real-time-object-detection-yolo

November 21, 2023

[1]:
```
!git clone https://github.com/ultralytics/yolov5
```

```
Cloning into 'yolov5'…
```

[9]:
```
!cd yolov5 && pip install -r requirements.txt
```

```
Collecting gitpython>=3.1.30 (from -r requirements.txt (line 5))
  Using cached GitPython-3.1.31-py3-none-any.whl (184 kB)
Collecting matplotlib>=3.3 (from -r requirements.txt (line 6))
  Using cached matplotlib-3.7.1-cp310-cp310-win_amd64.whl (7.6 MB)
Requirement already satisfied: numpy>=1.18.5 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
-r requirements.txt (line 7)) (1.24.3)
Requirement already satisfied: opencv-python>=4.1.1 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
-r requirements.txt (line 8)) (4.7.0.72)
Requirement already satisfied: Pillow>=7.1.2 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
-r requirements.txt (line 9)) (9.5.0)
Requirement already satisfied: psutil in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
-r requirements.txt (line 10)) (5.9.5)
Requirement already satisfied: PyYAML>=5.3.1 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
-r requirements.txt (line 11)) (6.0)
Requirement already satisfied: requests>=2.23.0 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
-r requirements.txt (line 12)) (2.30.0)
Collecting scipy>=1.4.1 (from -r requirements.txt (line 13))
  Using cached scipy-1.10.1-cp310-cp310-win_amd64.whl (42.5 MB)
Collecting thop>=0.1.1 (from -r requirements.txt (line 14))
  Using cached thop-0.1.1.post2209072238-py3-none-any.whl (15 kB)
Requirement already satisfied: torch>=1.7.0 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
-r requirements.txt (line 15)) (2.0.1+cu117)
Requirement already satisfied: torchvision>=0.8.1 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
-r requirements.txt (line 16)) (0.15.2+cu117)
```

```
Collecting tqdm>=4.64.0 (from -r requirements.txt (line 17))
  Using cached tqdm-4.65.0-py3-none-any.whl (77 kB)
Collecting pandas>=1.1.4 (from -r requirements.txt (line 26))
  Using cached pandas-2.0.1-cp310-cp310-win_amd64.whl (10.7 MB)
Collecting seaborn>=0.11.0 (from -r requirements.txt (line 27))
  Using cached seaborn-0.12.2-py3-none-any.whl (293 kB)
Collecting setuptools>=65.5.1 (from -r requirements.txt (line 41))
  Using cached setuptools-67.7.2-py3-none-any.whl (1.1 MB)
Collecting gitdb<5,>=4.0.1 (from gitpython>=3.1.30->-r requirements.txt (line
5))
  Using cached gitdb-4.0.10-py3-none-any.whl (62 kB)
Collecting contourpy>=1.0.1 (from matplotlib>=3.3->-r requirements.txt (line 6))
  Using cached contourpy-1.0.7-cp310-cp310-win_amd64.whl (162 kB)
Collecting cycler>=0.10 (from matplotlib>=3.3->-r requirements.txt (line 6))
  Using cached cycler-0.11.0-py3-none-any.whl (6.4 kB)
Collecting fonttools>=4.22.0 (from matplotlib>=3.3->-r requirements.txt (line
6))
  Using cached fonttools-4.39.3-py3-none-any.whl (1.0 MB)
Collecting kiwisolver>=1.0.1 (from matplotlib>=3.3->-r requirements.txt (line
6))
  Using cached kiwisolver-1.4.4-cp310-cp310-win_amd64.whl (55 kB)
Requirement already satisfied: packaging>=20.0 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
matplotlib>=3.3->-r requirements.txt (line 6)) (23.1)
Collecting pyparsing>=2.3.1 (from matplotlib>=3.3->-r requirements.txt (line 6))
  Using cached pyparsing-3.0.9-py3-none-any.whl (98 kB)
Requirement already satisfied: python-dateutil>=2.7 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
matplotlib>=3.3->-r requirements.txt (line 6)) (2.8.2)
Requirement already satisfied: charset-normalizer<4,>=2 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
requests>=2.23.0->-r requirements.txt (line 12)) (3.1.0)
Requirement already satisfied: idna<4,>=2.5 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
requests>=2.23.0->-r requirements.txt (line 12)) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
requests>=2.23.0->-r requirements.txt (line 12)) (2.0.2)
Requirement already satisfied: certifi>=2017.4.17 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
requests>=2.23.0->-r requirements.txt (line 12)) (2023.5.7)
Requirement already satisfied: filelock in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch>=1.7.0->-r requirements.txt (line 15)) (3.12.0)
Requirement already satisfied: typing-extensions in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch>=1.7.0->-r requirements.txt (line 15)) (4.5.0)
Requirement already satisfied: sympy in
```

```
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch>=1.7.0->-r requirements.txt (line 15)) (1.11.1)
Requirement already satisfied: networkx in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch>=1.7.0->-r requirements.txt (line 15)) (3.1)
Requirement already satisfied: jinja2 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch>=1.7.0->-r requirements.txt (line 15)) (3.1.2)
Requirement already satisfied: colorama in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
tqdm>=4.64.0->-r requirements.txt (line 17)) (0.4.6)
Collecting pytz>=2020.1 (from pandas>=1.1.4->-r requirements.txt (line 26))
  Using cached pytz-2023.3-py2.py3-none-any.whl (502 kB)
Collecting tzdata>=2022.1 (from pandas>=1.1.4->-r requirements.txt (line 26))
  Using cached tzdata-2023.3-py2.py3-none-any.whl (341 kB)
Collecting smmap<6,>=3.0.1 (from gitdb<5,>=4.0.1->gitpython>=3.1.30->-r
requirements.txt (line 5))
  Using cached smmap-5.0.0-py3-none-any.whl (24 kB)
Requirement already satisfied: six>=1.5 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
python-dateutil>=2.7->matplotlib>=3.3->-r requirements.txt (line 6)) (1.16.0)
Requirement already satisfied: MarkupSafe>=2.0 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
jinja2->torch>=1.7.0->-r requirements.txt (line 15)) (2.1.2)
Requirement already satisfied: mpmath>=0.19 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
sympy->torch>=1.7.0->-r requirements.txt (line 15)) (1.3.0)
Installing collected packages: pytz, tzdata, tqdm, smmap, setuptools, scipy,
pyparsing, kiwisolver, fonttools, cycler, contourpy, pandas, matplotlib, gitdb,
thop, seaborn, gitpython
  Attempting uninstall: setuptools
    Found existing installation: setuptools 65.5.0
    Uninstalling setuptools-65.5.0:
      Successfully uninstalled setuptools-65.5.0
Successfully installed contourpy-1.0.7 cycler-0.11.0 fonttools-4.39.3
gitdb-4.0.10 gitpython-3.1.31 kiwisolver-1.4.4 matplotlib-3.7.1 pandas-2.0.1
pyparsing-3.0.9 pytz-2023.3 scipy-1.10.1 seaborn-0.12.2 setuptools-67.7.2
smmap-5.0.0 thop-0.1.1.post2209072238 tqdm-4.65.0 tzdata-2023.3
```

