

Evaluation Result

| YOLO-formal | train | validation | test |
|-------------|-------|------------|-------|
| mAP50 | 0.995 | 0.995 | 0.995 |
| mAP50-95 | 0.977 | 0.933 | 0.931 |
| Precision | 1 | 1 | 1 |
| Recall | 1 | 0.998 | 0.998 |

Mount the google drive

```
1 from google.colab import drive
2 drive.mount('/content/gdrive')
```

Mounted at /content/gdrive

Import yolov5

```
1 %cd /content/gdrive/MyDrive/42028_Assessment3
```

```
/content/gdrive/MyDrive/42028_Assessment3
```

```
1 ls
```

```
dataset/                               pre_seat.ipynb
dataset_empty/                         ssd_coco_dataset/
dataset_empty_pascal/                  unzip.ipynb
experiment/                            Video_Inference/
obj_train_data/                       yolo_angle_3_1_standing.zip
original/                             'yolo_empty(Data_enhancement).ipynb'
pre_dataset/                           yolo_empty.ipynb
pre_dataset_angle3standing/           'yolo_formal(Data_enhancement).ipynb'
'pre_dataset_angle3standing\test.txt'  yolo_formal.ipynb
'pre_dataset_angle3standing\train.txt' YOLO_STANDING/
'pre_dataset_angle3standing\val.txt'   yolov5/
```

```
1 !git clone https://github.com/ultralytics/yolov5.git # Import the existing yolov5 model
```

fatal: destination path 'yolov5' already exists and is not an empty directory.

```
1 %cd yolov5
```

```
/content/gdrive/MyDrive/42028_Assessment3/yolov5
```

```
1 !pip install -r requirements.txt # Import package
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Collecting gitpython>=3.1.30 (from -r requirements.txt (line 5))
  Downloading GitPython-3.1.31-py3-none-any.whl (184 kB)
```

184.3/184.3 kB 19.5 MB/s eta 0:00:00

```
Requirement already satisfied: matplotlib>=3.3 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: numpy>=1.18.5 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: opencv-python>=4.1.1 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: psutil in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 10)) (5)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: requests>=2.23.0 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: scipy>=1.4.1 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: thop>=0.1.1 (from -r requirements.txt (line 14))
  Downloading thop-0.1.1.post2209072238-py3-none-any.whl (15 kB)
```

```
Requirement already satisfied: torch>=1.7.0 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: torchvision>=0.8.1 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: tqdm>=4.64.0 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 1))
Requirement already satisfied: pandas>=1.1.4 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 2))
Requirement already satisfied: seaborn>=0.11.0 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 2))
Requirement already satisfied: setuptools>=65.5.1 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 2))
Collecting gitdb<5,>=4.0.1 (from -r requirements.txt (line 5))
  Downloading gitdb-4.0.10-py3-none-any.whl (62 kB)
```

62.7/62.7 kB 10.4 MB/s eta 0:00:00

```
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r req)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r requirem
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r req
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r req
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r requi
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r requi
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r
Requirement already satisfied: urllib3<1.27,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->-
```

```

Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->-r)
Requirement already satisfied: charset-normalizer==2.0.0 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.
Requirement already satisfied: idna<4,>2.5 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->-r require
Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-packages (from torch>=1.7.0->-r requirements.t>
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.10/dist-packages (from torch>=1.7.0->-r requi
Requirement already satisfied: sympy in /usr/local/lib/python3.10/dist-packages (from torch>=1.7.0->-r requirements.txt >
Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-packages (from torch>=1.7.0->-r requirements.txt >
Requirement already satisfied: jinja2 in /usr/local/lib/python3.10/dist-packages (from torch>=1.7.0->-r requirements.txt >
Requirement already satisfied: triton==2.0.0 in /usr/local/lib/python3.10/dist-packages (from torch>=1.7.0->-r requirement
Requirement already satisfied: cmake in /usr/local/lib/python3.10/dist-packages (from triton==2.0.0->torch>=1.7.0->-r req
Requirement already satisfied: lit in /usr/local/lib/python3.10/dist-packages (from triton==2.0.0->torch>=1.7.0->-r requi
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.1.4->-r requirement
Collecting smmap<6,>=3.0.1 (from gitdb<5,>=4.0.1->gitpython>=3.1.30->-r requirements.txt (line 5))
  Downloading smmap-5.0.0-py3-none-any.whl (24 kB)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.7->matplotlib)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.10/dist-packages (from jinja2->torch>=1.7.0->-r
Requirement already satisfied: mpmath>=0.19 in /usr/local/lib/python3.10/dist-packages (from sympy->torch>=1.7.0->-r req
Installing collected packages: smmap, gitdb, gitpython, thop
Successfully installed gitdb-4.0.10 gitpython-3.1.31 smmap-5.0.0 thop-0.1.1.post2209072238

```

▼ Prepare Dataset

Convert all png images to jpg

▼ Setup Training YAML File - yolov5m

▼ Setup Dataset Configuration (Data.yaml)

▼ Setup Dataset Configuration (Data.yaml)

```

1 #@title Setup Dataset Configuration (Data.yaml)          train_data_dir: "/content/gdrive/MyDrive/42028_Assessm"
2 number_of_classes = 2                                val_data_dir: "/content/gdrive/MyDrive/42028_Assessme"
3 train_data_dir = "/content/gdrive/MyDrive/42028_Assessment3/dataset/data/train" #@param {type:"string"}      test_data_dir: "/content/gdrive/MyDrive/42028_Assessm"
4 val_data_dir = "/content/gdrive/MyDrive/42028_Assessment3/dataset/data/valid" #@param {type:"string"}           class_names: ["Empty_Seat", "People_Seating"]
5 test_data_dir = "/content/gdrive/MyDrive/42028_Assessment3/dataset/data/test" #@param {type:"string"}        class_names: ["Empty_Seat", "People_Seating"]
6
7 class_names = ['Empty_Seat', "People_Seating"] #@param {type:"raw"}
8 with open('new_data_yaml', 'w+') as file:
9   file.write(                                         class_names: ["Empty_Seat", "People_Seating"]
10    f"""
11      train: {train_data_dir}
12      val: {val_data_dir}
13      test: {test_data_dir}
14      nc: {number_of_classes}
15      names: {class_names}
16      """
17  )

