In [ ]:
```
!pip3 install torch torchvision torchaudio pandas pyYAML tqdm seaborn opencv-pythor
```

```
Requirement already satisfied: torch in c:\users\jmess\appdata\local\programs\pyth
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rograms\python\python39\lib\site-packages (from matplotlib>=2.2->seaborn) (1.4.4)
Requirement already satisfied: six>=1.5 in c:\users\jmess\appdata\local\programs\p
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1.0)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\jmess\appdata\loc
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0)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\jmess\appdata\local
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5)
Requirement already satisfied: idna<4,>=2.5 in c:\users\jmess\appdata\local\progra
ms\python\python39\lib\site-packages (from requests->torchvision) (3.3)
```

In [ ]:
```
%matplotlib inline
```

In [ ]:
```
import torch
import cv2
from matplotlib import pyplot as plt
```

In [ ]:
```
model = torch.hub.load('ultralytics/yolov5', 'yolov5s')
```

```
Using cache found in C:\Users\jmess/.cache\torch\hub\ultralytics_yolov5_master
YOLOv5  2022-7-18 Python-3.9.13 torch-1.12.0+cpu CPU

Fusing layers...
YOLOv5s summary: 213 layers, 7225885 parameters, 0 gradients
Adding AutoShape...
```

In [ ]:
```
def load_image(path):
    return cv2.imread(path)[:, :, ::-1]
```

In [ ]:
```
def process_image(img):
    result = model([img], size=640)

    print(result.pandas().xyxy[0])

    return result
```

In [ ]:
```
IMGS_PATH = ['imgs/all.png', 'imgs/bus.png', 'imgs/people.png']
```

In [ ]:
```
IMGS = []

for i in IMGS_PATH:
    IMGS.append(load_image(i))
```

a)

In [ ]:
```
def getRGBfromI(RGBint):
    blue =  RGBint & 255
    green = (RGBint >> 8) & 255
    red =   (RGBint >> 16) & 255
    return red, green, blue
```

In [ ]:
```
def draw_result(frame, results):
    frame = frame.copy()
    for box in results.xyxy[0]:
            xB = int(box[2])
            xA = int(box[0])
            yB = int(box[3])
            yA = int(box[1])

            cv2.rectangle(frame, (xA, yA), (xB, yB), getRGBfromI(int(box[5]) * 100(

    return frame
```

In [ ]:
```
def process(img):
    plt.imshow(img)
    plt.show()

    result = process_image(img)

    print(result)
```

```
    plt.imshow(draw_result(img, result))
    plt.show()
```

In [ ]:
```
process(IMGS[0])
```

```
            xmin        ymin         xmax         ymax  confidence  class  \
0     726.216492  870.891785   967.580078  1088.871460    0.846512      2
1    1104.301514  841.032959  1196.471558   923.366333    0.829974      2
2     393.870117  922.003052   694.894958  1192.261230    0.800172      2
3       1.707250  910.309021    84.191330  1184.690308    0.776526      0
4     636.185120  826.378418   760.100464   929.397766    0.770256      2
5    1045.868408  804.348999  1140.609253   883.489014    0.762862      2
6    1600.351807  493.414764  1672.191406   587.836914    0.680482      9
7     256.838928  852.810669   328.951660  1052.742432    0.631074      0
8     447.830383  725.431458   625.831116   910.149231    0.628749      5
9    1189.572998  697.095337  1907.240234  1186.575684    0.597191      7
10   1206.703735  593.303833  1252.806030   651.825256    0.585567      9
11    878.548706  793.447327   911.642090   870.598999    0.522277      0
12    971.822571  797.682190  1003.063477   869.149353    0.472607      0
13    718.716797  753.658752   812.098267   850.487915    0.451698      2
14    396.205566  838.769409   441.134613   986.398010    0.450832      0
15    507.221191  523.475037   573.016846   602.472778    0.437403      9
16   1020.958191  670.210266  1041.742432   708.367859    0.422663      9
17    392.386963  924.273560   691.774841  1186.112305    0.386347      7
18   1196.590454  700.699097  1843.417358  1188.745605    0.296920      5
19    964.837463  767.659180  1010.002258   861.787720    0.285839      0

             name
0             car
1             car
2             car
3          person
4             car
5             car
6   traffic light
7          person
8             bus
9           truck
10  traffic light
11         person
12         person
13            car
14         person
15  traffic light
16  traffic light
17          truck
18            bus
19         person
image 1/1: 1235x1920 6 persons, 6 cars, 2 buss, 2 trucks, 4 traffic lights
Speed: 13.0ms pre-process, 106.7ms inference, 2.0ms NMS per image at shape (1, 3,
416, 640)
```

