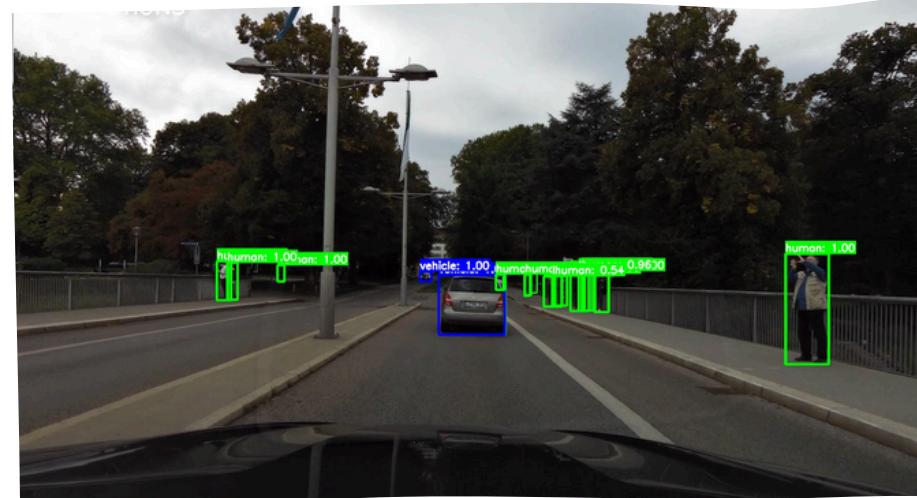
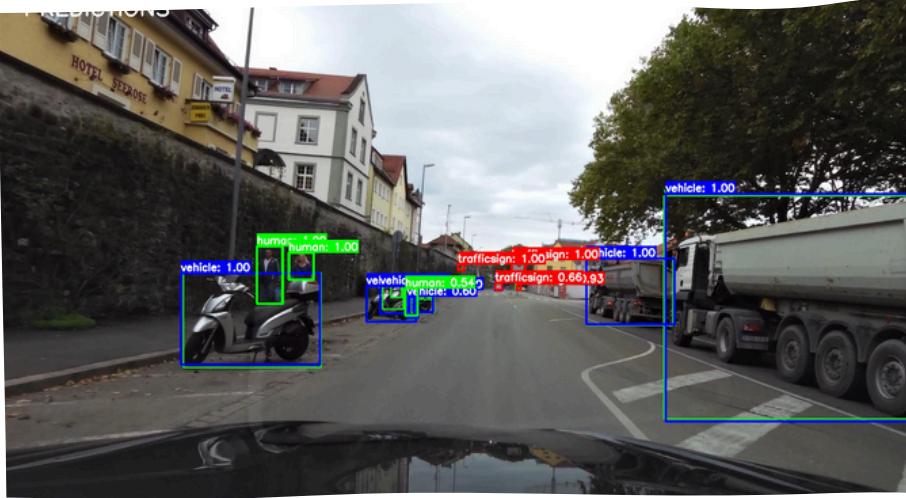
- Faster R-CNN (Region-based Convolutional Neural Network) is a widely used and highly influential deep learning model for object detection.
- The primary innovation of Faster R-CNN was the introduction of a Region Proposal Network (RPN).
- The RPN is a small fully convolutional network that generates region proposals within the model itself, enabling end-to-end training and substantially faster detection.
- **Architecture consists:**
 - Base CNN (Feature Extractor)
 - Region Proposal Network (RPN)
 - ROI Pooling
 - Detection Network



WHY IT WORKS?

- Faster RCNN offers a strong balance of high accuracy and reasonable speed, primarily due to its efficient, end-to-end trainable architecture that integrated region proposal generation into the neural network itself.
- Known for its superior precision, particularly with small and partially occluded objects, often outperforming faster single-stage detectors like YOLO and SSD in detection benchmarks.
- Advantages:
 - High Accuracy
 - Integrated Regional Proposal Network
 - End-to-End Trainable
 - Feature Sharing
 - Foundational Architecture
 - Robustness to Scale and Aspect Ratios