```

▼ Start training with yolov5

```

1 from datetime import datetime # To get model training time
2 import matplotlib.pyplot as plt # Import the pyplot module from the matplotlib library for drawing graphs
3
4 start = datetime.now() # Get the current time of start
5 !python train.py --img 416 --batch 32 --epochs 50 --hyp hyp.scratch.yaml --data new_data_yaml --weights empty1.pt # The in
6 end = datetime.now() # Get the current time of end
7 print('Trainining time:', end - start)

```

2023/6/6 13:30

yolo_formal(Data_enhancement).ipynb - Colaboratory

| Epoch | GPU_mem | box_loss | obj_loss | cls_loss | Instances | Size |
|-------|---------|----------|-----------|----------|-----------|--|
| 44/49 | 5.3G | 0.02389 | 0.02524 | 0.004069 | 299 | 416: 100% 130/130 [02:24<00:00, 1.11s/it] |
| | Class | Images | Instances | P | R | mAP50 mAP50-95: 100% 9/9 [00:06<00:00, 1.33it, |
| | all | 519 | 5182 | 1 | 1 | 0.995 0.967 |
| Epoch | GPU_mem | box_loss | obj_loss | cls_loss | Instances | Size |
| 45/49 | 5.3G | 0.02358 | 0.02485 | 0.004029 | 278 | 416: 100% 130/130 [02:24<00:00, 1.11s/it] |
| | Class | Images | Instances | P | R | mAP50 mAP50-95: 100% 9/9 [00:07<00:00, 1.23it, |
| | all | 519 | 5182 | 1 | 1 | 0.995 0.97 |
| Epoch | GPU_mem | box_loss | obj_loss | cls_loss | Instances | Size |
| 46/49 | 5.3G | 0.02348 | 0.02458 | 0.00402 | 244 | 416: 100% 130/130 [02:27<00:00, 1.13s/it] |
| | Class | Images | Instances | P | R | mAP50 mAP50-95: 100% 9/9 [00:06<00:00, 1.35it, |
| | all | 519 | 5182 | 1 | 1 | 0.995 0.969 |
| Epoch | GPU_mem | box_loss | obj_loss | cls_loss | Instances | Size |
| 47/49 | 5.3G | 0.0235 | 0.02491 | 0.004036 | 300 | 416: 100% 130/130 [02:21<00:00, 1.09s/it] |
| | Class | Images | Instances | P | R | mAP50 mAP50-95: 100% 9/9 [00:07<00:00, 1.27it, |
| | all | 519 | 5182 | 1 | 1 | 0.995 0.972 |
| Epoch | GPU_mem | box_loss | obj_loss | cls_loss | Instances | Size |
| 48/49 | 5.3G | 0.02314 | 0.02398 | 0.003993 | 251 | 416: 100% 130/130 [02:22<00:00, 1.10s/it] |
| | Class | Images | Instances | P | R | mAP50 mAP50-95: 100% 9/9 [00:07<00:00, 1.28it, |
| | all | 519 | 5182 | 1 | 1 | 0.995 0.977 |
| Epoch | GPU_mem | box_loss | obj_loss | cls_loss | Instances | Size |
| 49/49 | 5.3G | 0.02325 | 0.02412 | 0.003996 | 392 | 416: 100% 130/130 [02:21<00:00, 1.09s/it] |
| | Class | Images | Instances | P | R | mAP50 mAP50-95: 100% 9/9 [00:07<00:00, 1.23it, |
| | all | 519 | 5182 | 1 | 1 | 0.995 0.965 |

50 epochs completed in 2.323 hours.

Optimizer stripped from runs/train/exp19/weights/last.pt, 42.1MB

Optimizer stripped from runs/train/exp19/weights/best.pt, 42.1MB

Validating runs/train/exp19/weights/best.pt...

Fusing layers...

Model summary: 212 layers, 20856975 parameters, 0 gradients, 47.9 GFLOPs

| Class | Images | Instances | P | R | mAP50 | mAP50-95: 100% 9/9 [00:14<00:00, 1.56s/i] |
|----------------|--------|-----------|---|---|-------|---|
| all | 519 | 5182 | 1 | 1 | 0.995 | 0.977 |
| Empty_Seat | 519 | 2068 | 1 | 1 | 0.995 | 0.972 |
| People_Seating | 519 | 3114 | 1 | 1 | 0.995 | 0.982 |

Results saved to runs/train/exp19

Trainining time: 2:20:55.852572

```

1 import matplotlib.pyplot as plt
2 # !python detect.py --weight best.pt --source "/content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304
3 f = plt.figure(figsize=(20, 16))
4 ax1 = f.add_subplot(1,2,1)
5 ax1.imshow(plt.imread("/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/train_batch0.jpg"))
6 ax1.set_title('Train', fontsize = 14)
7 ax2 = f.add_subplot(1,2,2)
8 ax2.imshow(plt.imread("/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/val_batch0_pred.jpg"))
9 ax2.set_title('Validation', fontsize = 14)

```

```
Text(0.5, 1.0, 'Validation')
```



▼ Get test dataset result

```
1 # Get the best results from the train and test the test dataset
```

