```
!pip install tensorflow
```

```
Requirement already satisfied: tensorflow in /usr/local/lib/python3.10/dist-packages (2.13.0)
Requirement already satisfied: absl-py>=1.0.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.4.0)
Requirement already satisfied: astunparse>=1.6.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.6.3)
Requirement already satisfied: flatbuffers>=23.1.21 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (23.5.26)
Requirement already satisfied: gast<=0.4.0,>=0.2.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (0.4.0)
Requirement already satisfied: google-pasta>=0.1.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (0.2.0)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.57.0)
Requirement already satisfied: h5py>=2.9.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (3.9.0)
Requirement already satisfied: keras<2.14,>=2.13.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.13.1)
Requirement already satisfied: libclang>=13.0.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (16.0.6)
Requirement already satisfied: numpy<=1.24.3,>=1.22 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.23.5)
Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (3.3.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from tensorflow) (23.1)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<5.0.0dev,>=3.20.3 in /usr/local/lib/py
Requirement already satisfied: setuptools in /usr/local/lib/python3.10/dist-packages (from tensorflow) (67.7.2)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.16.0)
Requirement already satisfied: tensorboard<2.14,>=2.13 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.13.0)
Requirement already satisfied: tensorflow-estimator<2.14,>=2.13.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.1
Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.3.0)
Requirement already satisfied: typing-extensions<4.6.0,>=3.6.6 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (4.5.0)
Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.15.0)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (0
Requirement already satisfied: wheel<1.0,>=0.23.0 in /usr/local/lib/python3.10/dist-packages (from astunparse>=1.6.0->tensorflow) (0
Requirement already satisfied: google-auth<3,>=1.6.3 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->tensc
Requirement already satisfied: google-auth-oauthlib<1.1,>=0.5 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->tensorflow
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->tensor
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2
Requirement already satisfied: werkzeug>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->tensorflow
Requirement already satisfied: cachetools<6.0,>=2.0.0 in /usr/local/lib/python3.10/dist-packages (from google-auth<3,>=1.6.3->tensor
Requirement already satisfied: pyasn1-modules>=0.2.1 in /usr/local/lib/python3.10/dist-packages (from google-auth<3,>=1.6.3->tensorb
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.10/dist-packages (from google-auth<3,>=1.6.3->tensorboard<2.1
Requirement already satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.10/dist-packages (from google-auth-oauthlib<1.1,>=
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensor
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorboard<2.14,
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorboard<
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorboard<
Requirement already satisfied: MarkupSafe>=2.1.1 in /usr/local/lib/python3.10/dist-packages (from werkzeug>=1.0.1->tensorboard<2.14,
Requirement already satisfied: pyasn1<0.6.0,>=0.4.6 in /usr/local/lib/python3.10/dist-packages (from pyasn1-modules>=0.2.1->google-a
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.10/dist-packages (from requests-oauthlib>=0.7.0->google-aut
```

```
import tensorflow as tf
print(tf.__version__)
```

```
2.13.0
```

Cloning TFOD 2.0 GITHUB

```
!git clone https://github.com/tensorflow/models.git
```

```
Cloning into 'models'...
remote: Enumerating objects: 87573, done.
remote: Counting objects: 100% (1327/1327), done.
remote: Compressing objects: 100% (606/606), done.
remote: Total 87573 (delta 815), reused 1185 (delta 708), pack-reused 86246
Receiving objects: 100% (87573/87573), 599.33 MiB | 23.33 MiB/s, done.
Resolving deltas: 100% (62689/62689), done.
```

```
pwd
```

```
cd /content/models/research
```

```
/content/models/research
```

```
pwd
```

```
!protoc object_detection/protos/*.proto --python_out=.