[9]:
```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="uGsOY9EcjJTLfV21txyu")
project = rf.workspace("major-project-bbojo").project("major-project-kamim")
dataset = project.version(2).download("yolov5")
```

```
Requirement already satisfied: roboflow in e:\traning\venv1\lib\site-packages
(1.0.8)
```

```
Requirement already satisfied: opencv-python>=4.1.2 in
e:\traning\venv1\lib\site-packages (from roboflow) (4.7.0.72)
Requirement already satisfied: kiwisolver>=1.3.1 in e:\traning\venv1\lib\site-
packages (from roboflow) (1.4.4)
Requirement already satisfied: six in e:\traning\venv1\lib\site-packages (from
roboflow) (1.16.0)
Requirement already satisfied: urllib3>=1.26.6 in e:\traning\venv1\lib\site-
packages (from roboflow) (2.0.2)
Requirement already satisfied: wget in e:\traning\venv1\lib\site-packages (from
roboflow) (3.2)
Requirement already satisfied: matplotlib in e:\traning\venv1\lib\site-packages
(from roboflow) (3.7.1)
Requirement already satisfied: certifi==2022.12.7 in e:\traning\venv1\lib\site-
packages (from roboflow) (2022.12.7)
Requirement already satisfied: requests in e:\traning\venv1\lib\site-packages
(from roboflow) (2.30.0)
Requirement already satisfied: Pillow>=7.1.2 in e:\traning\venv1\lib\site-
packages (from roboflow) (9.5.0)
Requirement already satisfied: chardet==4.0.0 in e:\traning\venv1\lib\site-
packages (from roboflow) (4.0.0)
Requirement already satisfied: tqdm>=4.41.0 in e:\traning\venv1\lib\site-
packages (from roboflow) (4.65.0)
Requirement already satisfied: requests-toolbelt in e:\traning\venv1\lib\site-
packages (from roboflow) (1.0.0)
Requirement already satisfied: idna==2.10 in e:\traning\venv1\lib\site-packages
(from roboflow) (2.10)
Requirement already satisfied: python-dateutil in e:\traning\venv1\lib\site-
packages (from roboflow) (2.8.2)
Requirement already satisfied: PyYAML>=5.3.1 in e:\traning\venv1\lib\site-
packages (from roboflow) (6.0)
Requirement already satisfied: cycler==0.10.0 in e:\traning\venv1\lib\site-
packages (from roboflow) (0.10.0)
Requirement already satisfied: python-dotenv in e:\traning\venv1\lib\site-
packages (from roboflow) (1.0.0)
Requirement already satisfied: numpy>=1.18.5 in e:\traning\venv1\lib\site-
packages (from roboflow) (1.24.3)
Requirement already satisfied: pyparsing==2.4.7 in e:\traning\venv1\lib\site-
packages (from roboflow) (2.4.7)
Requirement already satisfied: colorama in e:\traning\venv1\lib\site-packages
(from tqdm>=4.41.0->roboflow) (0.4.6)
Requirement already satisfied: packaging>=20.0 in e:\traning\venv1\lib\site-
packages (from matplotlib->roboflow) (23.1)
Requirement already satisfied: contourpy>=1.0.1 in e:\traning\venv1\lib\site-
packages (from matplotlib->roboflow) (1.0.7)
Requirement already satisfied: fonttools>=4.22.0 in e:\traning\venv1\lib\site-
packages (from matplotlib->roboflow) (4.39.3)
Requirement already satisfied: charset-normalizer<4,>=2 in
e:\traning\venv1\lib\site-packages (from requests->roboflow) (3.1.0)
```

```
[notice] A new release of pip available: 22.3.1 -> 23.1.2
[notice] To update, run: python.exe -m pip install --upgrade pip
```

```
loading Roboflow workspace…
loading Roboflow project…
Downloading Dataset Version Zip in major-project-2 to yolov5pytorch: 89%
[457252864 / 508556011] bytes
```