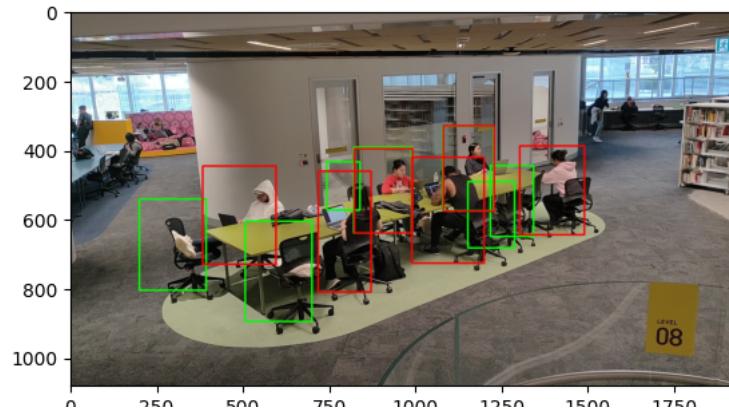
```
2 !python detect.py --weight /content/gdrive/MyDrive/42028_Assessment3/runs/train/exp19/weights/best.pt --source "/content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/" --conf 0.5
```

image 394/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201152.jpg: 384x640 2 Empty_Seats
 image 395/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201154.jpg: 384x640 2 Empty_Seats
 image 396/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201162.jpg: 384x640 2 Empty_Seats
 image 397/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201180.jpg: 384x640 2 Empty_Seats
 image 398/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201184.jpg: 384x640 2 Empty_Seats
 image 399/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201215.jpg: 384x640 2 Empty_Seats
 image 400/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201238.jpg: 384x640 2 Empty_Seats
 image 401/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201241.jpg: 384x640 2 Empty_Seats
 image 402/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201264.jpg: 384x640 2 Empty_Seats
 image 403/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201267.jpg: 384x640 2 Empty_Seats
 image 404/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201275.jpg: 384x640 2 Empty_Seats
 image 405/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201294.jpg: 384x640 2 Empty_Seats
 image 406/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201297.jpg: 384x640 2 Empty_Seats
 image 407/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201332.jpg: 384x640 2 Empty_Seats
 image 408/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201337.jpg: 384x640 2 Empty_Seats
 image 409/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201363.jpg: 384x640 2 Empty_Seats
 image 410/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201367.jpg: 384x640 2 Empty_Seats
 image 411/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201368.jpg: 384x640 2 Empty_Seats
 image 412/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201369.jpg: 384x640 2 Empty_Seats
 image 413/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201378.jpg: 384x640 2 Empty_Seats
 image 414/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201390.jpg: 384x640 2 Empty_Seats
 image 415/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201396.jpg: 384x640 2 Empty_Seats
 image 416/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201411.jpg: 384x640 2 Empty_Seats
 image 417/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201413.jpg: 384x640 2 Empty_Seats
 image 418/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201437.jpg: 384x640 2 Empty_Seats
 image 419/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201452.jpg: 384x640 2 Empty_Seats
 image 420/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201459.jpg: 384x640 2 Empty_Seats
 image 421/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201467.jpg: 384x640 2 Empty_Seats
 image 422/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/VID202304271358201487.jpg: 384x640 2 Empty_Seats
 image 423/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000001.jpg: 384x640 3 Empty_Seats,
 image 424/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000013.jpg: 384x640 3 Empty_Seats,
 image 425/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000020.jpg: 384x640 3 Empty_Seats,
 image 426/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000021.jpg: 384x640 3 Empty_Seats,
 image 427/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000034.jpg: 384x640 3 Empty_Seats,
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 image 430/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000080.jpg: 384x640 3 Empty_Seats,
 image 431/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000087.jpg: 384x640 3 Empty_Seats,
 image 432/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000091.jpg: 384x640 3 Empty_Seats,
 image 433/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000099.jpg: 384x640 3 Empty_Seats,
 image 434/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000102.jpg: 384x640 3 Empty_Seats,
 image 435/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000105.jpg: 384x640 3 Empty_Seats,
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 image 441/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000166.jpg: 384x640 3 Empty_Seats,
 image 442/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000189.jpg: 384x640 3 Empty_Seats,
 image 443/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000191.jpg: 384x640 3 Empty_Seats,
 image 444/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000201.jpg: 384x640 3 Empty_Seats,
 image 445/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000205.jpg: 384x640 3 Empty_Seats,
 image 446/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000214.jpg: 384x640 3 Empty_Seats,
 image 447/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000241.jpg: 384x640 3 Empty_Seats,
 image 448/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000243.jpg: 384x640 3 Empty_Seats,
 image 449/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000252.jpg: 384x640 3 Empty_Seats,
 image 450/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000269.jpg: 384x640 3 Empty_Seats,
 image 451/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000270.jpg: 384x640 3 Empty_Seats,
 image 452/523 /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/images/frame_000273.jpg: 384x640 3 Empty_Seats,

▼ Show the result of test

```
1 import cv2
2 test_img = plt.imread("/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp16/VID202304271355242102.jpg")
3 resize_img = cv2.resize(test_img, (20, 20))
4 plt.imshow(test_img)
```

```
<matplotlib.image.AxesImage at 0x7f92567c1b10>
```



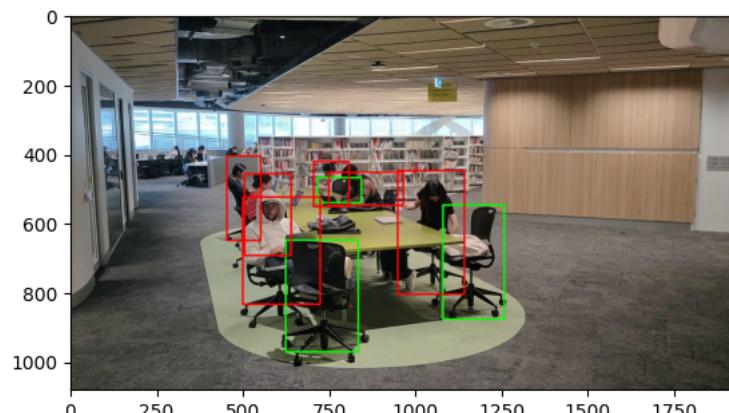
```
1 import cv2
2 test_img = plt.imread("/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp16/VID202304271358200871.jpg")
3 resize_img = cv2.resize(test_img, (20, 20))
4 plt.imshow(test_img)
```

```
<matplotlib.image.AxesImage at 0x7f92566369e0>
```



