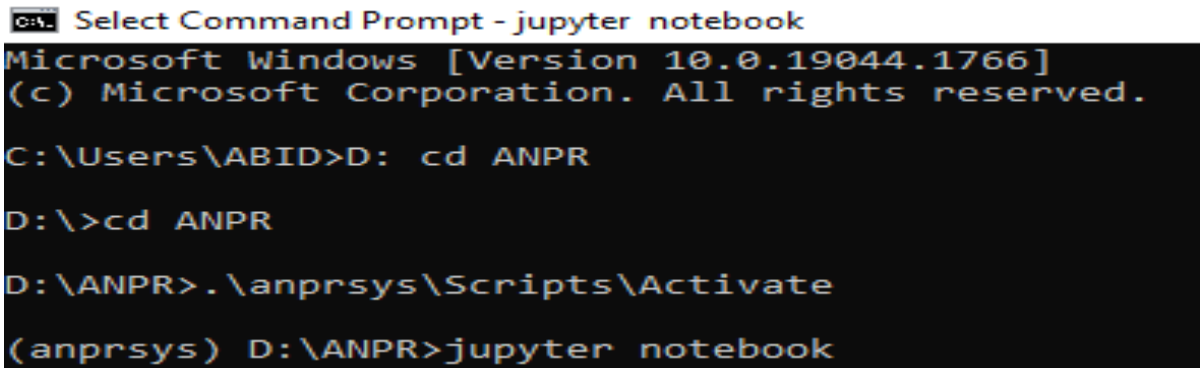
STEPS

1



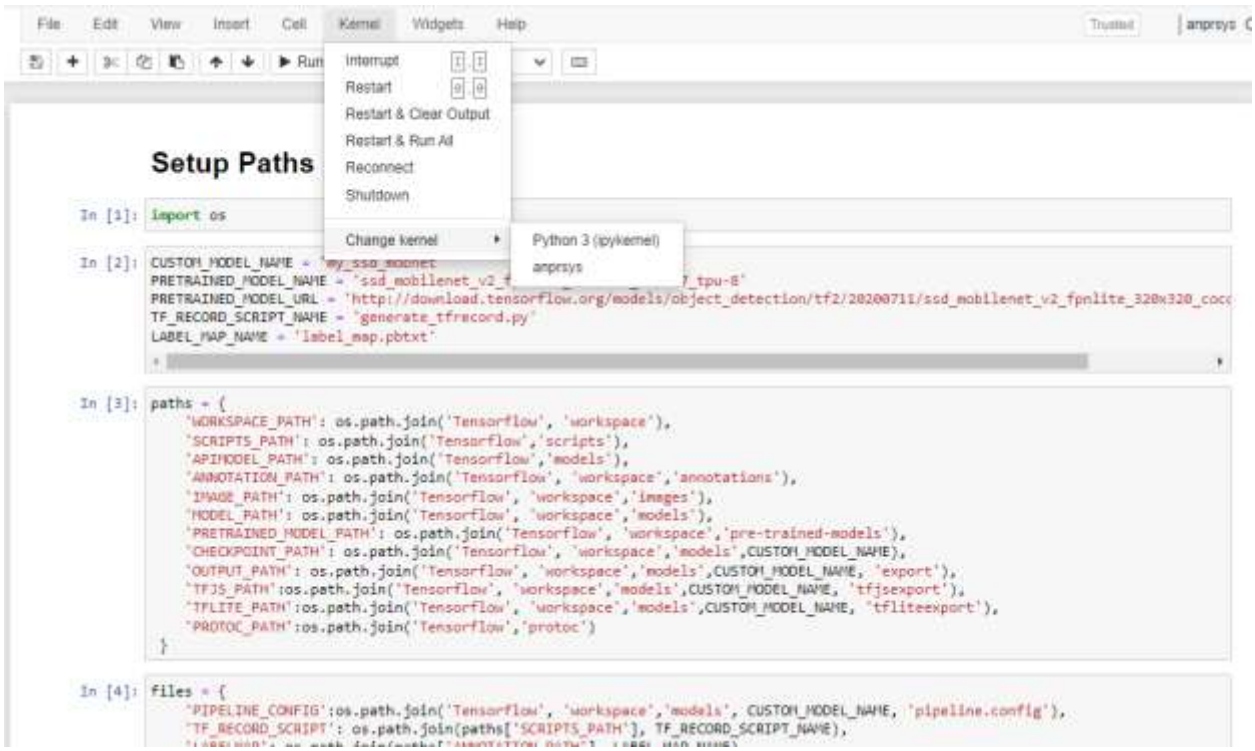
2.

