6th Semester Project (CS691) Presentation

TRAFFIC MONITORING SYSTEM

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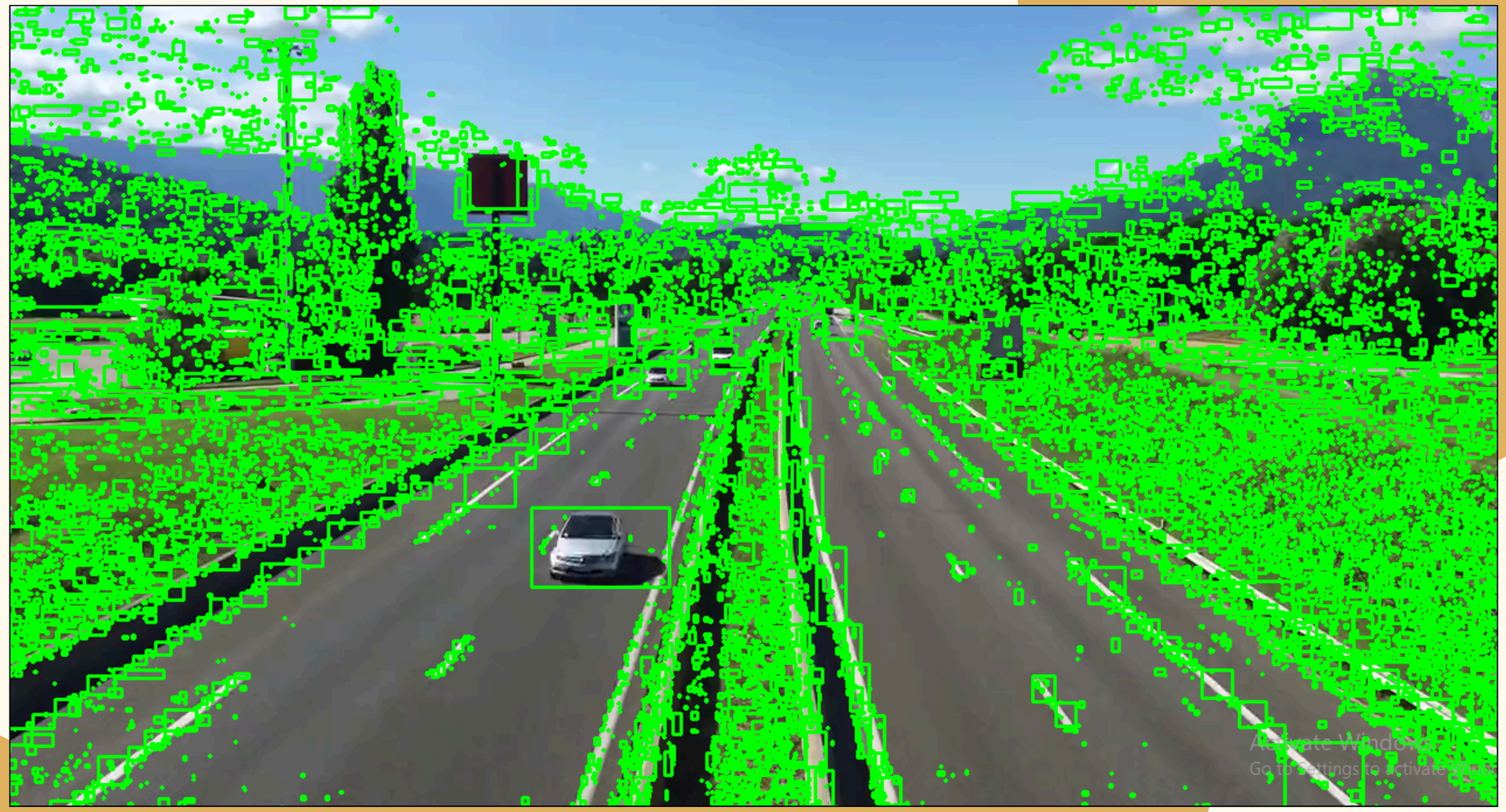
Objective

- To detect real time moving objects in a video
- Object detection and classification
- Object ID Management and Counting