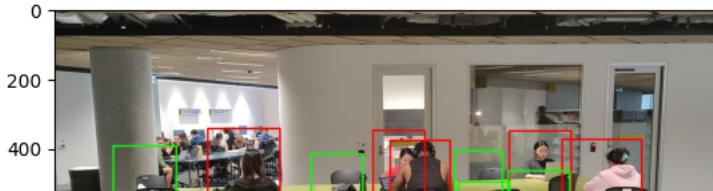
```
1 import cv2
2 test_img = plt.imread("/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp16/frame_000997.jpg")
3 resize_img = cv2.resize(test_img, (20, 20))
4 plt.imshow(test_img)
```

```
<matplotlib.image.AxesImage at 0x7f92564c92a0>
```



```
1 import cv2
2 test_img = plt.imread("/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp16/VID202304271356492817.jpg")
3 resize_img = cv2.resize(test_img, (20, 20))
4 plt.imshow(test_img)
```

```
<matplotlib.image.AxesImage at 0x7f925614f7f0>
```



▼ Display performance analysis

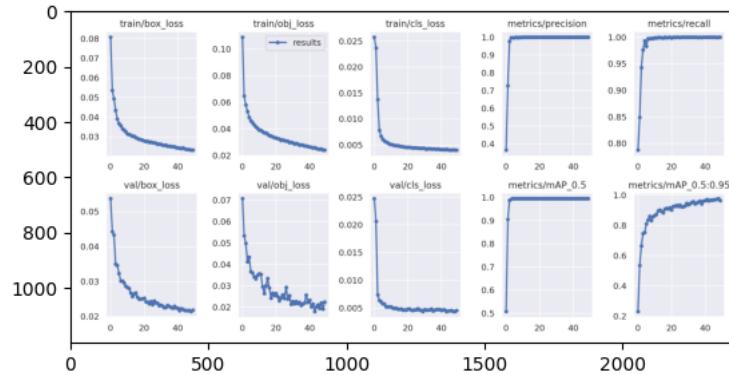
```
...
```

▼ Show Train and Validation Visualization Result

```
0 250 500 750 1000 1250 1500 1750
```

```
1 from PIL import Image
2 image = Image.open('/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/results.png') # Change 'exp' to the
3 #resize_img = cv2.resize(image, (20, 20))
4 plt.imshow(image)
```

```
<matplotlib.image.AxesImage at 0x7f92564a4250>
```



▼ Show Validation Reselt

```
1 !python val.py --weights "/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt" --data new_dat
val: data=new_data.yaml, weights=['/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt'], t
requirements: /content/gdrive/MyDrive/42028_Assessment3/requirements.txt not found, check failed.
YOLOv5 🚀 v7.0-160-g867f7f0 Python-3.10.11+cu118 CUDA:0 (Tesla T4, 15102MiB)

Fusing layers...
Model summary: 212 layers, 20856975 parameters, 0 gradients, 47.9 GFLOPs
val: Scanning /content/gdrive/MyDrive/42028_Assessment3/dataset/data/valid/labels.cache... 519 images, 0 backgrounds, 0 c
      Class     Images    Instances      P      R    mAP50    mAP50-95: 100% 17/17 [00:18<00:00, 1.11s
          all       519      5182       1     0.998    0.995    0.933
          Empty_Seat   519     2068       1     0.997    0.995    0.923
          People_Seating 519     3114       1       1     0.995    0.943
Speed: 0.2ms pre-process, 8.6ms inference, 5.6ms NMS per image at shape (32, 3, 640, 640)
Results saved to runs/val/exp7
```

▼ Show Test Result

- The val.py is designed to evaluate the performance of the validation dataset by default. Therefore, to evaluate the performance of the test datasets, we need to modify the new_data.yaml file and rewrite the paths for the test datasets to point to the validation dataset path.

▼ Setup Dataset Configuration (Data.yaml)

```
1 #@title Setup Dataset Configuration (Data.yaml)           train_data_dir: "/content/gdrive/MyDrive/42028_Assessm"
2 number_of_classes = 2                                     val_data_dir: "/content/gdrive/MyDrive/42028_Assessme"
3 train_data_dir = "/content/gdrive/MyDrive/42028_Assessment3/dataset/data/train" #@param {type:"string"}      test_data_dir: "/content/gdrive/MyDrive/42028_Assessm"
4 val_data_dir = "/content/gdrive/MyDrive/42028_Assessment3/dataset/data/test" #@param {type:"string"}            class_names: ["Empty_Seat", "People_Seating"]
5 test_data_dir = "/content/gdrive/MyDrive/42028_Assessment3/dataset/data/test" #@param {type:"string"}          class_names: ["Empty_Seat", "People_Seating"]
6
7 class_names = ['Empty_Seat', 'People_Seating'] #@param {type:"raw"}
8 with open('new_data.yaml', 'w+') as file:
9     file.write(
10         f"""
11         train: {train_data_dir}
12         val: {val_data_dir}""")