Install dependencies and add virtual environment to the Python Kernel

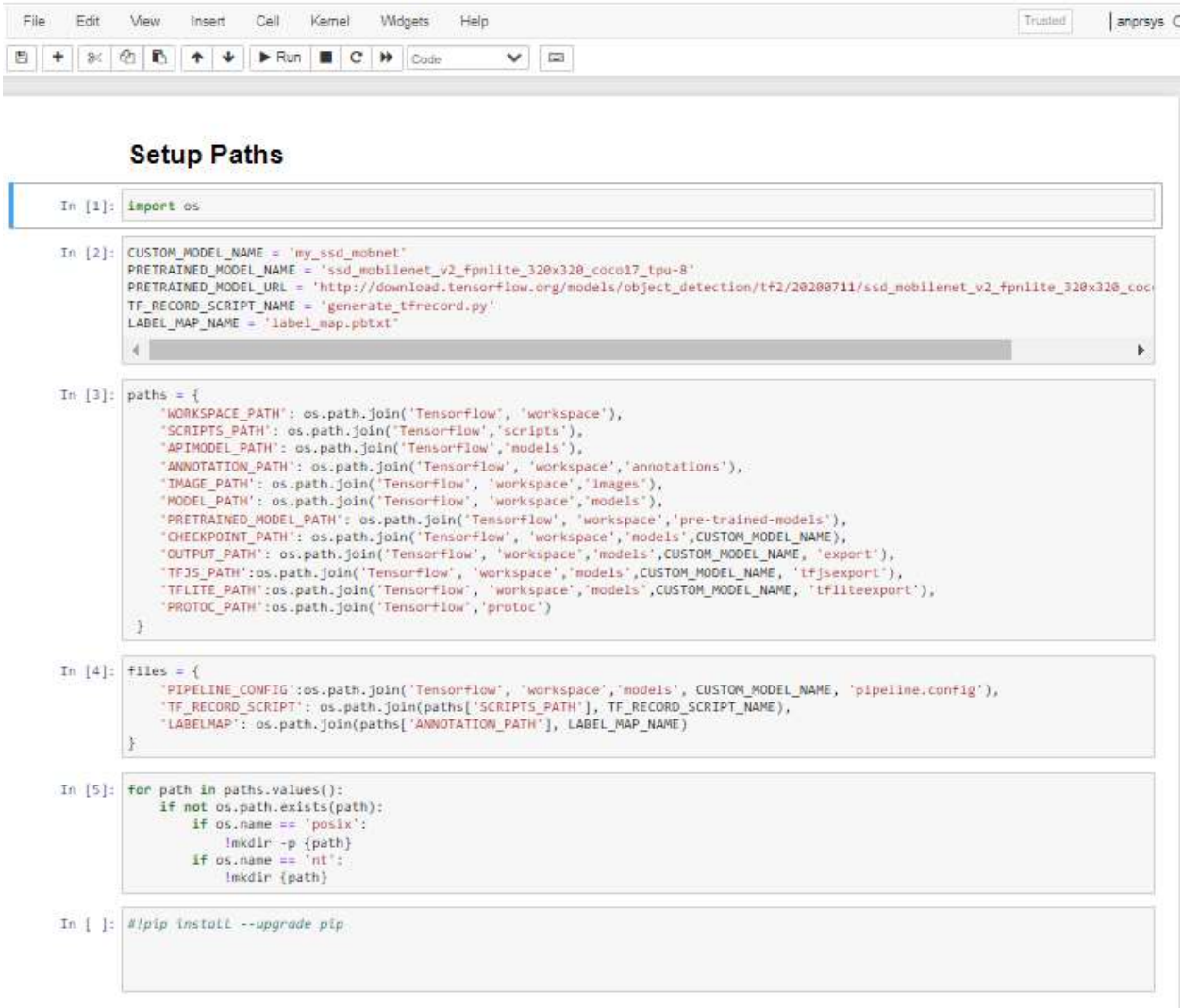
```
pip install ipykernel

python -m pip install --upgrade pip

python -m ipykernel install --user --name=anprsys
```

3

Ensure you change the kernel to the virtual environment as shown below



Setup Path .Install dependencies. Run all the cells serially.