Introduction

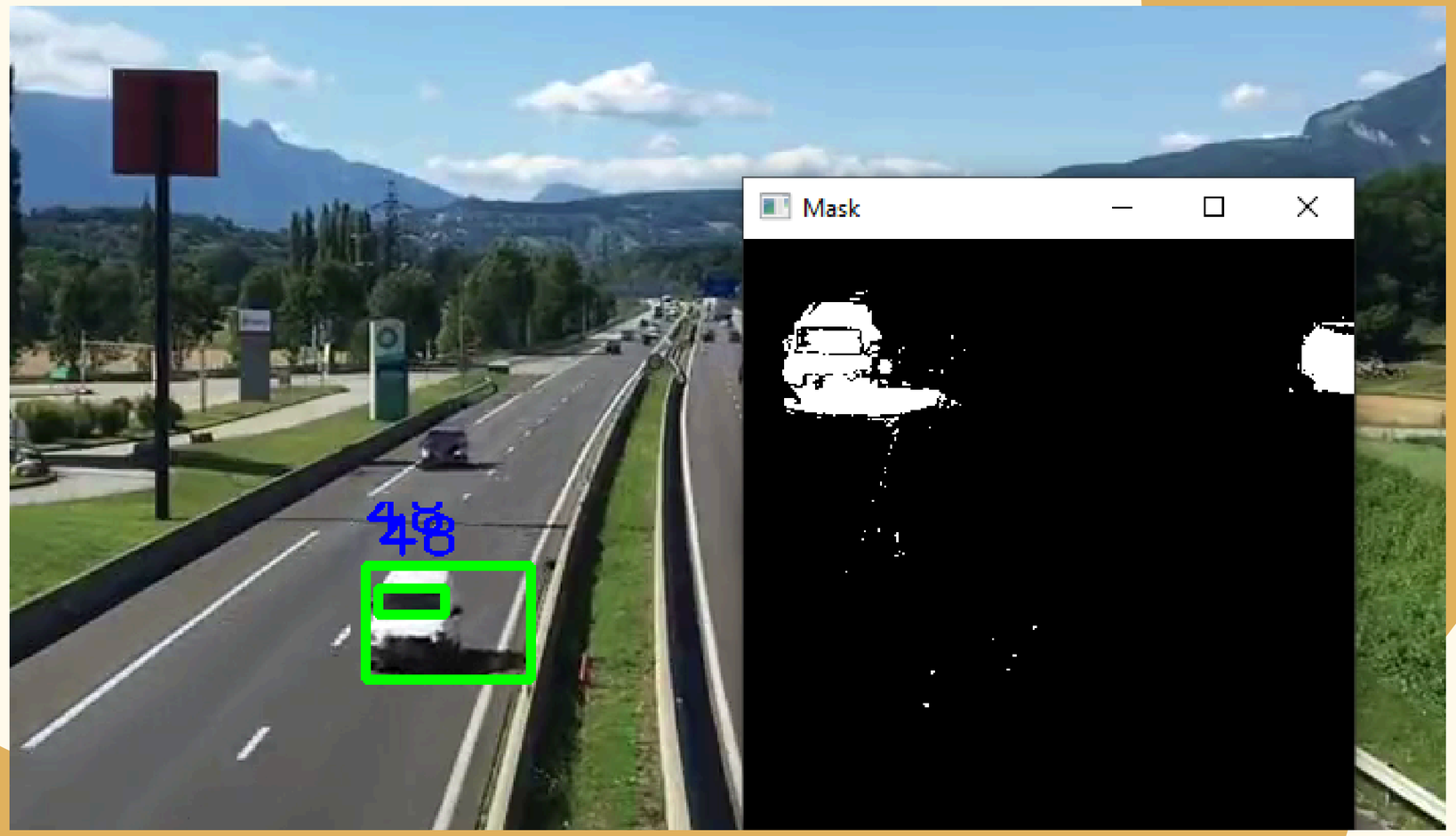
- How are we detecting and classifying objects
- Reasons to choose :
  - For Pollution Control and Estimation
  - Traffic Flow Analysis

First model using OpenCV



- Had several errors since Thresholding was not used

Improvisations using OpenCV



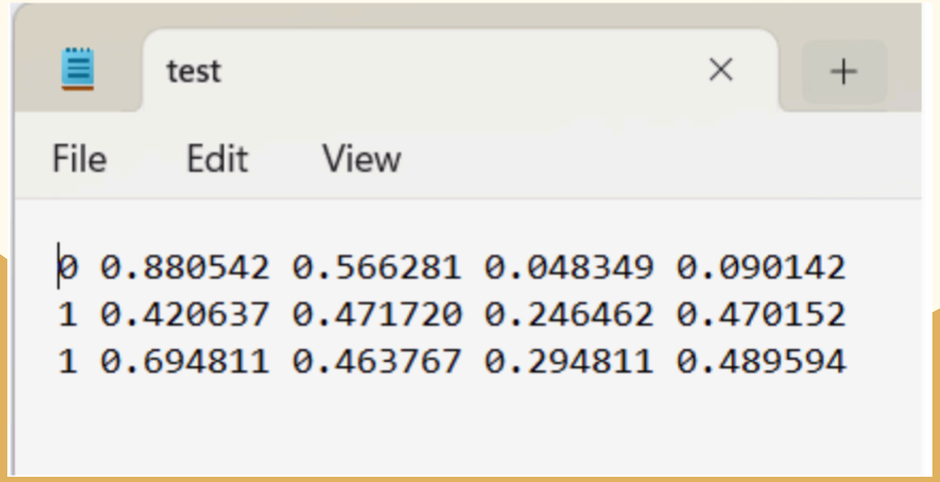
- Implemented using BgSub, Thresholding, and Contours