```

```

13     test: {test_data_dir}
14     nc: {number_of_classes}
15     names: {class_names}
16     """
17 )

# Change the path of the validation in new_data_yaml to the path of the test dataset and see how the result of test dataset
2 !python val.py --weights "/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt" --data new_dat

val: data=new_data_yaml, weights=['/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt'], k
requirements: /content/gdrive/MyDrive/42028_Assessment3/requirements.txt not found, check failed.
YOLOv5 🚀 v7.0-160-g867f7f0 Python-3.10.11 torch-2.0.1+cu118 CUDA:0 (Tesla T4, 15102MiB)

Fusing layers...
Model summary: 212 layers, 20856975 parameters, 0 gradients, 47.9 GFLOPs
val: Scanning /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/labels... 523 images, 0 backgrounds, 0 corrupt:
val: New cache created: /content/gdrive/MyDrive/42028_Assessment3/dataset/data/test/labels.cache
      Class      Images Instances      P      R    mAP50    mAP50-95: 100% 17/17 [00:18<00:00,  1.07s
          all       523      5222      1    0.998    0.995    0.931
        Empty_Seat    523      2084      1    0.997    0.995    0.922
      People_Seating   523      3138    0.999    0.999    0.995    0.941
Speed: 0.2ms pre-process, 8.5ms inference, 3.0ms NMS per image at shape (32, 3, 640, 640)
Results saved to runs/val/exp9

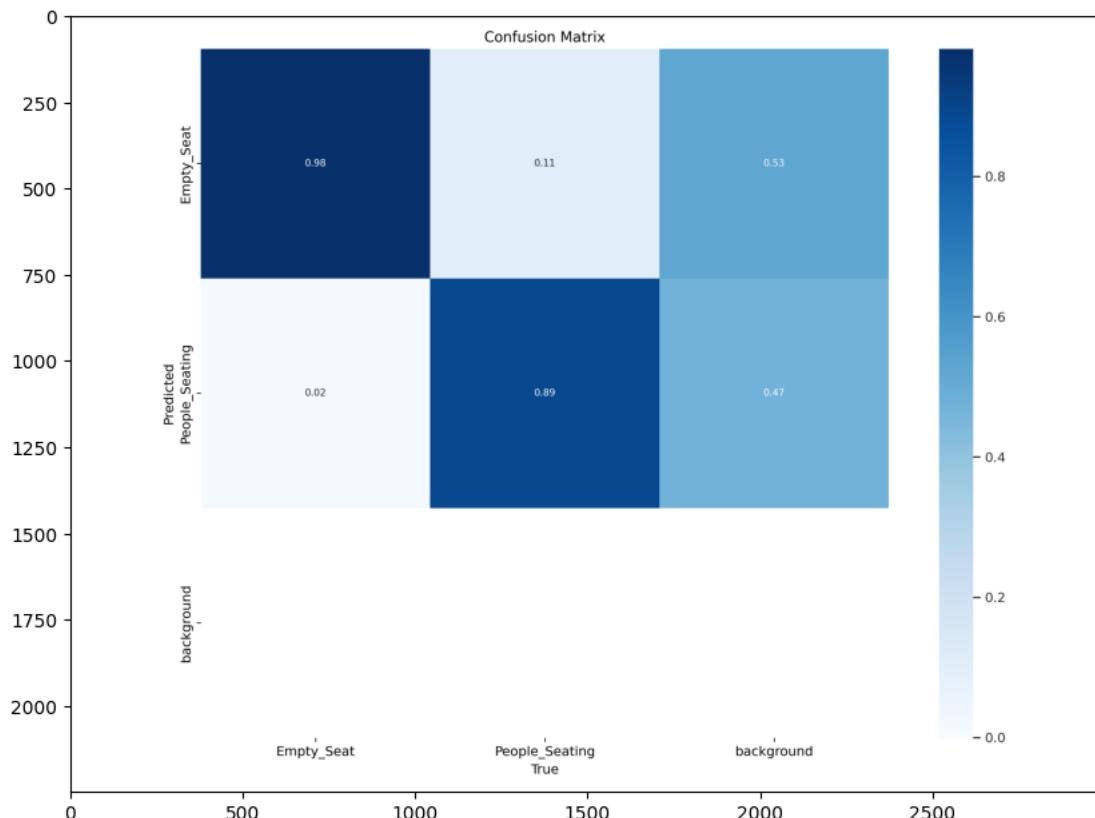
```

▼ Confusion Matrix - Train

```

1 import matplotlib.pyplot as plt
2 import matplotlib.image as image
3
4 img = image.imread('/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/confusion_matrix.png')
5 fig = plt.figure(figsize=(10, 10), dpi=100)
6 plt.imshow(img)
7 plt.show()