Download TF Models Pretrained Models from Tensorflow Model Zoo and Install TFOD

```
In [ ]: if os.name=='nt':
            !pip install wget
            import wget
```

```
In [ ]: if not os.path.exists(os.path.join(paths['APIMODEL_PATH'], 'research', 'object_detection')):
            !git clone https://github.com/tensorflow/models {paths['APIMODEL_PATH']}
```

```
In [ ]:
if os.name=='posix':
    !apt-get install protobuf-compiler
    !cd Tensorflow/models/research && protoc object_detection/protos/*.proto --python_out=. && cp object_detection/packages/tf2/

if os.name=='nt':
    url="https://github.com/protocolbuffers/protobuf/releases/download/v3.15.6/protoc-3.15.6-win64.zip"
    wget.download(url)
    !move protoc-3.15.6-win64.zip {paths['PROTOC_PATH']}
    !cd {paths['PROTOC_PATH']} && tar -xf protoc-3.15.6-win64.zip
    os.environ['PATH'] += os.pathsep + os.path.abspath(os.path.join(paths['PROTOC_PATH'], 'bin'))
    !cd Tensorflow/models/research && protoc object_detection/protos/*.proto --python_out=. && copy object_detection\\packages\\
    !cd Tensorflow/models/research/slim && pip install -e .
```

```
In [ ]: #!pip install opencv-python
```

```
In [ ]: #pip install tf-nightly
```

```
In [ ]: #!pip install tf-nightly-gpu
```

```
In [ ]: #!pip install pyparsing==2.4.7
```

```
In [ ]: #!pip install  matplotlib
```

```
In [ ]: #!pip uninstall protobuf matplotlib -y
        #!pip install protobuf matplotlib==3.2
```

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▶ Run Code

Verify Installation

```
In [ ]: VERIFICATION_SCRIPT = os.path.join(paths['APIMODEL_PATH'], 'research', 'object_detection', 'builders', 'model_builder_tf2_test.p

        !python {VERIFICATION_SCRIPT}
```

```
In [ ]: #!pip install pycocotools
```

```
In [ ]: import object_detection
```

```
In [ ]: if os.name =='posix':
            !wget {PRETRAINED_MODEL_URL}
            !mv {PRETRAINED_MODEL_NAME+'.tar.gz'} {paths['PRETRAINED_MODEL_PATH']}
            !cd {paths['PRETRAINED_MODEL_PATH']} && tar -zxvf {PRETRAINED_MODEL_NAME+'.tar.gz'}
        if os.name == 'nt':
            wget.download(PRETRAINED_MODEL_URL)
            !move {PRETRAINED_MODEL_NAME+'.tar.gz'} {paths['PRETRAINED_MODEL_PATH']}
            !cd {paths['PRETRAINED_MODEL_PATH']} && tar -zxvf {PRETRAINED_MODEL_NAME+'.tar.gz'}
```

Create Label Map

```
In [ ]: labels = [{'name':'licence', 'id':1}]

        with open(files['LABELMAP'], 'w') as f:
            for label in labels:
                f.write('item { \n')
                f.write('\tname:\'{}\'\n'.format(label['name']))
                f.write('\tid:{}\n'.format(label['id']))
                f.write('}\n')
```

Create TF records

```
In [ ]: if not os.path.exists(files['TF_RECORD_SCRIPT']):
            !git clone https://github.com/nicknochnack/GenerateTFRecord {paths['SCRIPTS_PATH']}
```

```
In [ ]: #!pip install protobuf==3.19.0
```

```
In [ ]: x {os.path.join(paths['IMAGE_PATH'], 'train')} -l {files['LABELMAP']} -o {os.path.join(paths['ANNOTATION_PATH'], 'train.record')}
        x {os.path.join(paths['IMAGE_PATH'], 'test')} -l {files['LABELMAP']} -o {os.path.join(paths['ANNOTATION_PATH'], 'test.record')}
```

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Run Code

Train the model

In [ ]:
```
TRAINING_SCRIPT = os.path.join(paths['APIMODEL_PATH'], 'research', 'object_detection', 'model_main_tf2.py')
```