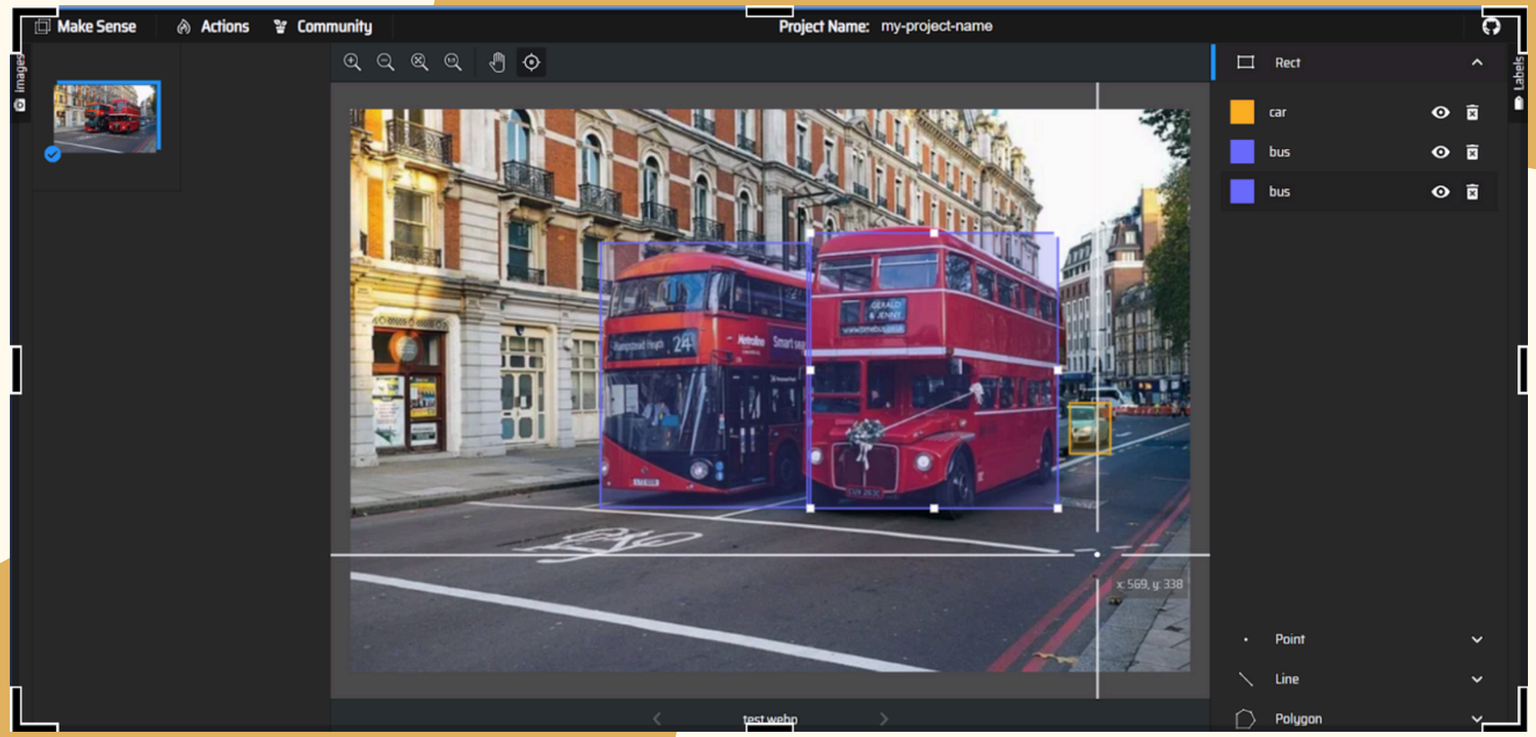
Using ML,how can we improve?

- We have used Supervised Machine Learning(Object Detection Model i.e., YOLO v8) in our project.
- YOLO is pre trained on labeled images.

Dataset Creation Process

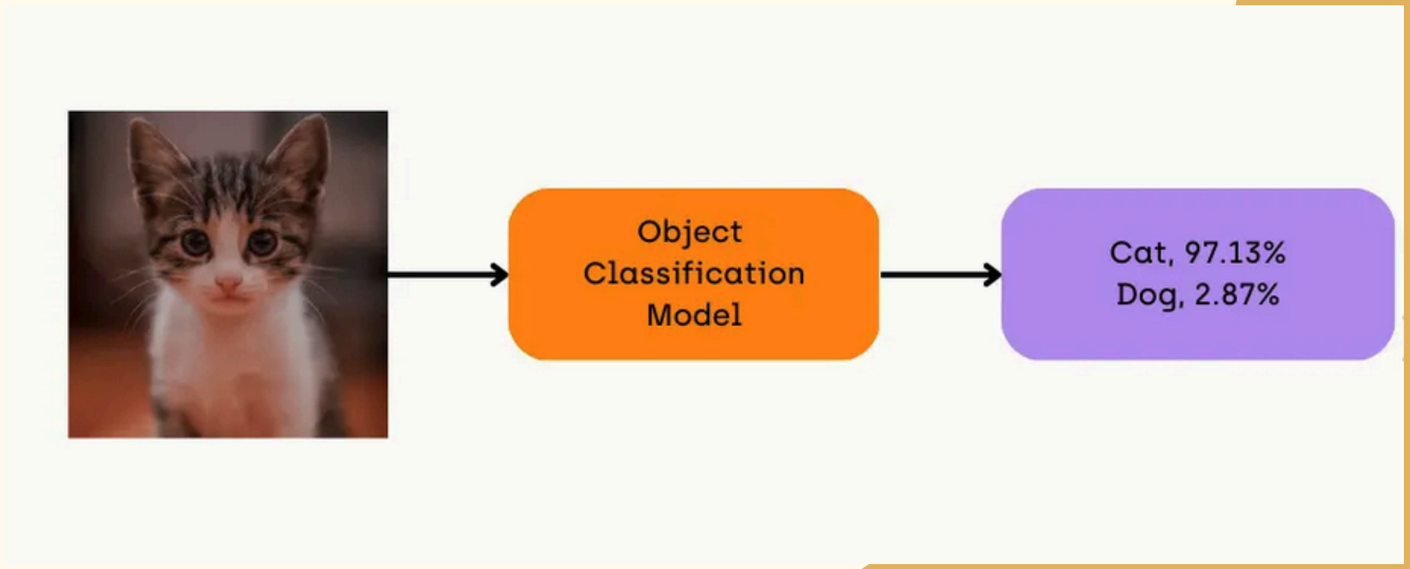
1. Collect Images
2. Annotate
3. Extract Data
4. Train Model