MODEL OUTPUT

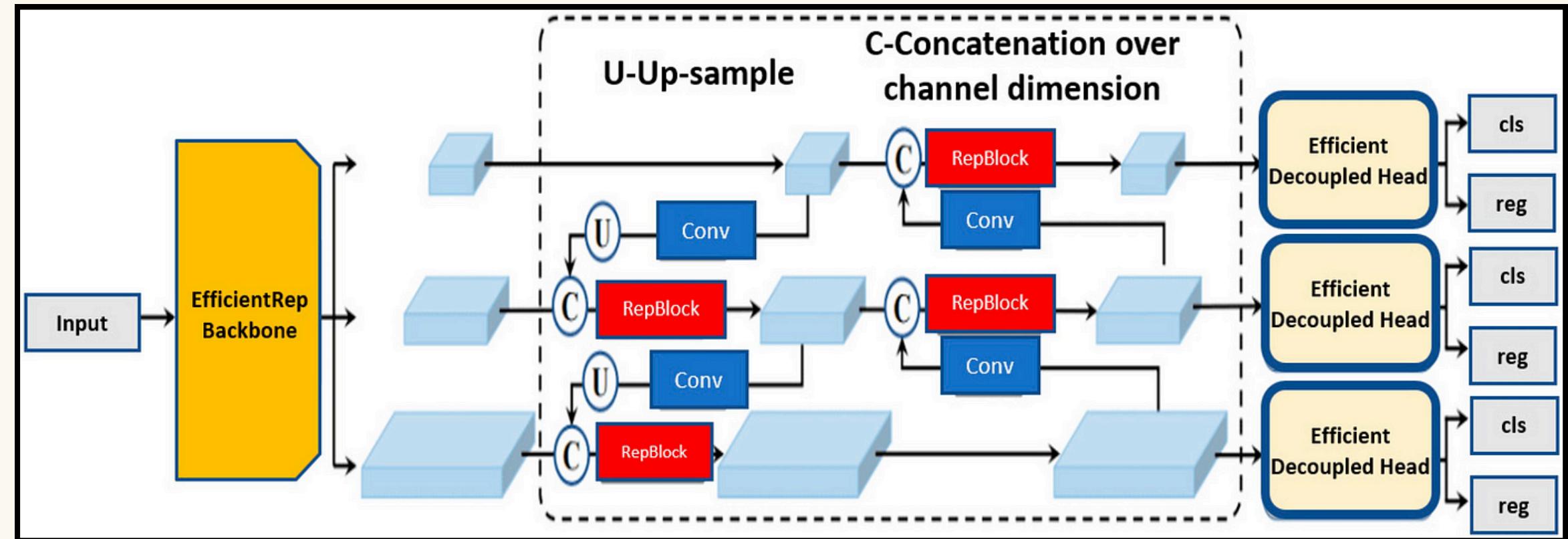


FASTER RCNN

YOLO V8 ?

WHAT IS IT?