```

```
!pip install cython
!pip install git+https://github.com/philferriere/cocoapi.git#subdirectory=PythonAPI
```

```
Requirement already satisfied: cython in /usr/local/lib/python3.10/dist-packages (3.0.2)
Collecting git+https://github.com/philferriere/cocoapi.git#subdirectory=PythonAPI
  Cloning https://github.com/philferriere/cocoapi.git to /tmp/pip-req-build-mnggj1m4
  Running command git clone --filter=blob:none --quiet https://github.com/philferriere/cocoapi.git /tmp/pip-req-build-mnggj1m4
  Resolved https://github.com/philferriere/cocoapi.git to commit 2929bd2ef6b451054755dfd7ceb09278f935f7ad
  Preparing metadata (setup.py) ... done
Building wheels for collected packages: pycocotools
  Building wheel for pycocotools (setup.py) ... done
  Created wheel for pycocotools: filename=pycocotools-2.0-cp310-cp310-linux_x86_64.whl size=378938 sha256=a646820bca701226f67f33ef9
  Stored in directory: /tmp/pip-ephem-wheel-cache-sst8mqgh/wheels/8e/1a/5f/0c984ae3d65a4d7da4ba3407d2a8d8c8e85dd55f84d4936f04
Successfully built pycocotools
Installing collected packages: pycocotools
  Attempting uninstall: pycocotools
    Found existing installation: pycocotools 2.0.7
    Uninstalling pycocotools-2.0.7:
      Successfully uninstalled pycocotools-2.0.7
Successfully installed pycocotools-2.0
```

```
!pip install git+https://github.com/philferriere/cocoapi.git#subdirectory=PythonAPI
```

```
Collecting git+https://github.com/philferriere/cocoapi.git#subdirectory=PythonAPI
  Cloning https://github.com/philferriere/cocoapi.git to /tmp/pip-req-build-mimm2tcb
  Running command git clone --filter=blob:none --quiet https://github.com/philferriere/cocoapi.git /tmp/pip-req-build-mimm2tcb
  Resolved https://github.com/philferriere/cocoapi.git to commit 2929bd2ef6b451054755dfd7ceb09278f935f7ad
  Preparing metadata (setup.py) ... done
```

Install the Object Detection API

```
pwd
```

```
cp object_detection/packages/tf2/setup.py .
```

```
!python -m pip install .
```

```
  Stored in directory: /root/.cache/pip/wheels/fc/ab/d4/5da2067ac95b36618c629a5f93f809425700506f72c9732fac
Successfully built object-detection avro-python3 crcmod dill hdfs seqeval docopt
Installing collected packages: sentencepiece, docopt, crcmod, zstandard, tensorflow-model-optimization, tensorflow-io-gcs-filesy
  Attempting uninstall: tensorflow-io-gcs-filesystem
    Found existing installation: tensorflow-io-gcs-filesystem 0.33.0
    Uninstalling tensorflow-io-gcs-filesystem-0.33.0:
      Successfully uninstalled tensorflow-io-gcs-filesystem-0.33.0
  Attempting uninstall: pyparsing
    Found existing installation: pyparsing 3.1.1
    Uninstalling pyparsing-3.1.1:
      Successfully uninstalled pyparsing-3.1.1
Successfully installed apache-beam-2.50.0 avro-python3-1.10.2 colorama-0.4.6 crcmod-1.7 dill-0.3.1.1 dnspython-2.4.2 docopt-0.6.
```

From within TensorFlow/models/research/

```
# From within TensorFlow/models/research/
!python object_detection/builders/model_builder_tf2_test.py
```

```
I0919 16:50:26.555016 140535984119808 ssd_efficientnet_bifpn_feature_extractor.py:161] EfficientDet EfficientNet backbone versio
I0919 16:50:26.555159 140535984119808 ssd_efficientnet_bifpn_feature_extractor.py:163] EfficientDet BiFPN num filters: 384
I0919 16:50:26.555237 140535984119808 ssd_efficientnet_bifpn_feature_extractor.py:164] EfficientDet BiFPN num iterations: 8
I0919 16:50:26.557326 140535984119808 efficientnet_model.py:143] round_filter input=32 output=64
I0919 16:50:26.580971 140535984119808 efficientnet_model.py:143] round_filter input=32 output=64
I0919 16:50:26.581117 140535984119808 efficientnet_model.py:143] round_filter input=16 output=32
I0919 16:50:26.888749 140535984119808 efficientnet_model.py:143] round_filter input=16 output=32
I0919 16:50:26.888917 140535984119808 efficientnet_model.py:143] round_filter input=24 output=48
I0919 16:50:27.523757 140535984119808 efficientnet_model.py:143] round_filter input=24 output=48
I0919 16:50:27.523934 140535984119808 efficientnet_model.py:143] round_filter input=40 output=80
I0919 16:50:28.180685 140535984119808 efficientnet_model.py:143] round_filter input=40 output=80
I0919 16:50:28.180871 140535984119808 efficientnet_model.py:143] round_filter input=80 output=160
I0919 16:50:29.104500 140535984119808 efficientnet_model.py:143] round_filter input=80 output=160