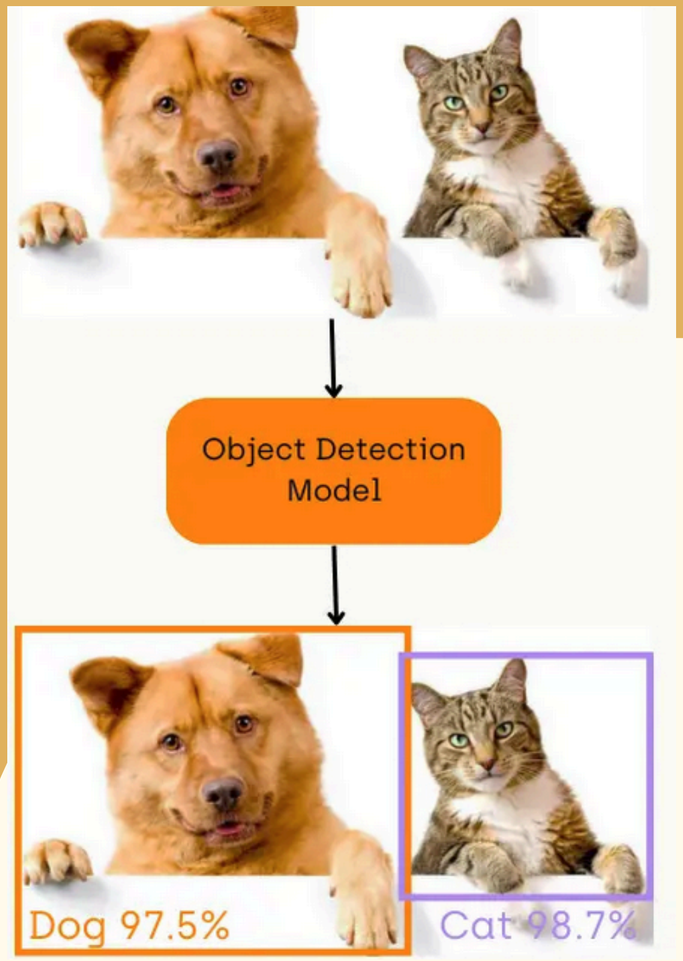




https://imgs.search.brave.com/0xktd2CS6gpHZzSdNuawgATLWd2uL5ebWtLWONpnUiU/rs:fit:860:0:0/g:ce/aHR0cHM6Ly9jZG4u/cGl4YWJheS5jb20v/cGhvdG8vMjAxNS8w/MS8wNi8xMS8wNi9s/b25kb24tNTkwMTE0/XzYOMC5qcGc

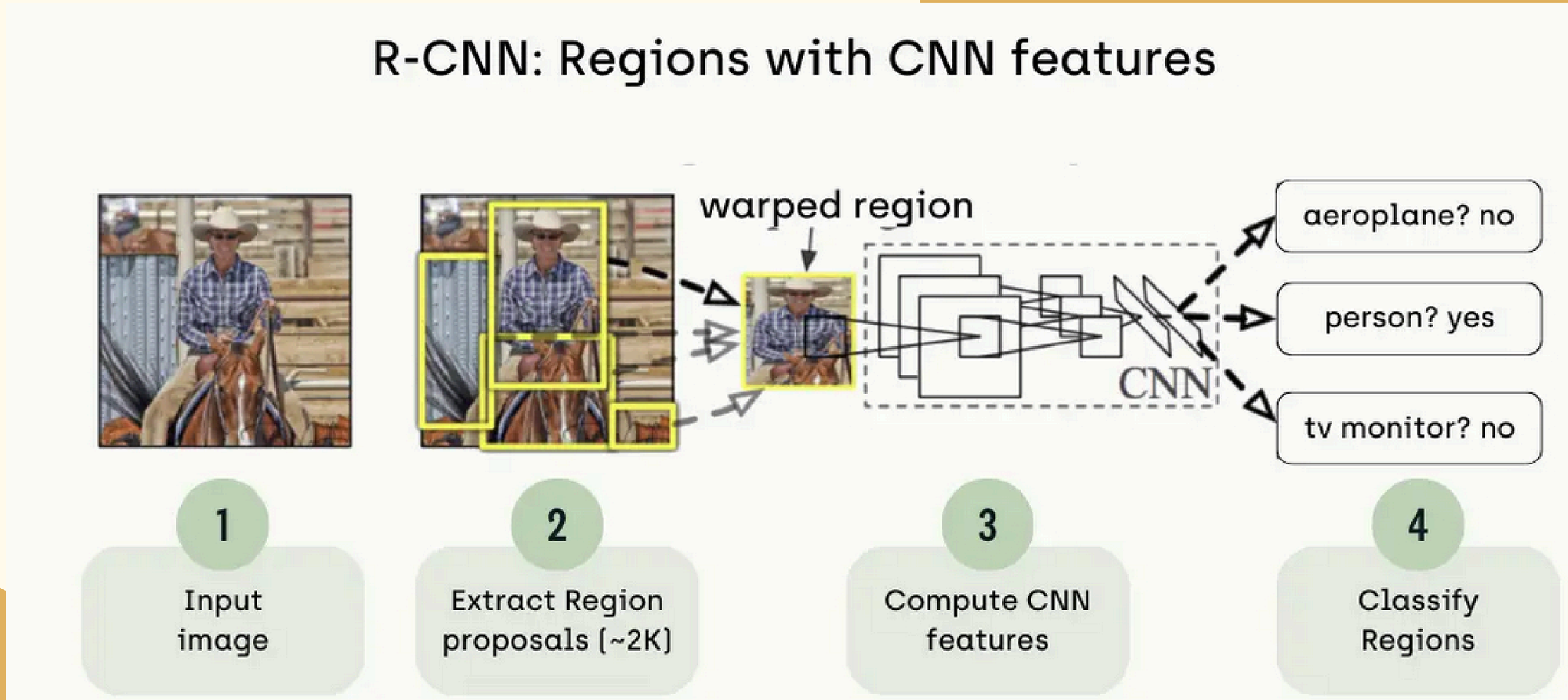
Object Classification and Object Detection