In [ ]:
```
command = "python {} --model_dir={} --pipeline_config_path={} --num_train_steps=10000".format(TRAINING_SCRIPT, paths['CHECKPOINT
```

In [ ]:
```
print(command)
```

In [ ]:
```
!{command}
```

In [ ]:
```
#!pip install pycocotools
```

Evaluate the Model

In [ ]:
```
command = "python {} --model_dir={} --pipeline_config_path={} --checkpoint_dir={}".format(TRAINING_SCRIPT, paths['CHECKPOINT_PATH
```

In [ ]:
```
print(command)
```

In [ ]:
```
!{command}
```

Load Train Model From Checkpoint

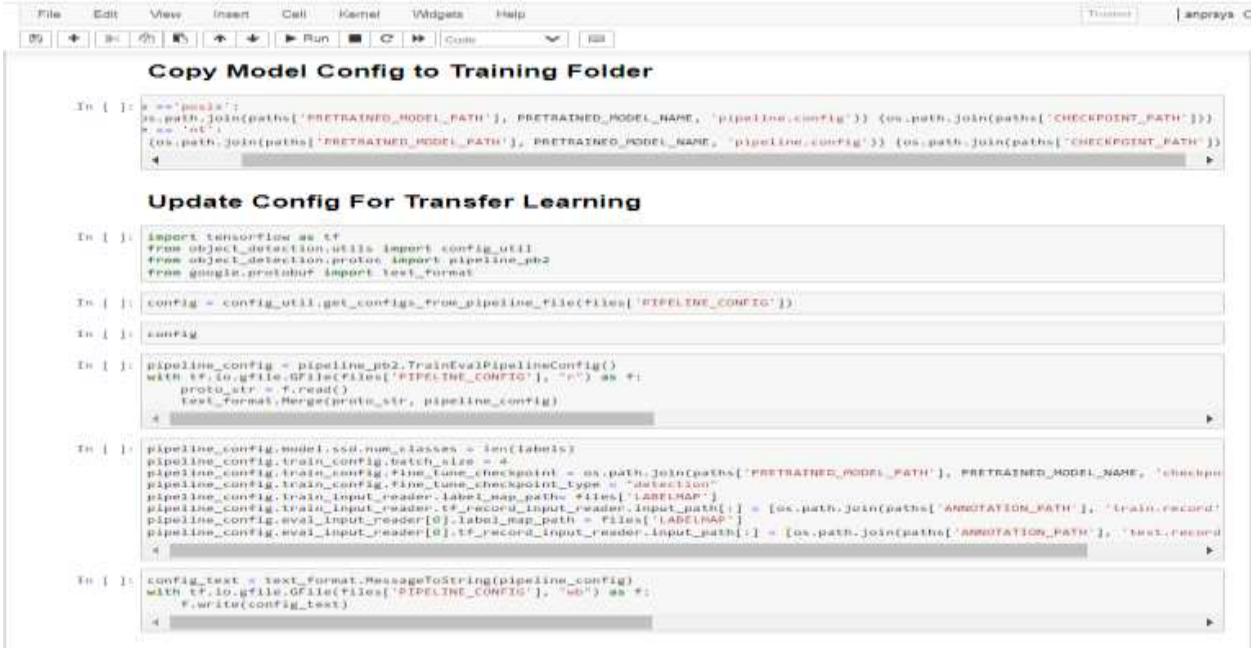
In [ ]:
```
import os
import tensorflow as tf
from object_detection.utils import label_map_util
from object_detection.utils import visualization_utils as viz_utils
from object_detection.builders import model_builder
from object_detection.utils import config_util
```