[10]:
```
!pip install torch torchvision torchaudio  --extra-index-url https://download.
↪pytorch.org/whl/cu117
```

```
Looking in indexes: https://pypi.org/simple,
https://download.pytorch.org/whl/cu117
Requirement already satisfied: torch in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages
(2.0.1+cu117)
Requirement already satisfied: torchvision in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages
(0.15.2+cu117)
Requirement already satisfied: torchaudio in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages
(2.0.2+cu117)
Requirement already satisfied: filelock in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch) (3.12.0)
Requirement already satisfied: typing-extensions in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch) (4.5.0)
Requirement already satisfied: sympy in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch) (1.11.1)
Requirement already satisfied: networkx in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch) (3.1)
Requirement already satisfied: jinja2 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torch) (3.1.2)
Requirement already satisfied: numpy in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torchvision) (1.24.3)
Requirement already satisfied: requests in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torchvision) (2.30.0)
Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
torchvision) (9.5.0)
Requirement already satisfied: MarkupSafe>=2.0 in
```

```
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
jinja2->torch) (2.1.2)
Requirement already satisfied: charset-normalizer<4,>=2 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
requests->torchvision) (3.1.0)
Requirement already satisfied: idna<4,>=2.5 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
requests->torchvision) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
requests->torchvision) (2.0.2)
Requirement already satisfied: certifi>=2017.4.17 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
requests->torchvision) (2023.5.7)
Requirement already satisfied: mpmath>=0.19 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
sympy->torch) (1.3.0)
```