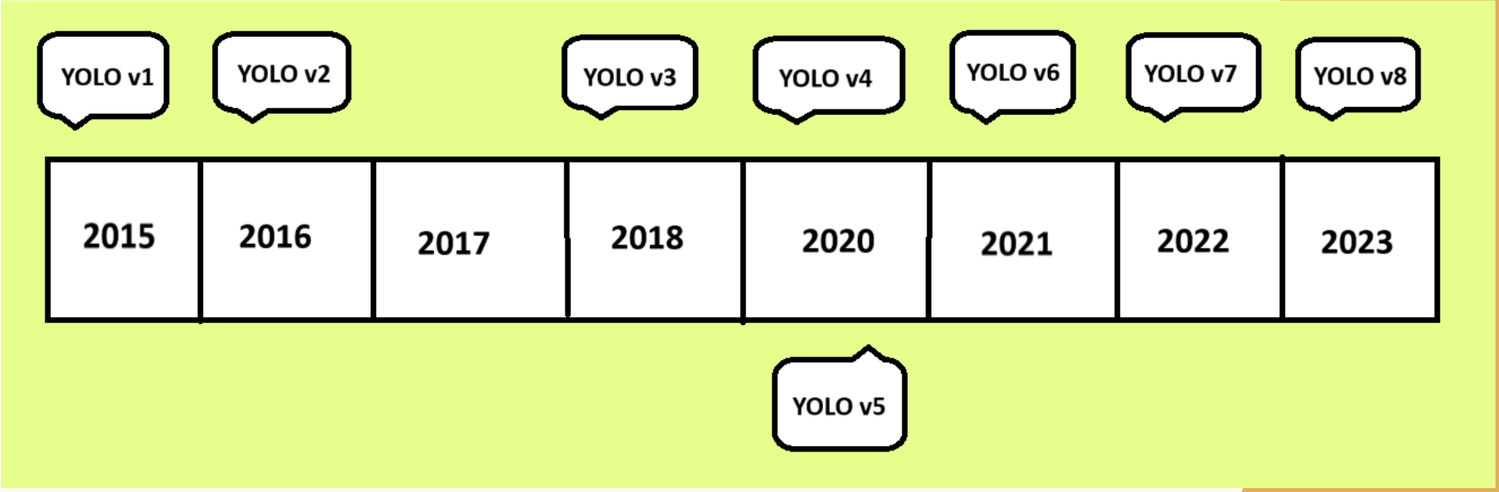
https://kili-technology.com/data-labeling/machine-learning/yolo-algorithm-real-time-object-detection-from-a-to-z

Why not R-CNN?

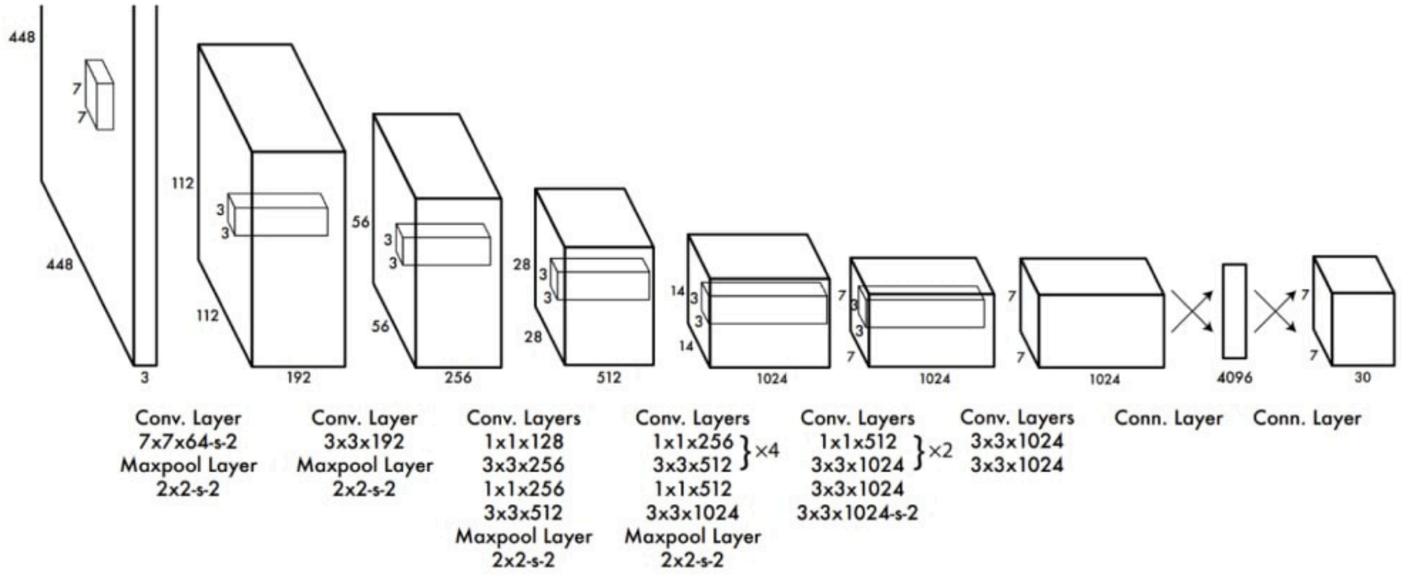


https://kili-technology.com/data-labeling/machine-learning/yolo-algorithm-real-time-object-detection-from-a-to-z

Why YOLO ?