I0919 16:50:29.104659 140535984119808 efficientnet_model.py:143] round_filter input=112 output=224
I0919 16:50:30.065272 140535984119808 efficientnet_model.py:143] round_filter input=112 output=224
I0919 16:50:30.065500 140535984119808 efficientnet_model.py:143] round_filter input=192 output=384
I0919 16:50:31.780448 140535984119808 efficientnet_model.py:143] round_filter input=192 output=384
I0919 16:50:31.780647 140535984119808 efficientnet_model.py:143] round_filter input=320 output=640
I0919 16:50:32.353883 140535984119808 efficientnet_model.py:143] round_filter input=1280 output=2560
I0919 16:50:32.415171 140535984119808 efficientnet_model.py:453] Building model efficientnet with params ModelConfig(width_coeff
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_ssd_models_from_config): 30.54s
I0919 16:50:32.986579 140535984119808 test_util.py:2462] time(__main__.ModelBuilderTF2Test.test_create_ssd_models_from_config):
[       OK ] ModelBuilderTF2Test.test_create_ssd_models_from_config
[ RUN      ] ModelBuilderTF2Test.test_invalid_faster_rcnn_batchnorm_update
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_invalid_faster_rcnn_batchnorm_update): 0.0s
I0919 16:50:33.023515 140535984119808 test_util.py:2462] time(__main__.ModelBuilderTF2Test.test_invalid_faster_rcnn_batchnorm_up
[       OK ] ModelBuilderTF2Test.test_invalid_faster_rcnn_batchnorm_update
[ RUN      ] ModelBuilderTF2Test.test_invalid_first_stage_nms_iou_threshold
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_invalid_first_stage_nms_iou_threshold): 0.0s
I0919 16:50:33.026020 140535984119808 test_util.py:2462] time(__main__.ModelBuilderTF2Test.test_invalid_first_stage_nms_iou_thre
[       OK ] ModelBuilderTF2Test.test_invalid_first_stage_nms_iou_threshold
[ RUN      ] ModelBuilderTF2Test.test_invalid_model_config_proto
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_invalid_model_config_proto): 0.0s
I0919 16:50:33.026706 140535984119808 test_util.py:2462] time(__main__.ModelBuilderTF2Test.test_invalid_model_config_proto): 0.0
[       OK ] ModelBuilderTF2Test.test_invalid_model_config_proto
[ RUN      ] ModelBuilderTF2Test.test_invalid_second_stage_batch_size
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_invalid_second_stage_batch_size): 0.0s
I0919 16:50:33.028900 140535984119808 test_util.py:2462] time(__main__.ModelBuilderTF2Test.test_invalid_second_stage_batch_size)
[       OK ] ModelBuilderTF2Test.test_invalid_second_stage_batch_size
[ RUN      ] ModelBuilderTF2Test.test_session
[  SKIPPED ] ModelBuilderTF2Test.test_session
[ RUN      ] ModelBuilderTF2Test.test_unknown_faster_rcnn_feature_extractor
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_unknown_faster_rcnn_feature_extractor): 0.0s
I0919 16:50:33.030737 140535984119808 test_util.py:2462] time(__main__.ModelBuilderTF2Test.test_unknown_faster_rcnn_feature_extr
[       OK ] ModelBuilderTF2Test.test_unknown_faster_rcnn_feature_extractor
[ RUN      ] ModelBuilderTF2Test.test_unknown_meta_architecture
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_unknown_meta_architecture): 0.0s
I0919 16:50:33.031265 140535984119808 test_util.py:2462] time(__main__.ModelBuilderTF2Test.test_unknown_meta_architecture): 0.0s
[       OK ] ModelBuilderTF2Test.test_unknown_meta_architecture
[ RUN      ] ModelBuilderTF2Test.test_unknown_ssd_feature_extractor
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_unknown_ssd_feature_extractor): 0.0s
I0919 16:50:33.032633 140535984119808 test_util.py:2462] time(__main__.ModelBuilderTF2Test.test_unknown_ssd_feature_extractor):
[       OK ] ModelBuilderTF2Test.test_unknown_ssd_feature_extractor
----------------------------------------------------------------------
Ran 24 tests in 40.638s

OK (skipped=1)
```

preparing image

```
cd /content/training_demo/pre-trained-modal
```

```
/content/training_demo/pre-trained-modal
```

```
!wget http://download.tensorflow.org/models/object_detection/tf2/20200711/ssd_resnet101_v1_fpn_640x640_coco17_tpu-8.tar.gz
```

```
--2023-09-18 10:02:18--  http://download.tensorflow.org/models/object_detection/tf2/20200711/ssd_resnet101_v1_fpn_640x640_coco17_tpu
Resolving download.tensorflow.org (download.tensorflow.org)... 142.251.8.207, 173.194.174.207, 74.125.23.207, ...