In [ ]:
```
#!pip install pip install tf-models-official
```

Load pipeline config and build a detection model & Restore checkpoint

In [ ]:
```
configs = config_util.get_configs_from_pipeline_file(files['PIPELINE_CONFIG'])
detection_model = model_builder.build(model_config=configs['model'], is_training=False)


ckpt = tf.compat.v2.train.Checkpoint(model=detection_model)
ckpt.restore(os.path.join(paths['CHECKPOINT_PATH'], 'ckpt-11')).expect_partial()
```




```
(anprsys) D:\ANPR>python Tensorflow\models\research\object_detection\model_main_tf2.py --model_dir=Tensorflow\workspace\models\my_ssd_mobnet --pipeline_config_path=Tensorflow\wo
rkspace\models\my_ssd_mobnet\pipeline.config --num_train_steps=5000
(anprsys) D:\ANPR>python Tensorflow\models\research\object_detection\model_main_tf2.py --model_dir=Tensorflow\workspace\models\my_ssd_mobnet --pipeline_config_path=Tensorflow\wo
rkspace\models\my_ssd_mobnet\pipeline.config --num_train_steps=5000
2022-07-03 13:15:20.133343: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cudart64_110.dll'; dlerror: cudart64_110.dll not foun
d
2022-07-03 13:15:20.133471: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Ignore above cudart dlerror if you do not have a GPU set up on your machine.
D:\ANPR\anprsys\lib\site-packages\tensorflow_addons\utils\ensure_tf_install.py:37: UserWarning: You are currently using a nightly version of TensorFlow (2.10.0-dev20220702).
TensorFlow Addons offers no support for the nightly versions of TensorFlow. Some things might work, some other might not.
If you encounter a bug, do not file an issue on GitHub.
  warnings.warn(
2022-07-03 13:15:26.508418: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'nvcuda.dll'; dlerror: nvcuda.dll not found
2022-07-03 13:15:26.508515: W tensorflow/stream_executor/cuda/cuda_driver.cc:263] failed call to cuInit: UNKNOWN ERROR (303)
2022-07-03 13:15:26.592251: I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:169] retrieving CUDA diagnostic information for host: DESKTOP-7305C0G
2022-07-03 13:15:26.592403: I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:176] hostname: DESKTOP-7305C0G
2022-07-03 13:15:26.593081: I tensorflow/core/platform/cpu_feature_guard.cc:193] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the
following CPU instructions in performance-critical operations:  AVX AVX2
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
WARNING:tensorflow:There are non-GPU devices in `tf.distribute.Strategy`, not using nccl allreduce.
W0703 13:15:26.582500 11608 cross_device_ops.py:1387] There are non-GPU devices in `tf.distribute.Strategy`, not using nccl allreduce.
INFO:tensorflow:Using MirroredStrategy with devices ('/job:localhost/replica:0/task:0/device:CPU:0',)
I0703 13:15:26.611831 11608 mirrored_strategy.py:374] Using MirroredStrategy with devices ('/job:localhost/replica:0/task:0/device:CPU:0',)
INFO:tensorflow:Maybe overwriting train_steps: 5000
I0703 13:15:26.629454 11608 config_util.py:552] Maybe overwriting train_steps: 5000
INFO:tensorflow:Maybe overwriting use_bfloat16: False
I0703 13:15:26.629454 11608 config_util.py:552] Maybe overwriting use_bfloat16: False
WARNING:tensorflow:From D:\ANPR\anprsys\lib\site-packages\object_detection-0.1-py3.10.egg\object_detection\model_lib_v2.py:563: StrategyBase.experimental_distribute_datasets_fro
m_function (from tensorflow.python.distribute.distribute_lib) is deprecated and will be removed in a future version.
Instructions for updating:
rename to distribute_datasets_from_function
W0703 13:15:26.778272 11608 deprecation.py:350] From D:\ANPR\anprsys\lib\site-packages\object_detection-0.1-py3.10.egg\object_detection\model_lib_v2.py:563: StrategyBase.experim
ental_distribute_datasets_from_function (from tensorflow.python.distribute.distribute_lib) is deprecated and will be removed in a future version.
Instructions for updating:
rename to distribute_datasets_from_function
INFO:tensorflow:Reading unweighted datasets: ['Tensorflow\\workspace\\annotations\\train.record']
I0703 13:15:26.885579 11608 dataset_builder.py:162] Reading unweighted datasets: ['Tensorflow\\workspace\\annotations\\train.record']
INFO:tensorflow:Reading record datasets for input file: ['Tensorflow\\workspace\\annotations\\train.record']
I0703 13:15:26.886584 11608 dataset_builder.py:79] Reading record datasets for input file: ['Tensorflow\\workspace\\annotations\\train.record']
INFO:tensorflow:Number of filenames to read: 1
I0703 13:15:26.887576 11608 dataset_builder.py:80] Number of filenames to read: 1
WARNING:tensorflow:num_readers has been reduced to 1 to match input file shards.
W0703 13:15:26.888576 11608 dataset_builder.py:86] num_readers has been reduced to 1 to match input file shards.
WARNING:tensorflow:From D:\ANPR\anprsys\lib\site-packages\object_detection-0.1-py3.10.egg\object_detection\builders\dataset_builder.py:100: parallel_interleave (from tensorflow.
python.data.experimental.ops.interleave_ops) is deprecated and will be removed in a future version.
Instructions for updating:
Use `tf.data.Dataset.interleave(map_func, cycle_length, block_length, num_parallel_calls=tf.data.AUTOTUNE)` instead. If sloppy execution is desired, use `tf.data.Options.determi
stic`.
W0703 13:15:27.200256 11608 deprecation.py:350] From D:\ANPR\anprsys\lib\site-packages\object_detection-0.1-py3.10.egg\object_detection\builders\dataset_builder.py:100: parallel
_interleave (from tensorflow.python.data.experimental.ops.interleave_ops) is deprecated and will be removed in a future version.
Instructions for updating:
Use `tf.data.Dataset.interleave(map_func, cycle_length, block_length, num_parallel_calls=tf.data.AUTOTUNE)` instead. If sloppy execution is desired, use `tf.data.Options.determi
stic`.
WARNING:tensorflow:From D:\ANPR\anprsys\lib\site-packages\object_detection-0.1-py3.10.egg\object_detection\builders\dataset_builder.py:235: DatasetV1.map_with_legacy_function (f
rom tensorflow.python.data.ops.dataset_ops) is deprecated and will be removed in a future version.
```