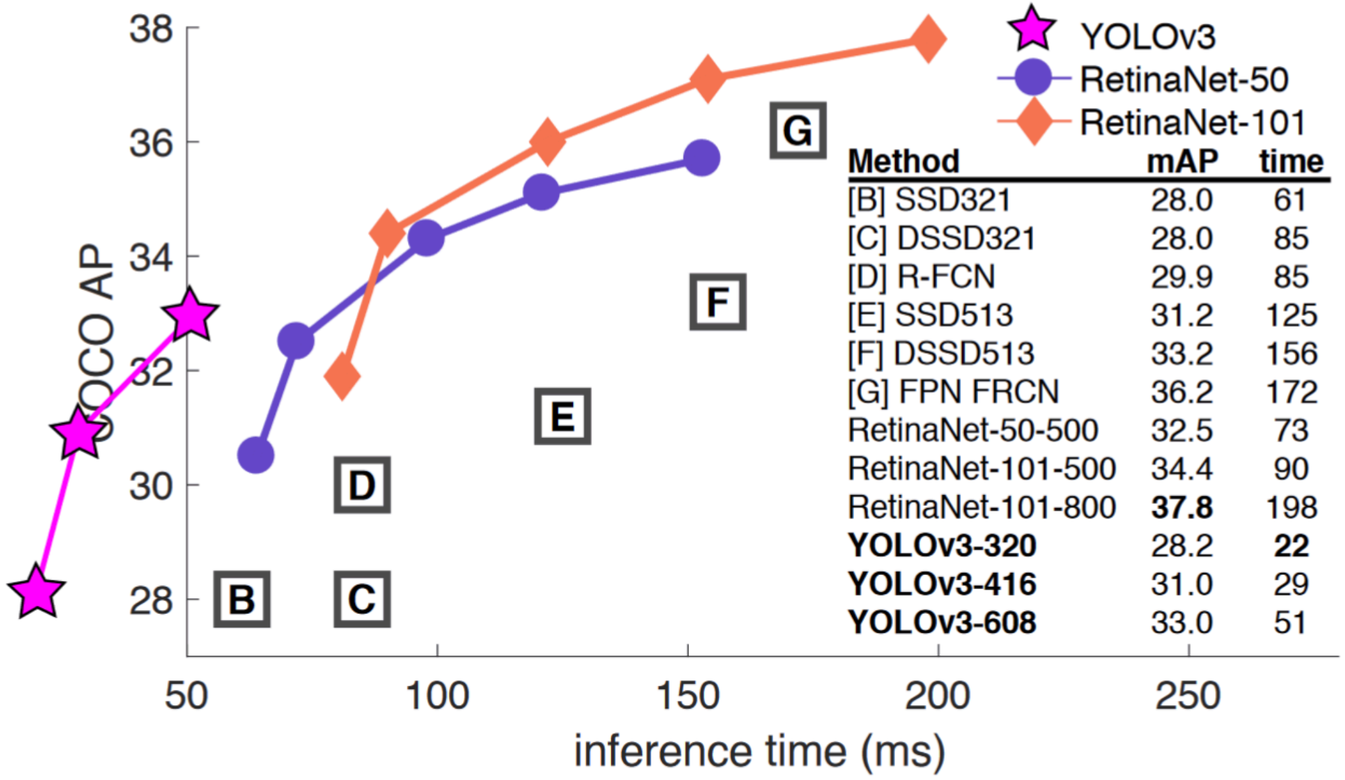
How does YOLO detect Objects?



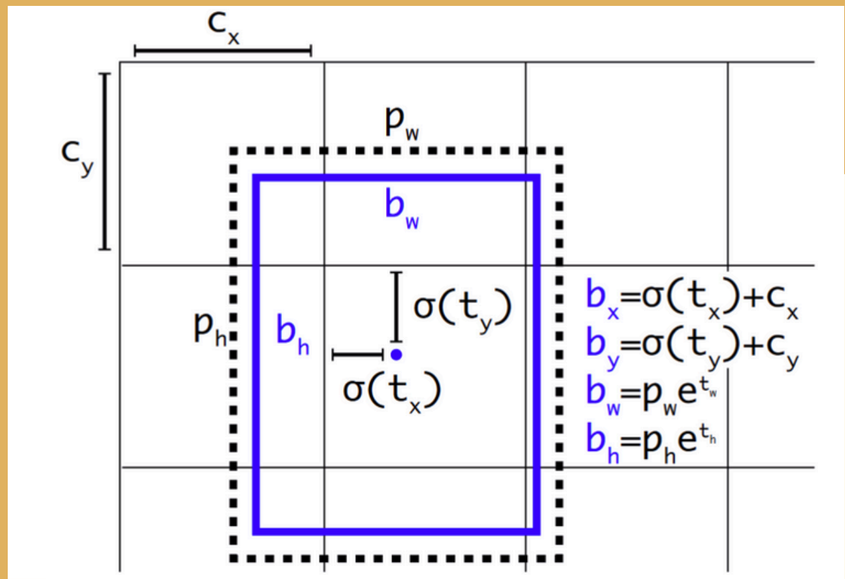
Wu et al.,2018

How does YOLO detect Objects?