Connecting to download.tensorflow.org (download.tensorflow.org)|142.251.8.207|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 386527459 (369M) [application/x-tar]
Saving to: 'ssd_resnet101_v1_fpn_640x640_coco17_tpu-8.tar.gz'

ssd_resnet101_v1_fp 100%[===================>] 368.62M  29.8MB/s    in 7.8s

2023-09-18 10:02:27 (47.1 MB/s) - 'ssd_resnet101_v1_fpn_640x640_coco17_tpu-8.tar.gz' saved [386527459/386527459]
```

```
!tar -xvf ssd_resnet101_v1_fpn_640x640_coco17_tpu-8.tar.gz
```

```
tar: ssd_resnet101_v1_fpn_640x640_coco17_tpu-8.tar.gz: Cannot open: No such file or directory
tar: Error is not recoverable: exiting now
```

```
# Create train data:
!python generate_tfrecord.py -x /content/training_demo/images/train-l /content/training_demo/annotations/label_map.pbtxt-o /content/trai

# Create test data:
!python generate_tfrecord.py -x /content/training_demo/images/test-l /content/training_demo/annotations/label_map.pbtxt-o /content/trair
```

```
usage: generate_tfrecord.py
       [-h]
       [-x XML_DIR]
       [-l LABELS_PATH]
       [-o OUTPUT_PATH]
       [-i IMAGE_DIR]
       [-c CSV_PATH]
generate_tfrecord.py: error: unrecognized arguments: /content/training_demo/annotations/label_map.pbtxt-o /content/training_demo/anr
usage: generate_tfrecord.py
       [-h]
       [-x XML_DIR]
       [-l LABELS_PATH]
       [-o OUTPUT_PATH]
       [-i IMAGE_DIR]
       [-c CSV_PATH]
generate_tfrecord.py: error: unrecognized arguments: /content/training_demo/annotations/label_map.pbtxt-o /content/training_demo/anr
```

```
cd /content/training_demo
```

```
/content/training_demo
```

```
# Generate train.record
!python generate_tfrecord.py -x /content/training_demo/annotations/xmls \
                             -l /content/training_demo/annotations/label_map.pbtxt \
                             -o /content/training_demo/annotations/train.record \
                             -i /content/training_demo/images/train \
                             -c /content/training_demo/annotations/train_labels.csv

# Generate test.record
!python generate_tfrecord.py -x /content/training_demo/annotations/xmls \
                             -l /content/training_demo/annotations/label_map.pbtxt \
                             -o /content/training_demo/annotations/test.record \
                             -i /content/training_demo/images/test \
                             -c /content/training_demo/annotations/test_labels.csv
```

```
Successfully created the TFRecord file: /content/training_demo/annotations/train.record
Successfully created the CSV file: /content/training_demo/annotations/train_labels.csv
Successfully created the TFRecord file: /content/training_demo/annotations/test.record
Successfully created the CSV file: /content/training_demo/annotations/test_labels.csv
```

```
!python generate_tfrecord.py -x /content/training_demo/annotations/xmls -l /content/training_demo/annotations/label_map.pbtxt -o /conter
```

```
Successfully created the TFRecord file: /content/training_demo/annotations/train.record
Successfully created the CSV file: /content/training_demo/annotations/train_labels.csv
```

```
pwd
```

```
ls
```

```
annotations/         export_tflite_graph_tf2.py  modals/
exported_modals/     generate_tfrecord.py        model_main_tf2.py
exporter_main_v2.py  images/                     pre-trained-modal/
```

```
!python model_main_tf2.py --model_dir=/content/training_demo/modals/my_ssd_resnet101_v1_fpn--pipeline_config_path=/content/training_demo
```

```
INFO:tensorflow:Using MirroredStrategy with devices ('/job:localhost/replica:0/task:0/device:GPU:0',)
