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CS10B DL Lab 8 Yolo

Report

Task 1(Training)

Scratch YOLOv5 training snippet:

```
!python ./yolov5/train.py --img 640 --batch 32 --epochs 50 --data ./vehicles/data.yaml --weights 'yolov5s.pt' --name vehic
```

Scratch YOLOv8 training snippet:

```
!yolo task=detect mode=train model=yolov8s.yaml imgsz=640 data=/content/vehicles/data.yaml epochs=50 batch=32 name=yolov8s
```

Pretrained YOLOv8 training snippet:

```
] from ultralytics import YOLO
# Load the model.
model = YOLO('yolov8s.pt')

# Training.
results = model.train(
    data='/content/vehicles/data.yaml',
    imgsz=640,
    epochs=10,
    batch=32,
    name='vehicles_pretrained')
```

Task 2(Evaluation with mAP values)

YOLOv5:

Class	Images	Instances	P	R	mAP50	mAP50-95
all	250	454	0.58	0.678	0.625	0.443
Ambulance	250	64	0.61	0.781	0.746	0.57
Bus	250	46	0.738	0.87	0.834	0.573
Car	250	238	0.533	0.555	0.535	0.364
Motorcycle	250	46	0.653	0.739	0.635	0.435
Truck	250	60	0.366	0.443	0.374	0.275

Yolov8 (Scratch):

Class	Images	Instances	P	R	mAP50	mAP50-95
all	250	454	0.597	0.429	0.475	0.309
Ambulance	250	64	0.871	0.633	0.75	0.57
Bus	250	46	0.514	0.435	0.45	0.317
Car	250	238	0.515	0.331	0.348	0.213
Motorcycle	250	46	0.567	0.478	0.518	0.266
Truck	250	60	0.516	0.267	0.311	0.18

Yolov8 (Pretrained):

Class	Images	Instances	P	R	mAP50	mAP50-95
all	250	454	0.249	0.267	0.254	0.192
person	250	64	0	0	0.0001	1e-05
bicycle	250	46	0	0	0	0
car	250	238	0.546	0.597	0.539	0.396
motorcycle	250	46	0.7	0.739	0.732	0.562

Task 3&4(Evaluation Results and Yolo architectures)

Yolo architectures:

Feature	YOLOv5	YOLOv8
Accuracy	Good	Very good
Speed	Fast	Faster
Architecture	Anchor-based	Anchor-free
Loss function	CIoU loss	TAL loss

CIoU loss is an extension of the Intersection over Union (IoU) loss function. It takes into account four factors:

1. The area of overlap between the predicted and ground truth bounding boxes.
2. The distance between the centers of the predicted and ground truth bounding boxes.
3. The aspect ratio of the predicted and ground truth bounding boxes.
4. The consistency between the predicted and ground truth bounding boxes.

TAL loss is a new loss function that takes into account the attention of the model to different parts of the image. It is based on the idea that the model should focus on the most important parts of the image, such as the center of the object, when making predictions.

Actual Results:

Actual results were very surprising.

1. The speed factor was correctly proved i.e. yolov8 is faster than yolov5.
2. Yolov5 turned out to be the best performing model with mAP50 of 0.625
3. Yolov8 from scratch turned out to be the better than the pretrained one with mAP50 of 0.475. The pretrained one had 0.254 mAP50.

This was completely unexpected as we actually expected the opposite results with the pretrained yolov8 being better than the yolov8 from scratch and yolov8 from scratch being better than yolov5. We don't have a solid explanation of why this happened.