Activate Windows
Go to Settings to activate Windows.

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Detect from an Image

In [ ]:
```
import cv2
import numpy as np
from matplotlib import pyplot as plt
%matplotlib inline
```

In [ ]:
```
category_index = label_map_util.create_category_index_from_labelmap(files['LABELMAP'])
```

In [ ]:
```
IMAGE_PATH = os.path.join(paths['IMAGE_PATH'], 'test', 'cars432.png')
```

In [ ]:
```
img = cv2.imread(IMAGE_PATH)
image_np = np.array(img)

input_tensor = tf.convert_to_tensor(np.expand_dims(image_np, 0), dtype=tf.float32)
detections = detect_fn(input_tensor)

num_detections = int(detections.pop('num_detections'))
detections = {key: value[0, :num_detections].numpy()
              for key, value in detections.items()}
detections['num_detections'] = num_detections

# detection_classes should be ints.
detections['detection_classes'] = detections['detection_classes'].astype(np.int64)

label_id_offset = 1
image_np_with_detections = image_np.copy()

viz_utils.visualize_boxes_and_labels_on_image_array(
            image_np_with_detections,
            detections['detection_boxes'],
            detections['detection_classes']+label_id_offset,
            detections['detection_scores'],
            category_index,
            use_normalized_coordinates=True,
            max_boxes_to_draw=5,
            min_score_thresh=.8,
            agnostic_mode=False)

plt.imshow(cv2.cvtColor(image_np_with_detections, cv2.COLOR_BGR2RGB))
plt.show()
```

In [ ]:
```
detections.keys()
```

In [ ]:
```
import easyocr
```

In [ ]:
```
detection_threshold = 0.5
```

In [ ]:
```
image = image_np_with_detections

scores = list(filter(lambda x: x> detection_threshold, detections['detection_scores']))
boxes = detections['detection_boxes'][:len(scores)]
classes = detections['detection_classes'][:len(scores)]
```

In [ ]:
```
scores
```

In [ ]:
```
detections['detection_scores']
```

In [ ]:
```
scores
```

In [ ]:
```
width = image.shape[1]
height = image.shape[0]
```

In [ ]:
```
width
```

In [ ]:
```
# Apply ROI filtering and OCR
for idx, box in enumerate(boxes):
    print(box)
    roi = box*[height, width, height, width]
    region = image [int(roi[0]):int(roi[2]),int(roi[1]):int(roi[3])]
    print(roi)
    reader = easyocr.Reader(['bn'])

    ocr_result = reader.readtext(region)
    print(ocr_result)
    plt.imshow(cv2.cvtColor(region,cv2.COLOR_BGR2RGB))
```

In [ ]:
```
ocr_result
```

In [ ]:
```
for result in ocr_result:
    print(np.sum(np.subtract(result[0][2],result[0][1])))
    print(result[1])
```