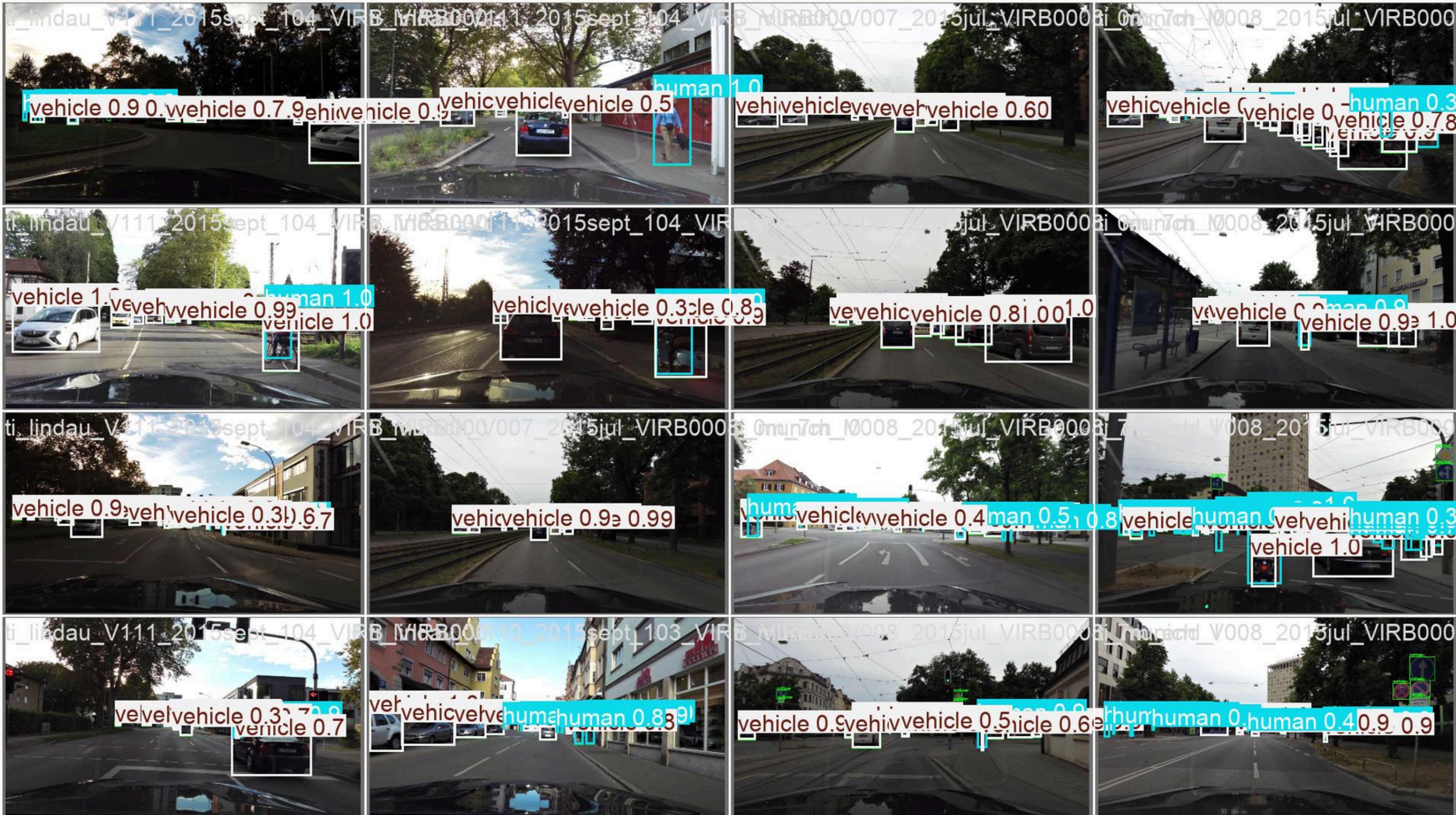
- You Only Look Once Version 8, it is a versatile and efficient deep learning framework.
- Builds upon the success of previous YOLO versions with several architectural improvements designed to enhance both speed and accuracy.
- YOLOv8 uses an anchor-free detection head that simplifies prediction, reduces hyper-parameters, and improves adaptability to diverse object shapes and sizes.
- **Architecture Consists:**
 - CSPDarknet53 (Cross-Stage Partial) network
 - Path Aggregation Network (PANet)
 - combination of loss functions



WHY IT WORKS?

- Yolov8 treats the task as a single regression problem (predicting everything in one network pass), which gives it exceptional speed and the modern architecture enhancement boost's accuracy.
- The model directly predicts an object's center and dimensions rather than offsets from predefined "anchor boxes". This reduces complexity, lowers predictions, and streamlines post-processing.
- Advantages:
 - real-time performance
 - single-pass architecture
 - mean Average Precision (mAP) scores for accuracy.
 - Optimized modules and loss functions
 - highly adaptable and efficient