Task 5(Result Snippets)

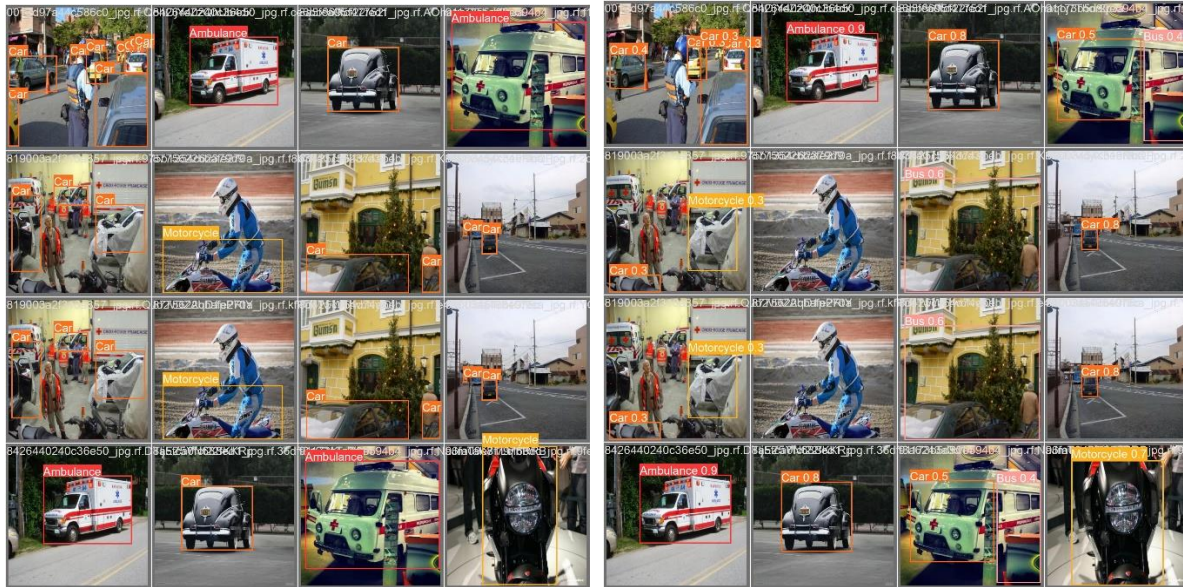
Yolov5



Yolov8(Scratch)

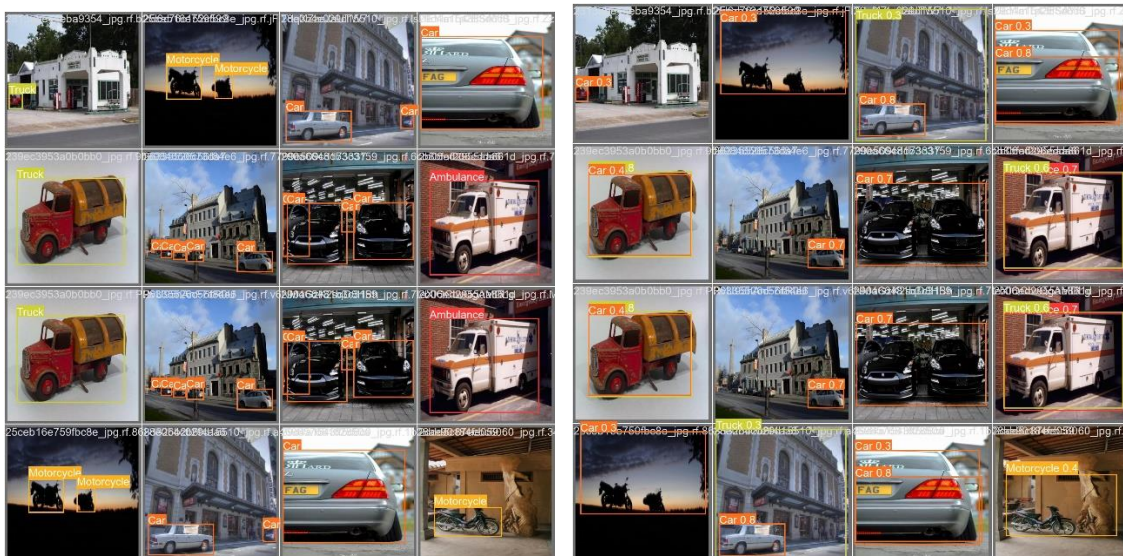
Labels

Predictions



Labels

Predictions



Yolov8(Pretrained)

Labels



Predictions



Labels



Predictions



Conclusion

The results, at least in terms of numerical metrics, were very much against our expectations and further investigation is necessary to figure out the reason.