[7]:
```
print("hello world")
!pip install opencv-python
```

```
hello world
Collecting opencv-python
  Using cached opencv_python-4.7.0.72-cp37-abi3-win_amd64.whl (38.2 MB)
Requirement already satisfied: numpy>=1.21.2 in
c:\users\subit\appdata\local\programs\python\python310\lib\site-packages (from
opencv-python) (1.24.3)
Installing collected packages: opencv-python
Successfully installed opencv-python-4.7.0.72
```

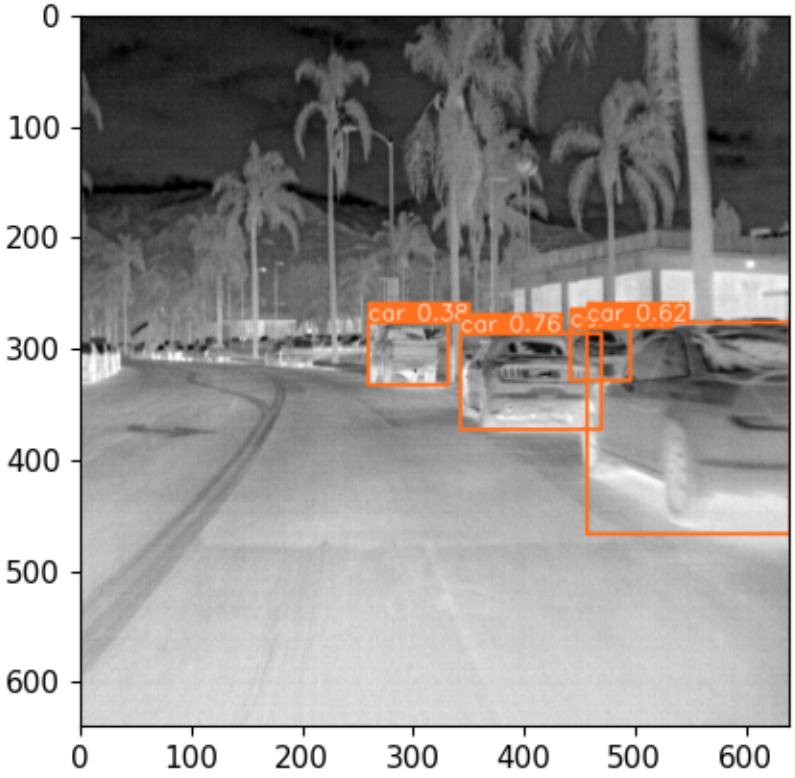
[1]:
```
import torch

# Model
model1 = torch.hub.load("ultralytics/yolov5", "yolov5s")  # or yolov5n -␣
 ↪yolov5x6, custom
img = "E:/traning/FLIR_00950_jpeg.rf.3964d4a21938a4e0d2cf073320892397.jpg"
results = model1(img)
results.print()
from matplotlib import pyplot as plt
import numpy as np
%matplotlib inline
plt.imshow(np.squeeze(results.render()))
plt.show()
```

```
Using cache found in C:\Users\subit/.cache\torch\hub\ultralytics_yolov5_master
YOLOv5  2023-5-9 Python-3.10.10 torch-2.0.0+cpu CPU
```

```
requirements: C:\Users\subit\.cache\torch\hub\requirements.txt not
found, check failed.

Fusing layers…
YOLOv5s summary: 213 layers, 7225885 parameters, 0 gradients
Adding AutoShape…
image 1/1: 640x640 4 cars
Speed: 264.1ms pre-process, 867.3ms inference, 141.7ms NMS per image at shape
(1, 3, 640, 640)
```



[ ]:
```
!cd yolov5 && python train.py --img 640 --batch -1 --epochs 100 --data E:/
↪traning/yolov5/major-project-2/data.yaml --weights yolov5s.pt --name␣
↪yolov5s_results
```

[ ]:
```
import torch
import cv2
!cd yolov5& python detect.py --source E:/traning/yolov5/major-project-2/train/
↪images --weights E:/traning/yolov5/runs/train/yolov5s_results4/weights/best.
↪pt
```