MODEL OUTPUT

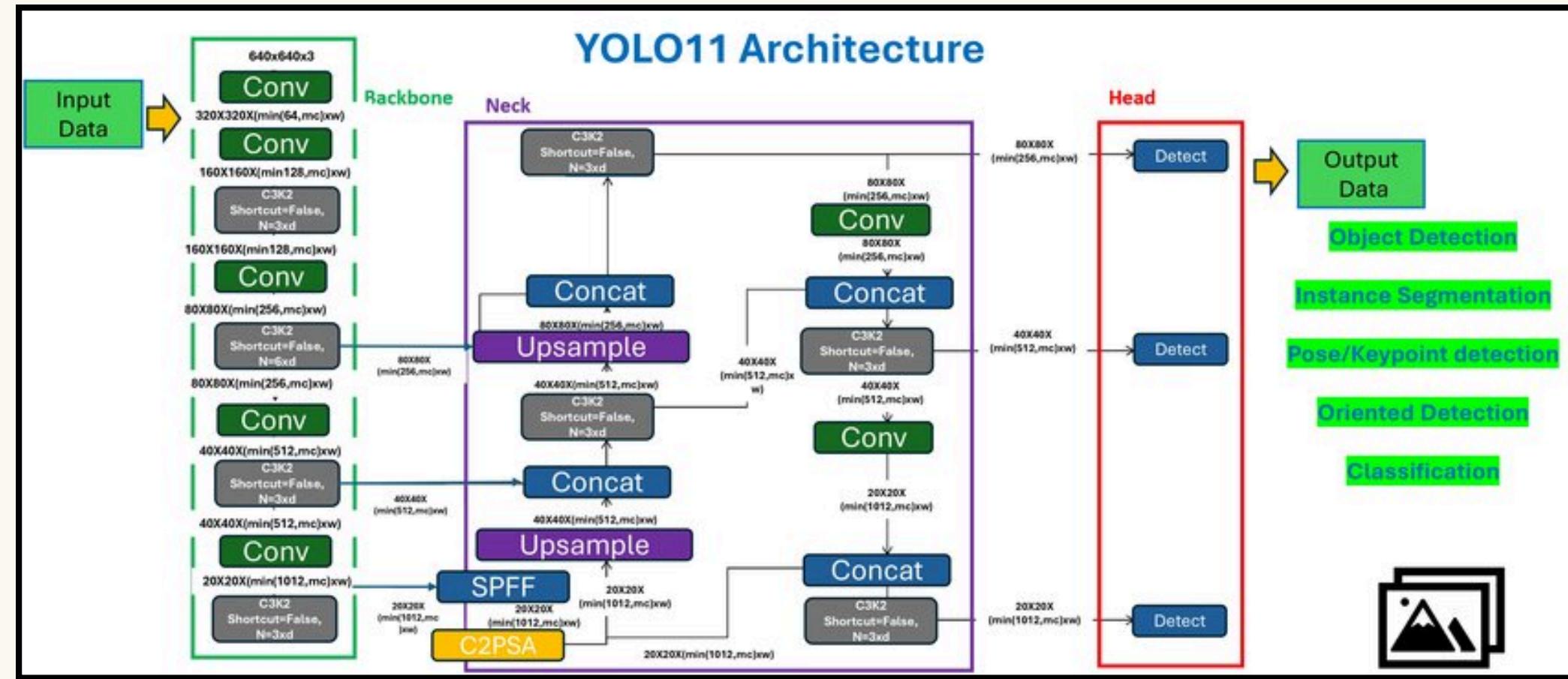


YOLO 8 N NO TS 128

YOLO 11?

WHAT IS IT?

- You Only Look Once version 11 is the latest iteration in the Ultralytics series.
- Model is optimized for performance, with the YOLO11 achieving a higher mean Average Precision (mAP) on the COCO dataset while using 22% fewer parameters than, YOLOv8.
- new components like the C3k2 (Cross Stage Partial with kernel size 2) block and the C2PSA (Convolutional block with Parallel Spatial Attention) module
- **Architecture Consist:**
 - Initial Convolutional Layers with C3k2, SPPF, C2PSA
 - Upsampling Layers with
 - Detect Module (Decoupled Head)
 - Depthwise Convolutions-DWConv



WHY IT WORKS?