- Processing video frame by frame ,cap.read()
- Object Detection in each frame,model.track()
- Concept of Max Pooling and Class Probability



Method	mAP	time
[B] SSD321	28.0	61
[C] DSSD321	28.0	85
[D] R-FCN	29.9	85
[E] SSD513	31.2	125
[F] DSSD513	33.2	156
[G] FPN FRCN	36.2	172
RetinaNet-50-500	32.5	73
RetinaNet-101-500	34.4	90
RetinaNet-101-800	**37.8**	198
YOLOv3-320	28.2	**22**
YOLOv3-416	31.0	29
YOLOv3-608	33.0	51



Redmon et al.,2018

$$\text{Confidence} = \Pr(\text{Object}) \times \text{IOU}_{\text{pre}}^{\text{truth}}$$

Wu et al.,2018

Bounding Box Prediction

$$b_x = \sigma(t_x) + c_x$$
$$b_y = \sigma(t_y) + c_y$$
$$b_w = p_w e^{t_w}$$
$$b_h = p_h e^{t_h}$$

Redmon et al.,2018

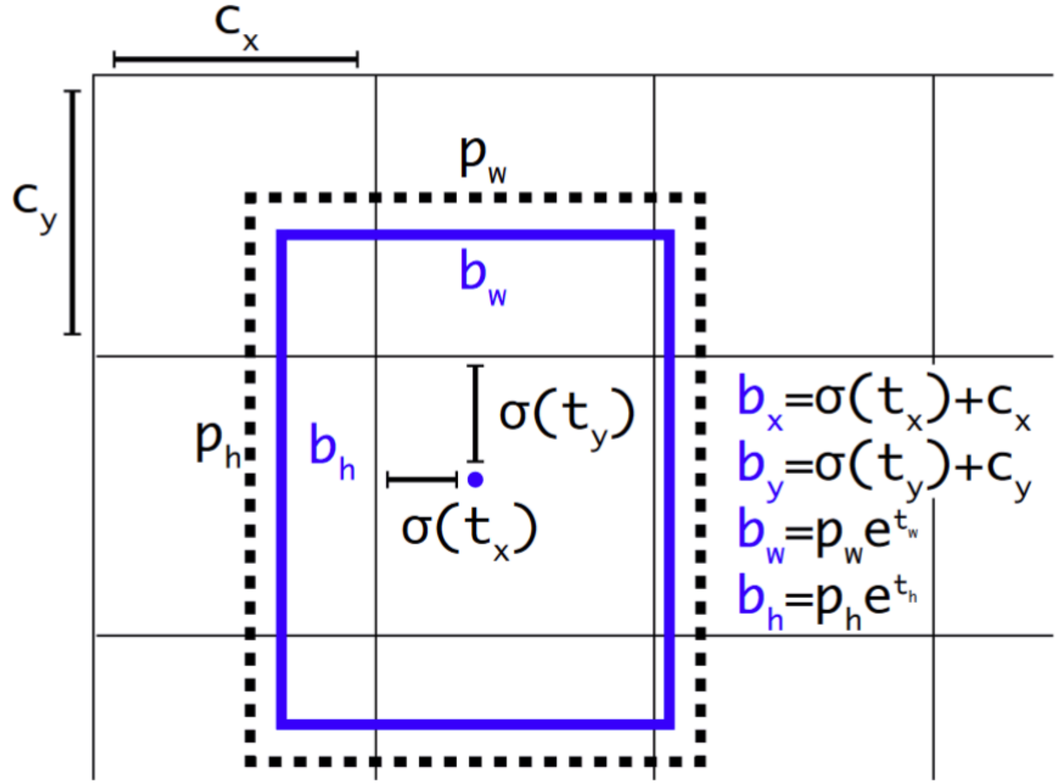
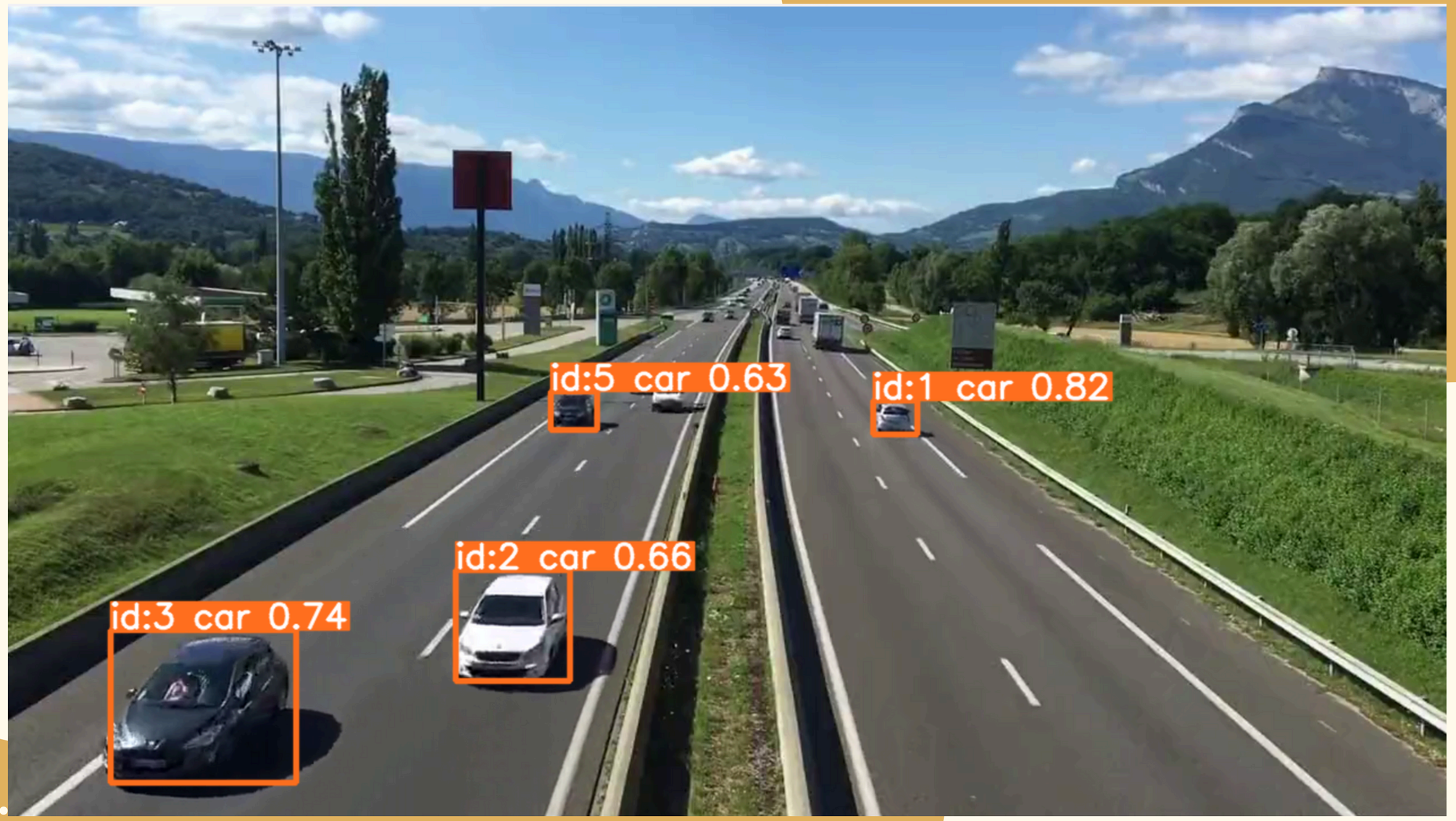