```

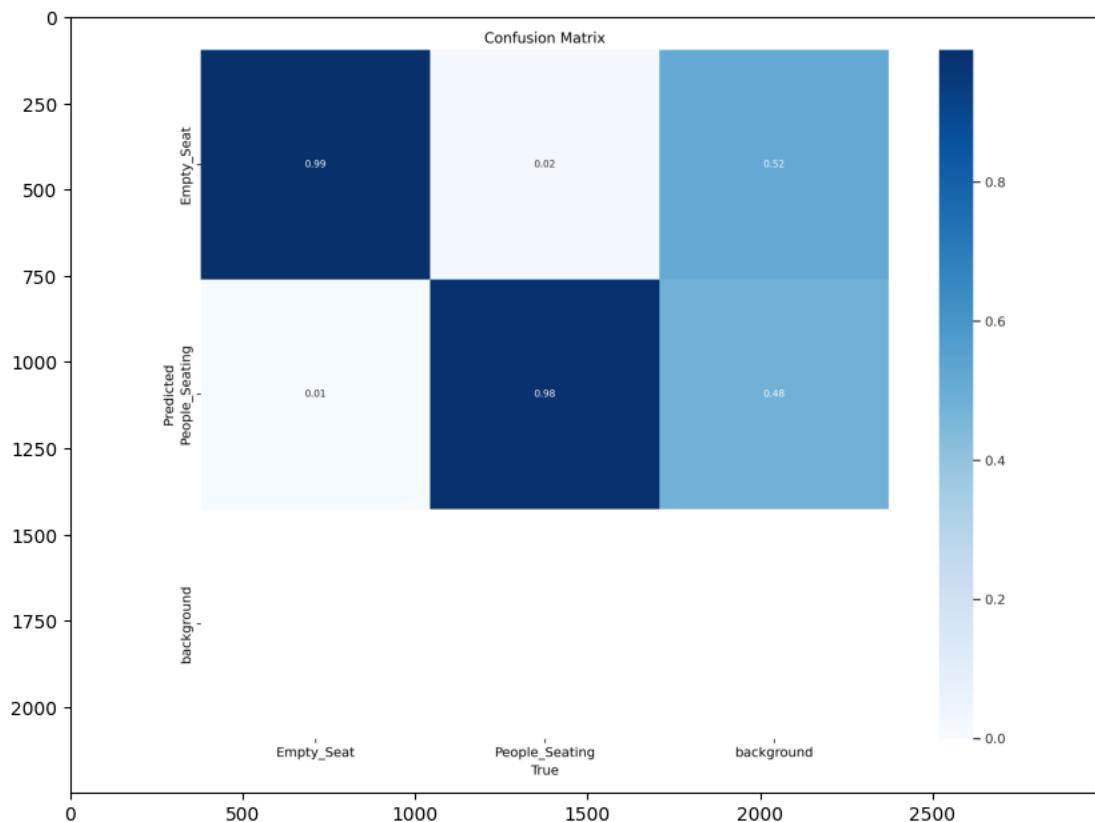


▼ Confusion Matrix - Validation

```

1 import matplotlib.pyplot as plt
2 import matplotlib.image as image
3
4 img = image.imread('/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/val/exp7/confusion_matrix.png')
5 fig = plt.figure(figsize=(10, 10), dpi=100)
6 plt.imshow(img)
7 plt.show()

```

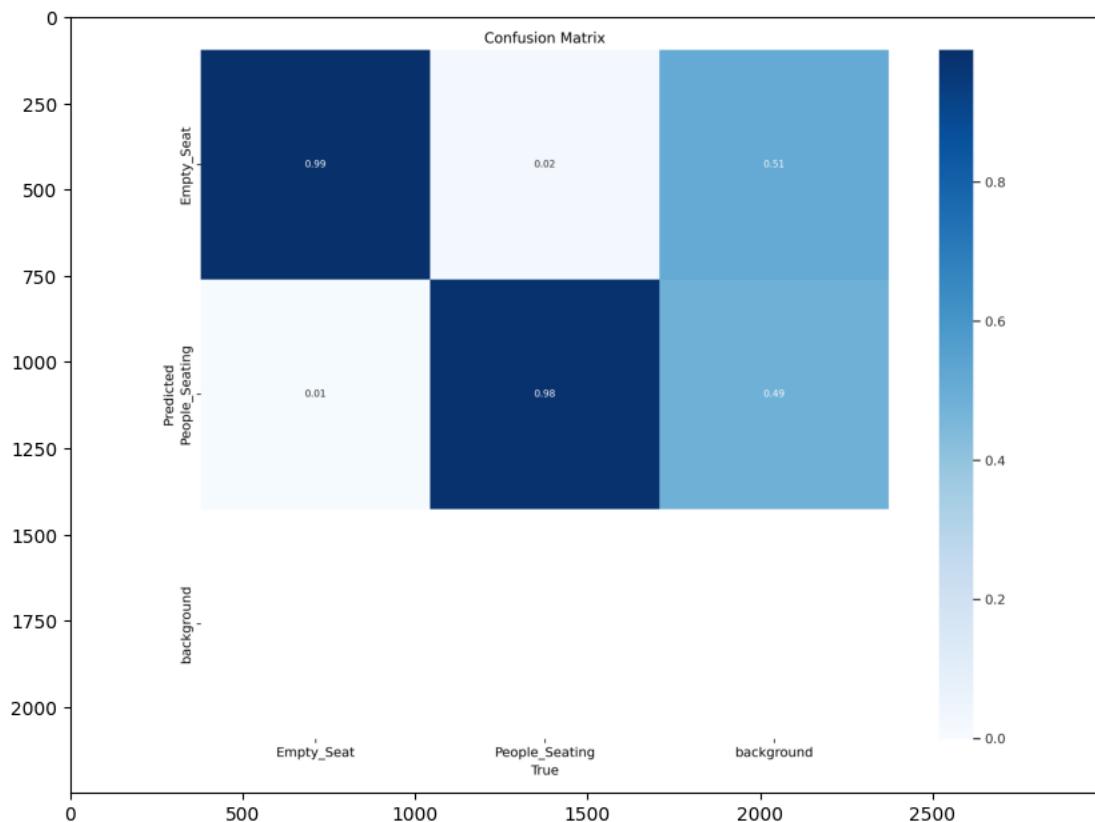


▼ Confusion Matrix - Test

```

1 import matplotlib.pyplot as plt
2 import matplotlib.image as image
3
4 img = image.imread('/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/val/exp9/confusion_matrix.png')
5 fig = plt.figure(figsize=(10, 10), dpi=100)
6 plt.imshow(img)
7 plt.show()