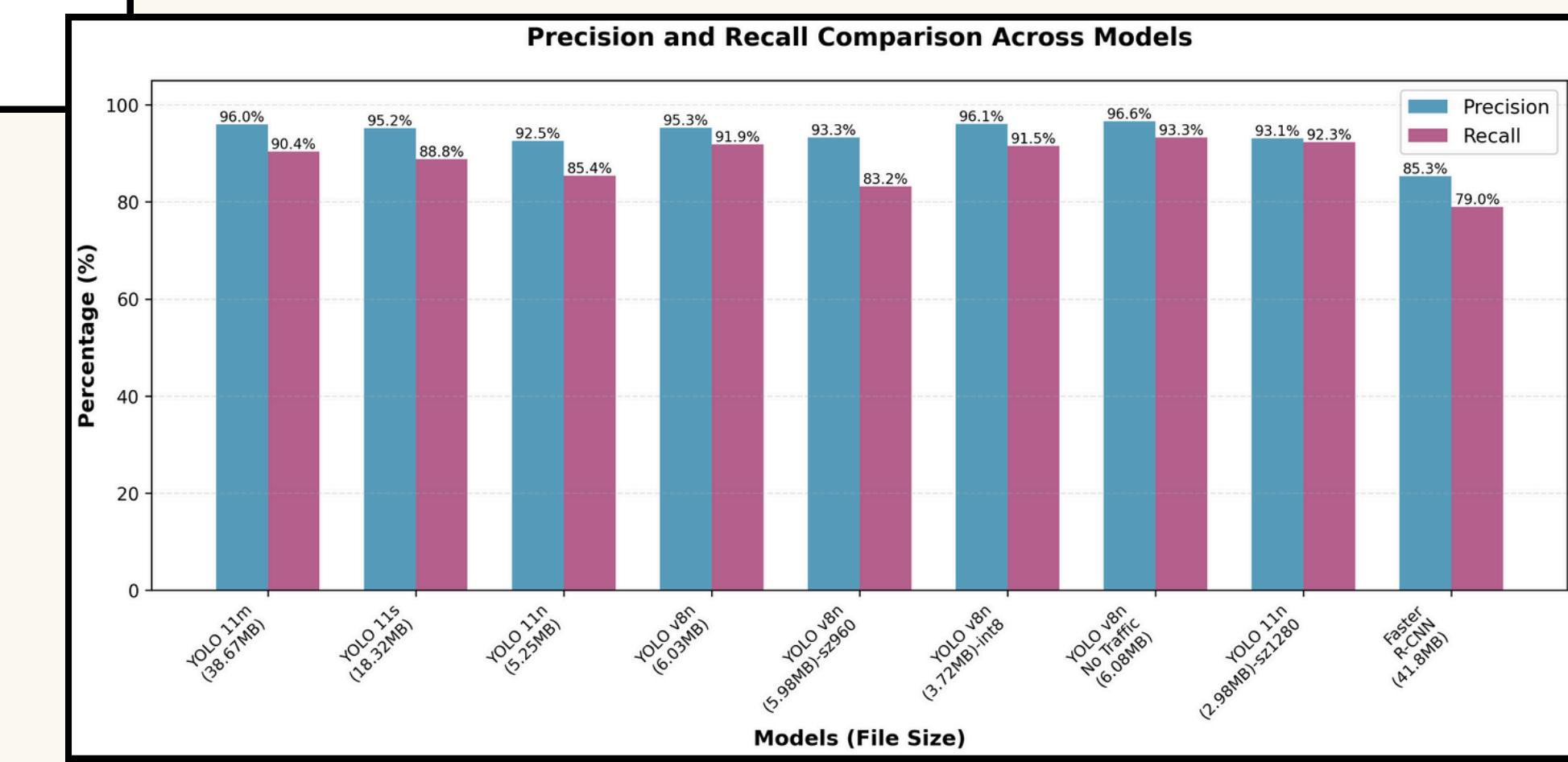
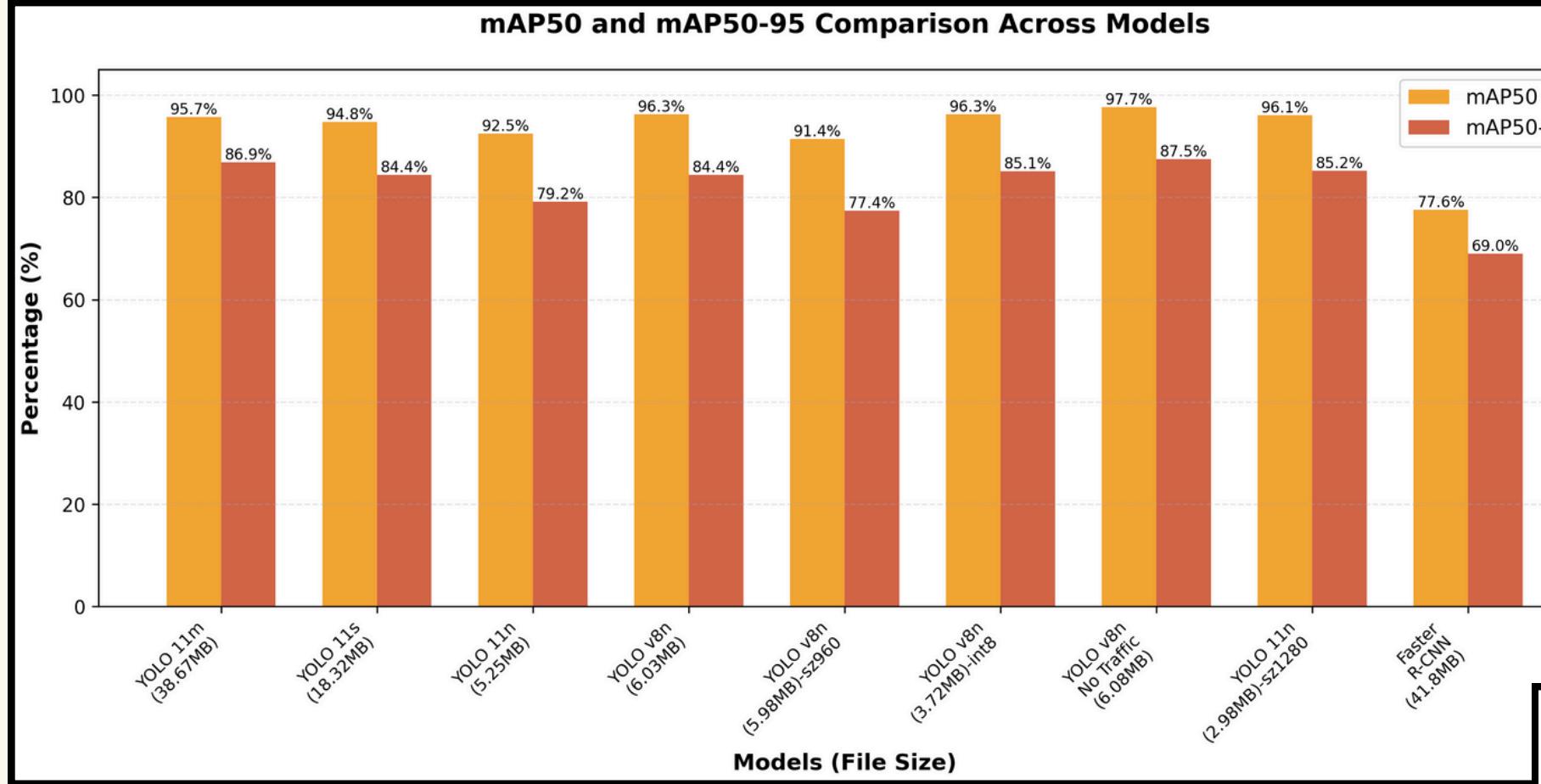
- It frames object detection as a single regression problem, processing the entire image in one neural network pass, which inherently makes it faster than traditional two-stage methods giving high accuracy, and efficiency.
- C3k2 Blocks is designed optimizes gradient flow and enhances feature representation using fewer parameters, contributing to faster processing while maintaining performance
- Advantages:
 - High efficiency with Fewer Parameters
 - Balance of accuracy (mAP) and speed (FPS)
 - Suitable for latency-sensitive applications
 - highly adaptable with hardware