[2]:
```
import torch
```

```
model = torch.hub.load('ultralytics/yolov5', 'custom', path='E:/traning/yolov5/
  ↪runs/train/yolov5s_results4/weights/best.pt')
```

```
Using cache found in C:\Users\subit/.cache\torch\hub\ultralytics_yolov5_master
YOLOv5  2023-5-9 Python-3.10.10 torch-2.0.0+cpu CPU


requirements: C:\Users\subit\.cache\torch\hub\requirements.txt not
found, check failed.

Fusing layers…
Model summary: 157 layers, 7020913 parameters, 0 gradients, 15.8 GFLOPs
Adding AutoShape…
```

[4]:
```
model
```

[4]:
```
AutoShape(
  (model): DetectMultiBackend(
    (model): DetectionModel(
      (model): Sequential(
        (0): Conv(
          (conv): Conv2d(3, 32, kernel_size=(6, 6), stride=(2, 2), padding=(2,
2))
          (act): SiLU(inplace=True)
        )
        (1): Conv(
          (conv): Conv2d(32, 64, kernel_size=(3, 3), stride=(2, 2), padding=(1,
1))
          (act): SiLU(inplace=True)
        )
        (2): C3(
          (cv1): Conv(
            (conv): Conv2d(64, 32, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv2): Conv(
            (conv): Conv2d(64, 32, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv3): Conv(
            (conv): Conv2d(64, 64, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (m): Sequential(
            (0): Bottleneck(
              (cv1): Conv(
                (conv): Conv2d(32, 32, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
```

```
              )
              (cv2): Conv(
                (conv): Conv2d(32, 32, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
                (act): SiLU(inplace=True)
              )
            )
          )
        )
        (3): Conv(
          (conv): Conv2d(64, 128, kernel_size=(3, 3), stride=(2, 2), padding=(1,
1))
          (act): SiLU(inplace=True)
        )
        (4): C3(
          (cv1): Conv(
            (conv): Conv2d(128, 64, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv2): Conv(
            (conv): Conv2d(128, 64, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv3): Conv(
            (conv): Conv2d(128, 128, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (m): Sequential(
            (0): Bottleneck(
              (cv1): Conv(
                (conv): Conv2d(64, 64, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
              )
              (cv2): Conv(
                (conv): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
                (act): SiLU(inplace=True)
              )
            )
            (1): Bottleneck(
              (cv1): Conv(
                (conv): Conv2d(64, 64, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
              )
              (cv2): Conv(
                (conv): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
```

```
              (act): SiLU(inplace=True)
            )
          )
        )
      )
      (5): Conv(
        (conv): Conv2d(128, 256, kernel_size=(3, 3), stride=(2, 2),
padding=(1, 1))
        (act): SiLU(inplace=True)
      )
      (6): C3(
        (cv1): Conv(
          (conv): Conv2d(256, 128, kernel_size=(1, 1), stride=(1, 1))
          (act): SiLU(inplace=True)
        )
        (cv2): Conv(
          (conv): Conv2d(256, 128, kernel_size=(1, 1), stride=(1, 1))
          (act): SiLU(inplace=True)
        )
        (cv3): Conv(
          (conv): Conv2d(256, 256, kernel_size=(1, 1), stride=(1, 1))
          (act): SiLU(inplace=True)
        )
        (m): Sequential(
          (0): Bottleneck(
            (cv1): Conv(
              (conv): Conv2d(128, 128, kernel_size=(1, 1), stride=(1, 1))
              (act): SiLU(inplace=True)
            )
            (cv2): Conv(
              (conv): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
              (act): SiLU(inplace=True)
            )
          )
          (1): Bottleneck(
            (cv1): Conv(
              (conv): Conv2d(128, 128, kernel_size=(1, 1), stride=(1, 1))
              (act): SiLU(inplace=True)
            )
            (cv2): Conv(
              (conv): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
              (act): SiLU(inplace=True)
            )
          )
          (2): Bottleneck(
```

```
              (cv1): Conv(
                (conv): Conv2d(128, 128, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
              )
              (cv2): Conv(
                (conv): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
                (act): SiLU(inplace=True)
              )
            )
          )
        )
        (7): Conv(
          (conv): Conv2d(256, 512, kernel_size=(3, 3), stride=(2, 2),
padding=(1, 1))
          (act): SiLU(inplace=True)
        )
        (8): C3(
          (cv1): Conv(
            (conv): Conv2d(512, 256, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv2): Conv(
