

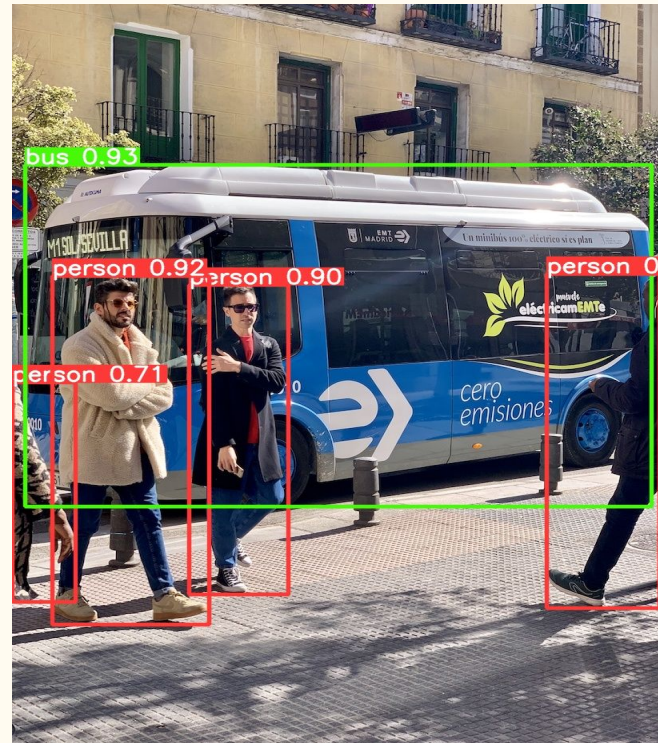
# Object Detection in Images

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# Object Detection

- Identify and locate objects within an image/video
- Project Goals
  - Perform object detection on Common Objects in Context (COCO) Dataset.
  - Fine-tuning object detection models for a custom vehicles dataset.
  - Compare current state-of-the-art object detection model performance.



# Dataset - COCO

- Used Common objects in context (COCO)-2017 validation set
  - 5k+ Images and annotations for 80 common object categories.
  - Filtered Labels: [car, truck, bus, bicycle] (732 images)

Train	Test
500 images	232 images

- Trained different architectures to identify objects:
  - Faster RCNN
  - Pretrained YOLO architecture
  - YOLO with further trained weights

# Faster RCNN

- General Workflow



- ResNet-50-FPN backbone
- Hyperparameters:
  - Learning rate = 0.005
  - Optimizer = SGD
  - Trained for 5 epochs
- Imbalance in Car and Bus class.

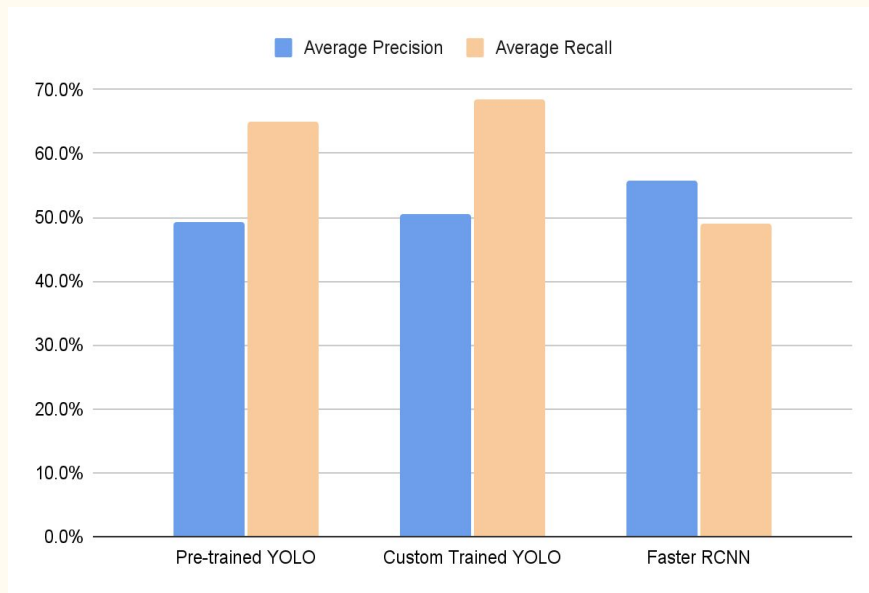
Classes	Precision	Recall	f1-score
Car	0.51	0.70	0.59
Bus	0.53	0.72	0.61
Truck	0.38	0.32	0.35
Bicycle	0.35	0.60	0.44
<b>Wgt. Avg</b>	<b>0.48</b>	<b>0.64</b>	<b>0.54</b>

# YOLO vs Faster RCNN

<b>YOLO</b>	<b>Faster RCNN</b>
Very Fast (45 Frames per second - better than real-time)	Slow - cannot be used for real-time prediction
1-step architecture - Does Classification and bounding box regression at the same time	2-step architecture - first classifies and then finds in the object
Difficulty predicting objects that are small and close to each other	Easily detect small objects

# Performance Comparison

- Faster RCNN has higher precision and lower recall than YOLO
- Higher precision means that an algorithm returns more relevant results than irrelevant ones and high recall means that an algorithm returns most of the relevant results



# What went well/didn't go well?

- Faster RCNN and YOLO are very complex architectures, training them took a lot of time
- We were able to explore faster RCNN more than the YOLO architecture
- Trained only for a few additional epochs
- Trained for only 4 classes out of a total of 80

## Conclusion

- Faster RCNN has a better average precision whereas YOLO gives a better average recall

THANK YOU