I0919 19:21:58.786276 137843561140224 mirrored_strategy.py:419] Using MirroredStrategy with devices ('/job:localhost/replica:0/task
Traceback (most recent call last):
  File "/content/training_demo/model_main_tf2.py", line 113, in <module>
    tf.compat.v1.app.run()
  File "/usr/local/lib/python3.10/dist-packages/tensorflow/python/platform/app.py", line 36, in run
    _run(main=main, argv=argv, flags_parser=_parse_flags_tolerate_undef)
  File "/usr/local/lib/python3.10/dist-packages/absl/app.py", line 308, in run
    _run_main(main, args)
  File "/usr/local/lib/python3.10/dist-packages/absl/app.py", line 254, in _run_main
    sys.exit(main(argv))
  File "/content/training_demo/model_main_tf2.py", line 104, in main
    model_lib_v2.train_loop(
  File "/usr/local/lib/python3.10/dist-packages/object_detection/model_lib_v2.py", line 505, in train_loop
    configs = get_configs_from_pipeline_file(
  File "/usr/local/lib/python3.10/dist-packages/object_detection/utils/config_util.py", line 138, in get_configs_from_pipeline_file
    proto_str = f.read()
  File "/usr/local/lib/python3.10/dist-packages/tensorflow/python/lib/io/file_io.py", line 116, in read
    self._preread_check()
  File "/usr/local/lib/python3.10/dist-packages/tensorflow/python/lib/io/file_io.py", line 77, in _preread_check
    self._read_buf = _pywrap_file_io.BufferedInputStream(
TypeError: __init__(): incompatible constructor arguments. The following argument types are supported:
    1. tensorflow.python.lib.io._pywrap_file_io.BufferedInputStream(filename: str, buffer_size: int, token: tensorflow.python.lib.io

Invoked with: None, 524288
```

```
pwd
```

```
!python exporter_main_v2.py --input_type image_tensor --pipeline_config_path /content/training_demo/models/my_ssd_resnet101_v1_fpn/pipel
```

```
2023-09-19 18:52:35.027860: W tensorflow/compiler/tf2tensorrt/utils/py_utils.cc:38] TF-TRT Warning: Could not find TensorRT
Traceback (most recent call last):
  File "/content/training_demo/exporter_main_v2.py", line 159, in <module>
    app.run(main)
  File "/usr/local/lib/python3.10/dist-packages/absl/app.py", line 308, in run
    _run_main(main, args)
  File "/usr/local/lib/python3.10/dist-packages/absl/app.py", line 254, in _run_main
    sys.exit(main(argv))
  File "/content/training_demo/exporter_main_v2.py", line 150, in main
    text_format.Merge(f.read(), pipeline_config)
  File "/usr/local/lib/python3.10/dist-packages/tensorflow/python/lib/io/file_io.py", line 116, in read
    self._preread_check()
  File "/usr/local/lib/python3.10/dist-packages/tensorflow/python/lib/io/file_io.py", line 77, in _preread_check
    self._read_buf = _pywrap_file_io.BufferedInputStream(
tensorflow.python.framework.errors_impl.NotFoundError: /content/training_demo/models/my_ssd_resnet101_v1_fpn/pipeline.config; No su
```

Inferencing My Trained Models

```
"""
Object Detection (On Image) From TF2 Saved Model
=====================================
"""

import os
os.environ['TF_CPP_MIN_LOG_LEVEL'] = '2'    # Suppress TensorFlow logging (1)
import pathlib
import tensorflow as tf
import cv2
import argparse
from google.colab.patches import cv2_imshow

# Enable GPU dynamic memory allocation
gpus = tf.config.experimental.list_physical_devices('GPU')
for gpu in gpus:
    tf.config.experimental.set_memory_growth(gpu, True)

# PROVIDE PATH TO IMAGE DIRECTORY
```

```
IMAGE_PATHS = '/content/training_demo/images/train/image1.jpg'


# PROVIDE PATH TO MODEL DIRECTORY
PATH_TO_MODEL_DIR = '/content/training_demo/exported_models/my_model'

# PROVIDE PATH TO LABEL MAP
PATH_TO_LABELS = '/content/training_demo/annotations/label_map.pbtxt'

# PROVIDE THE MINIMUM CONFIDENCE THRESHOLD
MIN_CONF_THRESH = float(0.60)