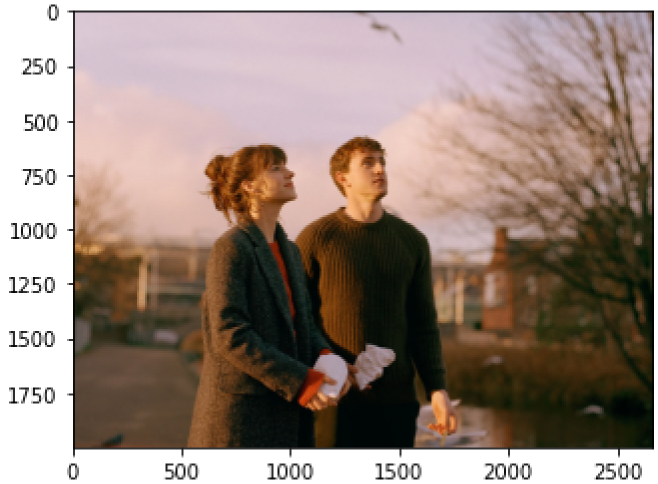
Como podemos ver, já que existem varios elementos na foto boa parte deles foi encontrado pelo modelo. Mas dá para ver que quanto mais profundo na foto o elemento está menor a confiança na classificação temos. Provavelmente devido menor informação de pixels para representá-lo dentro da foto.

In [ ]:
```
process(IMGS[1])
```

```
        xmin        ymin         xmax         ymax  confidence  class name
0  35.439453  164.285309  1411.653564  1055.357544    0.862536      5  bus
image 1/1: 1200x1600 1 bus
Speed: 13.0ms pre-process, 131.3ms inference, 2.0ms NMS per image at shape (1, 3,
480, 640)
```

O unico elementos da foto propositalmente é um onibus e podemos ver que o modelo o identifica, com um nivel consideravel de confiança.

In [ ]:
```
process(IMGS[2])
```



```
        xmin        ymin         xmax         ymax  confidence  class  \
0  1028.121338  574.823120  1774.388672  1998.000000    0.915181      0
1   537.640442  618.084961  1406.829224  1992.961426    0.865246      0

     name
0  person
1  person
image 1/1: 1998x2664 2 persons
Speed: 24.9ms pre-process, 116.6ms inference, 1.0ms NMS per image at shape (1, 3,
480, 640)
```

Os dois unico elementos da foto propositalmente são duas pessoas e podemos ver que o modelo o identifica, com um nivel consideravel de confiança as duas pessoas.

b)

In [ ]:
```
# Transforma o video em imagens para ser usado no modelo

def get_frames(path):
    vidcap = cv2.VideoCapture(path)
    vidcap.set(cv2.CAP_PROP_FRAME_WIDTH, 1280)
    vidcap.set(cv2.CAP_PROP_FRAME_HEIGHT, 720)
    lista_results = []

    success,image = vidcap.read()
    while success:
        image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
        lista_results.append(image)
```

```
        success,image = vidcap.read()

    return lista_results
```

In [ ]:
```
# Pega todos os frames
results = get_frames('videos/cross.mp4')
```

In [ ]:
```
# Executa os frames no modelo

t = model(results)
pd = t.pandas().xyxy
```

In [ ]:
```
# Verifica e calcula os centros dos quadrados demarcadores
def get_path(pd):
    path = []

    for j in pd:
        i = j[j['class'] == 0]

        if len(i) > 0:
            i = i.iloc[0]
            x = (i['xmax'] + i['xmin']) // 2
            y = (i['ymax'] + i['ymin']) // 2
            path.append((int(x), int(y)))

    return path
```

In [ ]:
```
# Pinta aréa a partir dos centros dos quadrados demarcadores calculado
def print_area(img, point, w):
    for i in range(point[0] - w, point[0] + w):
        for j in range(point[1] - w, point[1] + w):
            try:
                img[j][i] = (255, 0, 0)
            except IndexError:
                pass
```

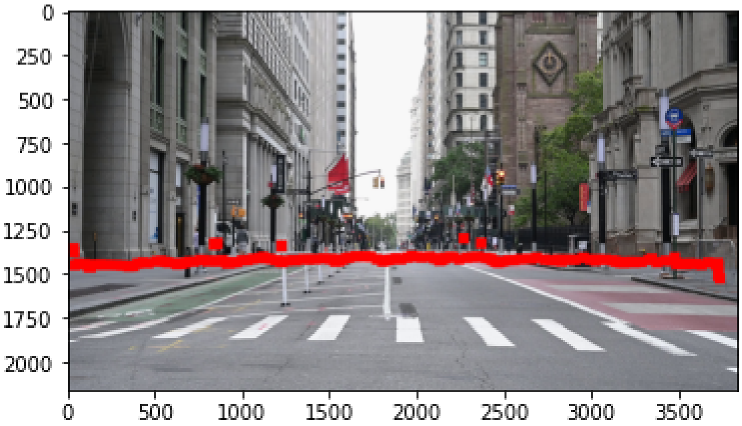
In [ ]:
```
# Angraria os centros
a = get_path(pd)
```

In [ ]:
```
# Pinta o caminho na imagem

img = results[0].copy()
for i in a:
    print_area(img, i, 30)
```

In [ ]:
```
# Exibe a imagem

plt.imshow(img)
plt.show()
```


0
250
500
750
1000
1250
1500
1750
2000
0
500
1000
1500
2000
2500
3000
3500