MODEL OUTPUT



YOLO 11 N

FROM THEORY TO PRACTICAL



OUR MODEL PERFORMANCE

Model	Best Model Size	Map 50	Map 50-95	GPU Inference Time	CPU Inference Time	Precision	Recall
Yolo11m (imgsz = 960)	38.67 MB	95.5 %	86.9%	19.3 ms	437.6 ms	95.97 %	90.4 %
Yolo11s (imgsz = 960)	18.32 MB	94.8%	84.4%	6.9 ms	166.5 ms	95.22 %	88.78 %
Yolo11n (imgsz = 960)	5.25 MB	92.5 %	79.2 %	5.2 ms	43.7 ms	92.55 %	85.38 %
Yolo11n (imgsz = 1280)	5.30 MB	96.1 %	85.2 %	4.9 ms	69.9 ms	93.1 %	92.3 %
Yolov8s(No-TS) (imgsz = 1280)	21.54 MB	98.6 %	91.9 %	13.7 ms	211.3 ms	98.3 %	94.6 %
Yolo v8 n (imgsz = 1280)	6.03 MB	96.3 %	84.4%	8.3 ms	73.3 ms	95.3 %	91.9 %
Yolo v8 n (Qtz) (imgsz = 1280)	3.72 MB	96.3 %	85.1 %	NA	86.1 ms	96.1 %	91.5 %
Yolov8n(No-TS) (imgsz = 1280)	6.03 MB	97.7 %	87.5 %	4.8 ms	71.3 ms	96.6 %	93.3 %
Faster RCNN (imgsz = 960)	41.8 MB	77.6 %	69.0 %			85.3 %	79.0 %

Thank You!



SÛRVUE