In [ ]:
```
region_threshold = 0.005
```

In [ ]:
```
def filter_text(region, ocr_result, region_threshold):
    rectangle_size = region.shape[0]*region.shape[1]

    plate = []

    for result in ocr_result:
        length = np.sum(np.subtract(result[0][1],result[0][0]))
        height = np.sum(np.subtract (result[0][2],result[0][1]))


        if length*height / rectangle_size > region_threshold:
            plate.append(result[1])
        return plate
```

In [ ]:
```
filter_text(region, ocr_result, region_threshold)
```

In [ ]:
```
region_threshold
```

In [ ]:
```
def ocr_it(image, detections, detection_threshold, region_threshold):
    scores= list(filter (lambda x: x> detection_threshold, detections['detection_scores']))
    boxes = detections['detection_boxes'][:len(scores)]
    classes = detections['detection_classes'][:len(scores)]

    width = image.shape[1]
    height =  image.shape[0]


    for idx, box in enumerate(boxes):
        print(box)
        roi = box*[height, width, height, width]
        print(roi)
        region = image[int(roi[0]):int(roi[2]), int(roi[1]):int(roi[3])]
        reader = easyocr.Reader(['bn'])
```

In [ ]:
```
text,region = ocr_it(image_np_with_detections, detections, detection_threshold, region_threshold)
```

Saving Files

In [ ]:
```
import csv
```

In [ ]:
```
import uuid
```

In [ ]:
```
'{}.png'.format(uuid.uuid1())
```

In [ ]:
```
def save_results(text, region, csv_filename, folder_path):
    img_name = '{}.png'.format(uuid.uuid1())

    cv2.imwrite(os.path.join(folder_path, img_name), region)

    with open( csv_filename, mode='a', newline='') as f:
        csv_writer = csv.writer ( f, delimiter = ',' , quotechar='"',quoting=csv.QUOTE_MINIMAL )
        csv_writer.writerow([(img_name, text)])
```

In [ ]:
```
region
```

In [ ]:
```
text
```

In [ ]:
```
save_results(text, region,'detection_results.csv','Detection_images')
```

Real Time Detections from your Webcam

In [ ]:
```
#!pip install opencv-contrib-python
```

In [ ]:
```
#!pip uninstall opencv-contrib-python-headless -y
#!pip uninstall opencv-python  -y
#!pip uninstall opencv-python-headless  -y
```

In [ ]:
```
#!pip list opencv
```

In [ ]:
```
#!pip install opencv-python==3.4.18.65
```

In [ ]:
```
import cv2
import numpy as np
from matplotlib import pyplot as plt
%matplotlib inline
```

In [ ]:
```
cap = cv2.VideoCapture(0)
```

Real Time Detections from your Webcam

In [ ]:
```
#!pip install opencv-contrib-python
```

In [ ]:
```
#!pip uninstall opencv-contrib-python-headless -y
#!pip uninstall opencv-python  -y
#!pip uninstall opencv-python-headless  -y
```

In [ ]:
```
#!pip list opencv
```

In [ ]:
```
#!pip install opencv-python==3.4.18.65
```

In [ ]:
```
import cv2
import numpy as np
from matplotlib import pyplot as plt
%matplotlib inline
```

In [ ]:
```
cap = cv2.VideoCapture(0)
width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))
while cap.isOpened():
    ret, frame = cap.read()
    image_np = np.array(frame)

    input_tensor = tf.convert_to_tensor(np.expand_dims(image_np, 0), dtype=tf.float32)
    detections = detect_fn(input_tensor)

    num_detections = int(detections.pop('num_detections'))
    detections = {key: value[0, :num_detections].numpy()
                  for key, value in detections.items()}
    detections['num_detections'] = num_detections

    # detection_classes should be ints.
    detections['detection_classes'] = detections['detection_classes'].astype(np.int64)

    label_id_offset = 1
    image_np_with_detections = image_np.copy()

    viz_utils.visualize_boxes_and_labels_on_image_array(
                image_np_with_detections,
                detections['detection_boxes'],
                detections['detection_classes']+label_id_offset,
                detections['detection_scores'],
                category_index,
                use_normalized_coordinates=True,
                max_boxes_to_draw=5,
                min_score_thresh=.8,
                agnostic_mode=False)

     try:
```

5.

Real Time Detections from Webcam