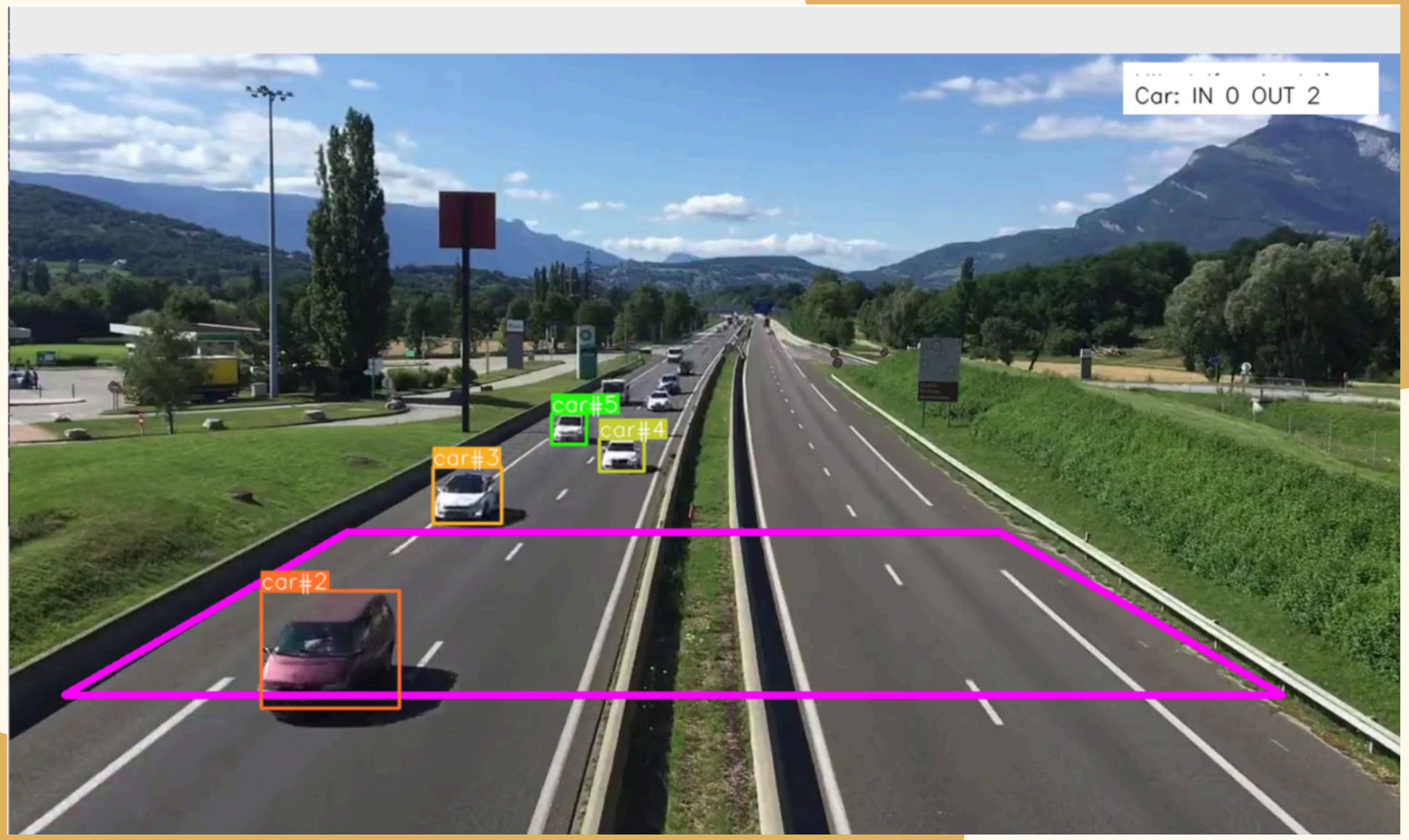
Figure 2. **Bounding boxes with dimension priors and location prediction.** We predict the width and height of the box as offsets from cluster centroids. We predict the center coordinates of the box relative to the location of filter application using a sigmoid function. This figure blatantly self-plagiarized from [15].

Results



Displaying vehicle category along with their Confidence Score

Results



Maintaining Count of Vehicles crossing the two lines

Conclusion

- Tracked count of different categories of vehicles, such as cars, trucks and buses.
- Object Detection in each frame

Thank You !