```



▼ Video/Real-Time Inference

▼ Video1-different angles

```

1 !python detect.py --img 416 --weights "/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt" -
video 1/1 (424/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (425/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (426/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (427/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (428/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (429/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (430/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (431/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (432/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (433/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (434/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (435/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (436/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (437/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (438/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (439/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (440/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (441/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (442/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (443/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (444/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (445/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (446/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (447/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (448/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (449/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (450/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (451/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (452/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (453/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (454/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (455/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (456/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (457/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (458/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (459/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (460/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (461/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (462/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (463/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 3 Empty_Sea
video 1/1 (464/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (465/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 3 Empty_Sea
video 1/1 (466/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (467/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (468/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (469/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 3 Empty_Sea
video 1/1 (470/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 3 Empty_Sea
video 1/1 (471/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (472/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (473/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (474/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (475/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (476/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (477/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (478/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (479/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 2 Empty_Sea
video 1/1 (480/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 3 Empty_Sea
video 1/1 (481/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 3 Empty_Sea
video 1/1 (482/1844) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112634.mp4: 256x416 3 Empty_Sea

1 # Convert mp4 to webm
2 !ffmpeg -i /content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp15/VID20230327112634.mp4 -vcodec vp9 ./Detection

ffmpeg version 4.2.7-0ubuntu0.1 Copyright (c) 2000-2022 the FFmpeg developers
built with gcc 9 (Ubuntu 9.4.0-1ubuntu1-20.04.1)
configuration: --prefix=/usr --extra-version=0ubuntu0.1 --toolchain=hardened --libdir=/usr/lib/x86_64-linux-gnu --incdir
libavutil      56. 31.100 / 56. 31.100
libavcodec     58. 54.100 / 58. 54.100
libavformat    58. 29.100 / 58. 29.100
libavdevice     58.  8.100 / 58.  8.100
libavfilter     7. 57.100 / 7. 57.100
libavresample   4.  0. 0 / 4.  0. 0
libswscale       5.  5.100 / 5.  5.100
libswresample   3.  5.100 / 3.  5.100
libpostproc    55.  5.100 / 55.  5.100
Input #0, mov,mp4,m4a,3gp,3g2,mj2, from '/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp15/VID20230327112634.mp4'
Metadata:
  major_brand     : isom
  minor_version   : 512

```

```

compatible_brands: isomiso2mp41
encoder       : Lavf59.27.100
Duration: 00:00:30.73, start: 0.000000, bitrate: 56053 kb/s
Stream #0:0(und): Video: mpeg4 (Simple Profile) (mp4v / 0x7634706D), yuv420p, 1920x1080 [SAR 1:1 DAR 16:9], 56052 kb/s
Metadata:
    handler_name   : VideoHandler
Stream mapping:
Stream #0:0 -> #0:0 (mpeg4 (native) -> vp9 (libvpx-vp9))
Press [q] to stop, [?] for help
[libvpx-vp9 @ 0x562c346ff700] v1.8.2
Output #0, webm, to './DetectionResult1.webm':
Metadata:
    major_brand     : isom
    minor_version   : 512
    compatible_brands: isomiso2mp41
    encoder         : Lavf58.29.100
Stream #0:0(und): Video: vp9 (libvpx-vp9), yuv420p, 1920x1080 [SAR 1:1 DAR 16:9], q=-1--1, 200 kb/s, 60.01 fps, 1k tkip
Metadata:
    handler_name   : VideoHandler
    encoder         : Lavc58.54.100 libvpx-vp9
Side data:
cpb: bitrate max/min/avg: 0/0/0 buffer size: 0 vbv_delay: -1
frame= 1844 fps=5.7 q=0.0 Lsize= 2273kB time=00:00:30.71 bitrate= 606.4kbits/s speed=0.0948x
video:2260kB audio:0kB subtitle:0kB other streams:0kB global headers:0kB muxing overhead: 0.610748%

```

```

1 # Check the Result!!
2 import io
3 from base64 import b64encode
4 from IPython.display import HTML
5
6 with io.open('/content/gdrive/MyDrive/42028_Assessment3/yolov5/DetectionResult1.webm', 'r+b') as f:
7     mp4 = f.read()
8 data_url = "data:video/webm;base64," + b64encode(mp4).decode()
9 HTML("""
10 <video width=800 controls>
11     <source src=\"%s\" type=\"video/webm\">
12 </video>
13 """ % data_url)

```

0:00 / 0:30



▼ Image-different scene

```

1 !python detect.py --img 416 --weights "/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt" -
detect: weights=['/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt'], source=/content/gc
requirements: /content/gdrive/MyDrive/42028_Assessment3/requirements.txt not found, check failed.
YOLOv5 🚀 v7.0-160-g867f7f0 Python-3.10.11 torch-2.0.1+cu118 CUDA:0 (Tesla T4, 15102MiB)

Fusing layers...
Model summary: 212 layers, 20856975 parameters, 0 gradients, 47.9 GFLOPS
image 1/1 /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/WechatIMG100.jpg: 192x416 1 People_Seating, 44.3ms
Speed: 0.4ms pre-process, 44.3ms inference, 1.5ms NMS per image at shape (1, 3, 416, 416)
Results saved to runs/detect/exp1

```

```

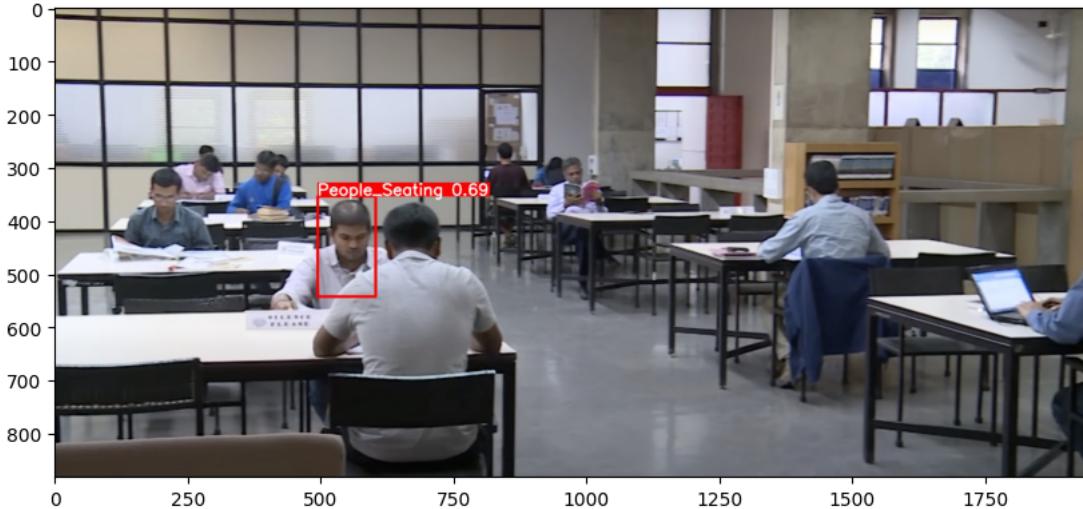
1 import matplotlib.pyplot as plt
2 import matplotlib.image as image
3