            (conv): Conv2d(512, 256, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv3): Conv(
            (conv): Conv2d(512, 512, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (m): Sequential(
            (0): Bottleneck(
              (cv1): Conv(
                (conv): Conv2d(256, 256, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
              )
              (cv2): Conv(
                (conv): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
                (act): SiLU(inplace=True)
              )
            )
          )
        )
        (9): SPPF(
          (cv1): Conv(
            (conv): Conv2d(512, 256, kernel_size=(1, 1), stride=(1, 1))
```

```
            (act): SiLU(inplace=True)
          )
          (cv2): Conv(
            (conv): Conv2d(1024, 512, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (m): MaxPool2d(kernel_size=5, stride=1, padding=2, dilation=1,
ceil_mode=False)
        )
        (10): Conv(
          (conv): Conv2d(512, 256, kernel_size=(1, 1), stride=(1, 1))
          (act): SiLU(inplace=True)
        )
        (11): Upsample(scale_factor=2.0, mode='nearest')
        (12): Concat()
        (13): C3(
          (cv1): Conv(
            (conv): Conv2d(512, 128, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv2): Conv(
            (conv): Conv2d(512, 128, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv3): Conv(
            (conv): Conv2d(256, 256, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (m): Sequential(
            (0): Bottleneck(
              (cv1): Conv(
                (conv): Conv2d(128, 128, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
              )
              (cv2): Conv(
                (conv): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
                (act): SiLU(inplace=True)
              )
            )
          )
        )
        (14): Conv(
          (conv): Conv2d(256, 128, kernel_size=(1, 1), stride=(1, 1))
          (act): SiLU(inplace=True)
        )
        (15): Upsample(scale_factor=2.0, mode='nearest')
```

```
        (16): Concat()
        (17): C3(
          (cv1): Conv(
            (conv): Conv2d(256, 64, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv2): Conv(
            (conv): Conv2d(256, 64, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv3): Conv(
            (conv): Conv2d(128, 128, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (m): Sequential(
            (0): Bottleneck(
              (cv1): Conv(
                (conv): Conv2d(64, 64, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
              )
              (cv2): Conv(
                (conv): Conv2d(64, 64, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
                (act): SiLU(inplace=True)
              )
            )
          )
        )
        (18): Conv(
          (conv): Conv2d(128, 128, kernel_size=(3, 3), stride=(2, 2),
padding=(1, 1))
          (act): SiLU(inplace=True)
        )
        (19): Concat()
        (20): C3(
          (cv1): Conv(
            (conv): Conv2d(256, 128, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv2): Conv(
            (conv): Conv2d(256, 128, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv3): Conv(
            (conv): Conv2d(256, 256, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
```

```
          (m): Sequential(
            (0): Bottleneck(
              (cv1): Conv(
                (conv): Conv2d(128, 128, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
              )
              (cv2): Conv(
                (conv): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
                (act): SiLU(inplace=True)
              )
            )
          )
        )
        (21): Conv(
          (conv): Conv2d(256, 256, kernel_size=(3, 3), stride=(2, 2),
padding=(1, 1))
          (act): SiLU(inplace=True)
        )
        (22): Concat()
        (23): C3(
          (cv1): Conv(
            (conv): Conv2d(512, 256, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv2): Conv(
            (conv): Conv2d(512, 256, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (cv3): Conv(
            (conv): Conv2d(512, 512, kernel_size=(1, 1), stride=(1, 1))
            (act): SiLU(inplace=True)
          )
          (m): Sequential(
            (0): Bottleneck(
              (cv1): Conv(
                (conv): Conv2d(256, 256, kernel_size=(1, 1), stride=(1, 1))
                (act): SiLU(inplace=True)
              )
              (cv2): Conv(
                (conv): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1),
padding=(1, 1))
                (act): SiLU(inplace=True)
              )
            )
          )
        )
```