# LOAD THE MODEL

import time
from object_detection.utils import label_map_util
from object_detection.utils import visualization_utils as viz_utils

PATH_TO_SAVED_MODEL = PATH_TO_MODEL_DIR + "/saved_model"

print('Loading model...', end='')
start_time = time.time()

# LOAD SAVED MODEL AND BUILD DETECTION FUNCTION
detect_fn = tf.saved_model.load(PATH_TO_SAVED_MODEL)

end_time = time.time()
elapsed_time = end_time - start_time
print('Done! Took {} seconds'.format(elapsed_time))

# LOAD LABEL MAP DATA FOR PLOTTING

category_index = label_map_util.create_category_index_from_labelmap(PATH_TO_LABELS,
                                                                    use_display_name=True)

import numpy as np
from PIL import Image
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')   # Suppress Matplotlib warnings

def load_image_into_numpy_array(path):
    """Load an image from file into a numpy array.
    Puts image into numpy array to feed into tensorflow graph.
    Note that by convention we put it into a numpy array with shape
    (height, width, channels), where channels=3 for RGB.
    Args:
      path: the file path to the image
    Returns:
      uint8 numpy array with shape (img_height, img_width, 3)
    """
    return np.array(Image.open(path))




print('Running inference for {}... '.format(IMAGE_PATHS), end='')

image = cv2.imread(IMAGE_PATHS)
image_rgb = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
image_expanded = np.expand_dims(image_rgb, axis=0)

# The input needs to be a tensor, convert it using `tf.convert_to_tensor`.
input_tensor = tf.convert_to_tensor(image)
# The model expects a batch of images, so add an axis with `tf.newaxis`.
input_tensor = input_tensor[tf.newaxis, ...]

# input_tensor = np.expand_dims(image_np, 0)
detections = detect_fn(input_tensor)

# All outputs are batches tensors.
# Convert to numpy arrays, and take index [0] to remove the batch dimension.
# We're only interested in the first num_detections.
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)

image_with_detections = image.copy()
```

```
# SET MIN_SCORE_THRESH BASED ON YOU MINIMUM THRESHOLD FOR DETECTIONS
viz_utils.visualize_boxes_and_labels_on_image_array(
      image_with_detections,
      detections['detection_boxes'],
      detections['detection_classes'],
      detections['detection_scores'],
      category_index,
      use_normalized_coordinates=True,
      max_boxes_to_draw=200,
      min_score_thresh=0.5,
      agnostic_mode=False)

print('Done')
# DISPLAYS OUTPUT IMAGE
cv2_imshow(image_with_detections)
# CLOSES WINDOW ONCE KEY IS PRESSED
```

```
Loading model...
---------------------------------------------------------------------------
OSError                                   Traceback (most recent call last)
<ipython-input-53-1123e17ab1d1> in <cell line: 44>()
     42
     43 # LOAD SAVED MODEL AND BUILD DETECTION FUNCTION
---> 44 detect_fn = tf.saved_model.load(PATH_TO_SAVED_MODEL)
     45
     46 end_time = time.time()

                                    3 frames
/usr/local/lib/python3.10/dist-packages/tensorflow/python/saved_model/loader_impl.py in parse_saved_model(export_dir)
    114       raise IOError(f"Cannot parse file {path_to_pbtxt}: {str(e)}.")
    115   else:
--> 116     raise IOError(
    117         f"SavedModel file does not exist at: {export_dir}{os.path.sep}"
    118         f"{{{constants.SAVED_MODEL_FILENAME_PBTXT}|"

OSError: SavedModel file does not exist at:
/content/training_demo/exported_models/my_model/saved_model/{saved_model.pbtxt|saved_model.pb}
```

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