```

```

4 img = image.imread('/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp17/WechatIMG100.jpg')
5 fig = plt.figure(figsize=(10, 10), dpi=100)
6 plt.imshow(img)
7 plt.show()

```



▼ Video2-different angles and tables

```

1 !python detect.py --img 640 --weights "/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt" -
detect: weights=['/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/train/exp19/weights/best.pt'], source=/content/gc
requirements: /content/gdrive/MyDrive/42028_Assessment3/requirements.txt not found, check failed.
YOLOv5 🚀 v7.0-160-g867f7f0 Python-3.10.11+cu118 CUDA:0 (Tesla T4, 15102MiB)

```

Fusing layers...

```

Model summary: 212 layers, 20856975 parameters, 0 gradients, 47.9 GFLOPs
video 1/1 (1/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (2/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (3/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (4/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (5/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (6/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (7/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (8/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (9/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (10/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (11/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (12/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (13/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (14/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (15/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (16/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (17/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (18/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (19/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (20/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (21/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (22/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (23/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (24/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (25/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (26/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (27/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (28/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (29/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (30/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (31/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (32/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (33/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (34/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (35/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (36/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (37/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (38/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (39/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 (no detector
video 1/1 (40/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (41/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (42/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (43/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (44/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (45/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (46/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (47/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat

```

```

video 1/1 (48/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (49/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (50/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
video 1/1 (51/1835) /content/gdrive/MyDrive/42028_Assessment3/Video_Inference/VID20230327112507.mp4: 384x640 1 Empty_Seat
.

1 # Convert mp4 to webm
2 !ffmpeg -i /content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp13/VID20230327112507.mp4 -vcodec vp9 ./Detection

ffmpeg version 4.2.7-0ubuntu0.1 Copyright (c) 2000-2022 the FFmpeg developers
  built with gcc 9 (Ubuntu 9.4.0-1ubuntu1~20.04.1)
configuration: --prefix=/usr --extra-version=0ubuntu0.1 --toolchain=hardened --libdir=/usr/lib/x86_64-linux-gnu --incdir
libavutil      56. 31.100 / 56. 31.100
libavcodec     58. 54.100 / 58. 54.100
libavformat    58. 29.100 / 58. 29.100
libavdevice    58.  8.100 / 58.  8.100
libavfilter     7. 57.100 /  7. 57.100
libavresample   4.  0.  0 /  4.  0.  0
libswscale      5.  5.100 /  5.  5.100
libswresample   3.  5.100 /  3.  5.100
libpostproc    55.  5.100 / 55.  5.100
Input #0, mov,mp4,m4a,3gp,3g2,mj2, from '/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp13/VID20230327112507.mp4' @ 0:0:0, mov,mp4,m4a,3gp,3g2,mj2, from '/content/gdrive/MyDrive/42028_Assessment3/yolov5/runs/detect/exp13/VID20230327112507.mp4'
Metadata:
  major_brand     : isom
  minor_version   : 512
  compatible_brands: isomiso2mp41
  encoder         : Lavf59.27.100
Duration: 00:00:30.91, start: 0.000000, bitrate: 42390 kb/s
  Stream #0:0(und): Video: mpeg4 (Simple Profile) (mp4v / 0x7634706D), yuv420p, 1920x1080 [SAR 1:1 DAR 16:9], 42387 kb/s
  Metadata:
    handler_name   : VideoHandler
Stream mapping:
  Stream #0:0 -> #0:0 (mpeg4 (native) -> vp9 (libvpx-vp9))
Press [q] to stop, [?] for help
[libvpx-vp9 @ 0x558905d23cc0] v1.8.2
Output #0, webm, to './DetectionResult2.webm':
Metadata:
  major_brand     : isom
  minor_version   : 512
  compatible_brands: isomiso2mp41
  encoder         : Lavf58.29.100
  Stream #0:0(und): Video: vp9 (libvpx-vp9), yuv420p, 1920x1080 [SAR 1:1 DAR 16:9], q=-1--1, 200 kb/s, 59.30 fps, 1k tbn
Metadata:
  handler_name   : VideoHandler
  encoder         : Lavc58.54.100 libvpx-vp9
Side data:
  cpb: bitrate max/min/avg: 0/0/0 buffer size: 0 vbv_delay: -1
frame= 1833 fps=7.9 q=0.0 Lsize= 1106kB time=00:00:30.89 bitrate= 293.3kbits/s speed=0.133x
video:1093kB audio:0kB subtitle:0kB other streams:0kB global headers:0kB muxing overhead: 1.255254%
.

1 # Check the Result!!
2 import io
3 from base64 import b64encode
4 from IPython.display import HTML
5
6 with io.open('/content/gdrive/MyDrive/42028_Assessment3/yolov5/DetectionResult2.webm', 'r+b') as f:
7     mp4 = f.read()
8 data_url = "data:video/webm;base64," + b64encode(mp4).decode()
9 HTML("""
10 <video width=800 controls>
11     <source src=\"%s\" type=\"video/webm\">
12 </video>
13 """ % data_url)

```

↳