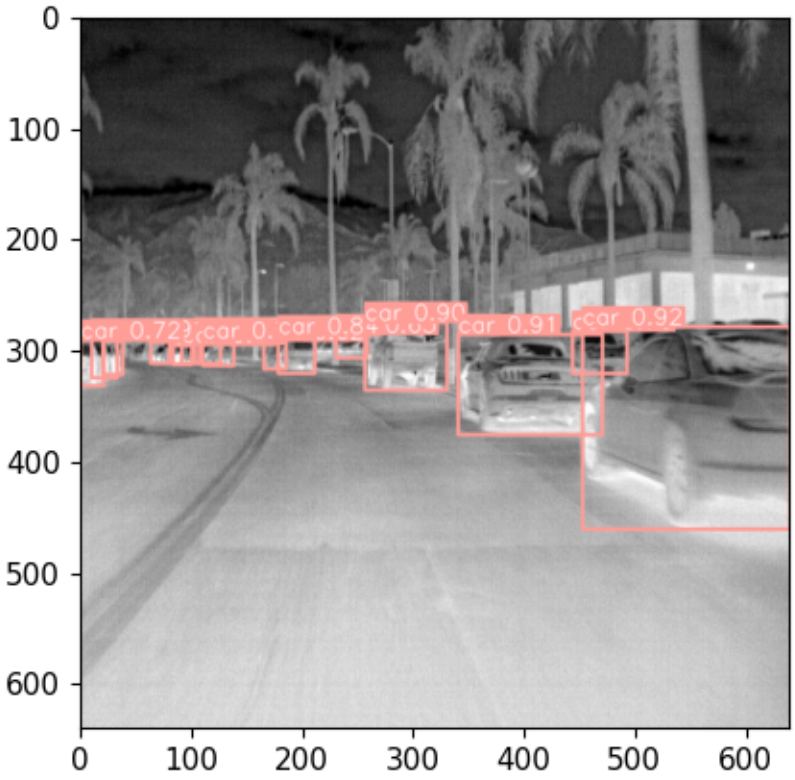
```
        (24): Detect(
          (m): ModuleList(
            (0): Conv2d(128, 27, kernel_size=(1, 1), stride=(1, 1))
            (1): Conv2d(256, 27, kernel_size=(1, 1), stride=(1, 1))
            (2): Conv2d(512, 27, kernel_size=(1, 1), stride=(1, 1))
          )
        )
      )
    )
  )
)
```

[4]:
```
#img = 'https://ultralytics.com/images/zidane.jpg'
img = "E:/traning/FLIR_00950_jpeg.rf.3964d4a21938a4e0d2cf073320892397.jpg"
```

[5]:
```
results = model(img)
results.print()
```

```
image 1/1: 640x640 15 cars
Speed: 16.2ms pre-process, 491.9ms inference, 7.0ms NMS per image at shape (1,
3, 640, 640)
```

[6]:
```
from matplotlib import pyplot as plt
import numpy as np
%matplotlib inline
plt.imshow(np.squeeze(results.render()))
plt.show()
```



[7]:
```
!cd yolov5 && val.py --data E:/traning/yolov5/major-project-2/data.yaml --task
↪test
```

[5]:
```
import cv2

#cap = cv2.VideoCapture(0)
#while cap.isOpened():
#    ret, frame = cap.read()

#    cv2.imshow('YOLO',frame)

 #   if cv2.waitKey(10) & 0xFF == ord('q'):
  #      break
#cap.release()
#cv2.destroyAllWindows

cap = cv2.VideoCapture("output_video.mp4")

if not cap.isOpened():
    print("Cannot open camera")
    exit()
```

```
while True:

    # Capture frame-by-frame
    ret, frame = cap.read()

    results = model1(frame)

    cv2.imshow('YOLO', np.squeeze(results.render()))

    # if frame is read correctly ret is True
    if not ret:
        print("Can't receive frame (stream end?). Exiting ...")
        break

    # Display the resulting frame


    if cv2.waitKey(1) == ord('q'):
        break

# When everything done, release the capture
cap.release()
cv2.destroyAllWindows()
```

[11]:
```
!cd yolov5 && python detect.py --weights E:/traning/yolov5/runs/train/
↪yolov5s_results4/weights/best.pt --source 0
```

```
^C
```

[ ]: