

0. Setup Paths

In [1]:

```
import os
```

In [2]:

```
CUSTOM_MODEL_NAME = 'my_ssd_mobnet_tuned'
PRETRAINED_MODEL_NAME = 'ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8'
PRETRAINED_MODEL_URL = 'http://download.tensorflow.org/models/object_detection/tf2/20200711/ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8.tar.gz'
TF_RECORD_SCRIPT_NAME = 'generate_tfrecord.py'
LABEL_MAP_NAME = 'label_map.pbtxt'
```

In [3]:

```
paths = {
    'WORKSPACE_PATH': os.path.join('Tensorflow', 'workspace'),
    'SCRIPTS_PATH': os.path.join('Tensorflow', 'scripts'),
    'APIMODEL_PATH': os.path.join('Tensorflow', 'models'),
    'ANNOTATION_PATH': os.path.join('Tensorflow', 'workspace', 'annotations'),
    'IMAGE_PATH': os.path.join('Tensorflow', 'workspace', 'images'),
    'MODEL_PATH': os.path.join('Tensorflow', 'workspace', 'models'),
    'PRETRAINED_MODEL_PATH': os.path.join('Tensorflow', 'workspace', 'pre-trained-models'),
    'CHECKPOINT_PATH': os.path.join('Tensorflow', 'workspace', 'models', CUSTOM_MODEL_NAME),
    'OUTPUT_PATH': os.path.join('Tensorflow', 'workspace', 'models', CUSTOM_MODEL_NAME, 'export'),
    'TFJS_PATH': os.path.join('Tensorflow', 'workspace', 'models', CUSTOM_MODEL_NAME, 'tfjsexport'),
    'TFLITE_PATH': os.path.join('Tensorflow', 'workspace', 'models', CUSTOM_MODEL_NAME, 'tfliteexport'),
    'PROTOC_PATH': os.path.join('Tensorflow', 'protoc')
}
```

In [4]:

```
files = {
    'PIPELINE_CONFIG': os.path.join('Tensorflow', 'workspace', 'models', CUSTOM_MODEL_NAME, 'pipeline.config'),
    'TF_RECORD_SCRIPT': os.path.join(paths['SCRIPTS_PATH'], TF_RECORD_SCRIPT_NAME),
    'LABELMAP': os.path.join(paths['ANNOTATION_PATH'], LABEL_MAP_NAME)
}
```

In [5]:

```
for path in paths.values():
    if not os.path.exists(path):
        if os.name == 'posix':
            !mkdir -p {path}
        if os.name == 'nt':
            !mkdir {path}
```

In [6]:

```
files
```

Out[6]:

```
{'PIPELINE_CONFIG': 'Tensorflow/workspace/models/my_ssd_mobnet_tune  
d/pipeline.config',  
 'TF_RECORD_SCRIPT': 'Tensorflow/scripts/generate_tfrecord.py',  
 'LABELMAP': 'Tensorflow/workspace/annotations/label_map.pbtxt'}
```

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

In [7]:

```
# https://www.tensorflow.org/install/source\_windows
```

In [8]:

```
os.name
```

Out[8]:

```
'posix'
```

In [9]:

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

In [10]:

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

In [11]:

```
# Install Tensorflow Object Detection
if os.name=='posix':
    !apt-get install protobuf-compiler
    !cd Tensorflow/models/research && protoc object_detection/protos/*.proto --p
ython_out=. && cp object_detection/packages/tf2/setup.py . && python -m pip inst
all .

if os.name=='nt':
    url="https://github.com/protocolbuffers/protobuf/releases/download/v3.15.6/p
rotoc-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['PROTO
C_PATH'], 'bin'))
    !cd Tensorflow/models/research && protoc object_detection/protos/*.proto --p
ython_out=. && copy object_detection\\packages\\tf2\\setup.py setup.py && python
setup.py build && python setup.py install
    !cd Tensorflow/models/research/slim && pip install -e .
```

```
/bin/bash: apt-get: command not found
```

```
Processing /Users/AlanZhu/Desktop/OD/TFODCourse/Tensorflow/models/research
```

DEPRECATION: A future pip version will change local packages to be built in-place without first copying to a temporary directory. We recommend you use `--use-feature=in-tree-build` to test your packages with this new behavior before it becomes the default.

pip 21.3 will remove support for this functionality. You can find discussion regarding this at <https://github.com/pypa/pip/issues/7555>.

```
Requirement already satisfied: avro-python3 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (1.9.1)
```

```
Requirement already satisfied: apache-beam in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (2.30.0)
```

```
Requirement already satisfied: pillow in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (8.2.0)
```

```
Requirement already satisfied: lxml in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (4.6.3)
```

```
Requirement already satisfied: matplotlib in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (3.2.0)
```

```
Requirement already satisfied: Cython in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (0.29.23)
```

```
Requirement already satisfied: contextlib2 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (0.6.0.post1)
```

```
Requirement already satisfied: tf-slim in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (1.1.0)
```

```
Requirement already satisfied: six in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (1.15.0)
```

```
Requirement already satisfied: pycocotools in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (2.0.2)
```

```
Requirement already satisfied: lvis in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (0.5.3)
```

```
Requirement already satisfied: scipy in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (1.6.3)
```

```
Requirement already satisfied: pandas in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (1.2.4)
```

```
Requirement already satisfied: tf-models-official in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from object-detection==0.1) (2.5.0)
```

```
Requirement already satisfied: grpcio<2,>=1.29.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (1.34.1)
```

```
Requirement already satisfied: future<1.0.0,>=0.18.2 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (0.18.2)
```

```
Requirement already satisfied: pydot<2,>=1.2.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (1.4.2)
```

Requirement already satisfied: hdfs<3.0.0,>=2.1.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (2.6.0)

Requirement already satisfied: crcmod<2.0,>=1.7 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (1.7)

Requirement already satisfied: pymongo<4.0.0,>=3.8.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (3.11.4)

Requirement already satisfied: typing-extensions<3.8.0,>=3.7.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (3.7.4.3)

Requirement already satisfied: httplib2<0.20.0,>=0.8 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (0.19.1)

Requirement already satisfied: requests<3.0.0,>=2.24.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (2.25.1)

Requirement already satisfied: python-dateutil<3,>=2.8.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (2.8.1)

Requirement already satisfied: protobuf<4,>=3.12.2 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (3.17.3)

Requirement already satisfied: fastavro<2,>=0.21.4 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (1.4.1)

Requirement already satisfied: pyarrow<4.0.0,>=0.15.1 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (3.0.0)

Requirement already satisfied: pytz>=2018.3 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (2021.1)

Requirement already satisfied: dill<0.3.2,>=0.3.1.1 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (0.3.1.1)

Requirement already satisfied: numpy<1.21.0,>=1.14.3 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (1.19.5)

Requirement already satisfied: oauth2client<5,>=2.0.1 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from apache-beam->object-detection==0.1) (4.1.3)

Requirement already satisfied: docopt in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from hdfs<3.0.0,>=2.1.0->apache-beam->object-detection==0.1) (0.6.2)

Requirement already satisfied: pyparsing<3,>=2.4.2 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from httplib2<0.20.0,>=0.8->apache-beam->object-detection==0.1) (2.4.7)

Requirement already satisfied: pyasn1>=0.1.7 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from oauth2client<5,>=2.0.1->apache-beam->object-detection==0.1) (0.4.8)

Requirement already satisfied: pyasn1-modules>=0.0.5 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from oauth2client<5,>=2.0.1->apache-beam->object-detection==0.1) (0.2.8)

Requirement already satisfied: rsa>=3.1.4 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from oauth2client<5,>=2.0.1->apache-beam->object-detection==0.1) (4.7.2)

Requirement already satisfied: urllib3<1.27,>=1.21.1 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from requests<3.0.0,>=2.24.0->apache-beam->object-detection==0.1) (1.26.5)

Requirement already satisfied: certifi>=2017.4.17 in /Users/AlanZhu/

Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from request s<3.0.0,>=2.24.0->apache-beam->object-detection==0.1) (2021.5.30)
Requirement already satisfied: chardet<5,>=3.0.2 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from requests <3.0.0,>=2.24.0->apache-beam->object-detection==0.1) (4.0.0)
Requirement already satisfied: idna<3,>=2.5 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from requests<3.0.0,>=2.24.0->apache-beam->object-detection==0.1) (2.10)
Requirement already satisfied: opencv-python>=4.1.0.25 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from lvis->object-detection==0.1) (4.5.1.48)
Requirement already satisfied: cyclr>=0.10.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from lvis->object-detection==0.1) (0.10.0)
Requirement already satisfied: kiwisolver>=1.1.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from lvis->object-detection==0.1) (1.3.1)
Requirement already satisfied: setuptools>=18.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from pycocotools->object-detection==0.1) (57.0.0)
Requirement already satisfied: tensorflow-hub>=0.6.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (0.12.0)
Requirement already satisfied: py-cpuinfo>=3.3.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (8.0.0)
Requirement already satisfied: gin-config in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (0.4.0)
Requirement already satisfied: google-api-python-client>=1.6.7 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (2.8.0)
Requirement already satisfied: sacrebleu in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (1.5.1)
Requirement already satisfied: pyyaml>=5.1 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (5.4.1)
Requirement already satisfied: kaggle>=1.3.9 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (1.5.12)
Requirement already satisfied: tensorflow>=2.5.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (2.5.0)
Requirement already satisfied: tensorflow-addons in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (0.13.0)
Requirement already satisfied: google-cloud-bigquery>=0.31.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (2.20.0)
Collecting opencv-python-headless
Using cached opencv_python_headless-4.5.1.48-cp37-cp37m-macosx_10_13_x86_64.whl (40.3 MB)
Requirement already satisfied: tensorflow-model-optimization>=0.4.1 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (0.5.0)
Requirement already satisfied: psutil>=5.4.3 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (5.8.0)
Requirement already satisfied: segeval in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (0.1.0)

```

->object-detection==0.1) (1.2.2)
Requirement already satisfied: tensorflow-datasets in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (4.3.0)
Requirement already satisfied: sentencepiece in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tf-models-official->object-detection==0.1) (0.1.95)
Requirement already satisfied: google-auth-http2>=0.1.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-api-python-client>=1.6.7->tf-models-official->object-detection==0.1) (0.1.0)
Requirement already satisfied: uritemplate<4dev,>=3.0.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-api-python-client>=1.6.7->tf-models-official->object-detection==0.1) (3.0.1)
Requirement already satisfied: google-api-core<2dev,>=1.21.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-api-python-client>=1.6.7->tf-models-official->object-detection==0.1) (1.30.0)
Requirement already satisfied: google-auth<2dev,>=1.16.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-api-python-client>=1.6.7->tf-models-official->object-detection==0.1) (1.31.0)
Requirement already satisfied: packaging>=14.3 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-api-core<2dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official->object-detection==0.1) (20.9)
Requirement already satisfied: googleapis-common-protos<2.0dev,>=1.6.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-api-core<2dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official->object-detection==0.1) (1.53.0)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-auth<2dev,>=1.16.0->google-api-python-client>=1.6.7->tf-models-official->object-detection==0.1) (4.2.2)
Requirement already satisfied: google-resumable-media<2.0dev,>=0.6.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-cloud-bigquery>=0.31.0->tf-models-official->object-detection==0.1) (1.3.0)
Requirement already satisfied: google-cloud-core<2.0dev,>=1.4.1 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-cloud-bigquery>=0.31.0->tf-models-official->object-detection==0.1) (1.6.0)
Requirement already satisfied: proto-plus>=1.10.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-cloud-bigquery>=0.31.0->tf-models-official->object-detection==0.1) (1.18.1)
Requirement already satisfied: google-crc32c<2.0dev,>=1.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-resumable-media<2.0dev,>=0.6.0->google-cloud-bigquery>=0.31.0->tf-models-official->object-detection==0.1) (1.1.2)
Requirement already satisfied: cffi>=1.0.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from google-crc32c<2.0dev,>=1.0->google-resumable-media<2.0dev,>=0.6.0->google-cloud-bigquery>=0.31.0->tf-models-official->object-detection==0.1) (1.14.5)
Requirement already satisfied: pycparser in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from cffi>=1.0.0->google-crc32c<2.0dev,>=1.0->google-resumable-media<2.0dev,>=0.6.0->google-cloud-bigquery>=0.31.0->tf-models-official->object-detection==0.1) (2.20)
Requirement already satisfied: tqdm in /Users/AlanZhu/Desktop/OD/TFOD

```

DCourse/tfod/lib/python3.7/site-packages (from kaggle>=1.3.9->tf-models-official->object-detection==0.1) (4.61.0)

Requirement already satisfied: python-slugify in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from kaggle>=1.3.9->tf-models-official->object-detection==0.1) (5.0.2)

Requirement already satisfied: termcolor~=1.1.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (1.1.0)

Requirement already satisfied: opt-einsum~=3.3.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (3.3.0)

Requirement already satisfied: flatbuffers~=1.12.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (1.12)

Requirement already satisfied: tensorboard~=2.5 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (2.5.0)

Requirement already satisfied: wrapt~=1.12.1 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (1.12.1)

Requirement already satisfied: h5py~=3.1.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (3.1.0)

Requirement already satisfied: keras-preprocessing~=1.1.2 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (1.1.2)

Requirement already satisfied: tensorflow-estimator<2.6.0,>=2.5.0rc0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (2.5.0)

Requirement already satisfied: keras-nightly~=2.5.0.dev in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (2.5.0.dev2021032900)

Requirement already satisfied: absl-py~=0.10 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (0.12.0)

Requirement already satisfied: google-pasta~=0.2 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (0.2.0)

Requirement already satisfied: wheel~=0.35 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (0.36.2)

Requirement already satisfied: astunparse~=1.6.3 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (1.6.3)

Requirement already satisfied: gast==0.4.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (0.4.0)

Requirement already satisfied: cached-property in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from h5py~=3.1.0->tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (1.5.2)

Requirement already satisfied: werkzeug>=0.11.15 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (2.0.1)

Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow>=2.5.0->tf-models-official->object-


```

detection==0.1) (1.8.0)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0
in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-pack
ages (from tensorboard~=2.5->tensorflow>=2.5.0->tf-models-official->
object-detection==0.1) (0.6.1)
Requirement already satisfied: markdown>=2.6.8 in /Users/AlanZhu/Des
ktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorboar
d~=2.5->tensorflow>=2.5.0->tf-models-official->object-detection==0.
1) (3.3.4)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /
Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages
(from tensorboard~=2.5->tensorflow>=2.5.0->tf-models-official->objec
t-detection==0.1) (0.4.4)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /Users/Al
anZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from g
oogle-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.5->tensorflow>=2.5.0
->tf-models-official->object-detection==0.1) (1.3.0)
Requirement already satisfied: importlib-metadata in /Users/AlanZhu/
Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from markdow
n>=2.6.8->tensorboard~=2.5->tensorflow>=2.5.0->tf-models-official->o
bject-detection==0.1) (4.5.0)
Requirement already satisfied: oauthlib>=3.0.0 in /Users/AlanZhu/Des
ktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from requests-o
authlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.5->
tensorflow>=2.5.0->tf-models-official->object-detection==0.1) (3.1.
1)
Requirement already satisfied: dm-tree~=0.1.1 in /Users/AlanZhu/Desk
top/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow-
model-optimization>=0.4.1->tf-models-official->object-detection==0.
1) (0.1.6)
Requirement already satisfied: zipp>=0.5 in /Users/AlanZhu/Desktop/O
D/TFODCourse/tfod/lib/python3.7/site-packages (from importlib-metada
ta->markdown>=2.6.8->tensorboard~=2.5->tensorflow>=2.5.0->tf-models-
official->object-detection==0.1) (3.4.1)
Requirement already satisfied: text-unidecode>=1.3 in /Users/AlanZh
u/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from pytho
n-slugify->kaggle>=1.3.9->tf-models-official->object-detection==0.1)
(1.3)
Requirement already satisfied: portalocker==2.0.0 in /Users/AlanZhu/
Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from sacrebl
eu->tf-models-official->object-detection==0.1) (2.0.0)
Requirement already satisfied: scikit-learn>=0.21.3 in /Users/AlanZh
u/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from sequeval->tf-models-official->object-detection==0.1) (0.24.2)
Requirement already satisfied: threadpoolctl>=2.0.0 in /Users/AlanZh
u/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from sciki
t-learn>=0.21.3->sequeval->tf-models-official->object-detection==0.1)
(2.1.0)
Requirement already satisfied: joblib>=0.11 in /Users/AlanZhu/Deskt
op/OD/TFODCourse/tfod/lib/python3.7/site-packages (from scikit-learn>
=0.21.3->sequeval->tf-models-official->object-detection==0.1) (1.0.1)
Requirement already satisfied: typeguard>=2.7 in /Users/AlanZhu/Desk
top/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow-
addons->tf-models-official->object-detection==0.1) (2.12.1)
Requirement already satisfied: promise in /Users/AlanZhu/Desktop/OD/
TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow-dataset
s->tf-models-official->object-detection==0.1) (2.3)
Requirement already satisfied: tensorflow-metadata in /Users/AlanZh
u/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tenso
rflow-datasets->tf-models-official->object-detection==0.1) (1.0.0)
Requirement already satisfied: importlib-resources in /Users/AlanZh

```

```
u/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow-datasets->tf-models-official->object-detection==0.1) (5.1.4)
Requirement already satisfied: attrs>=18.1.0 in /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages (from tensorflow-datasets->tf-models-official->object-detection==0.1) (21.2.0)
Building wheels for collected packages: object-detection
  Building wheel for object-detection (setup.py) ... done
  Created wheel for object-detection: filename=object_detection-0.1-py3-none-any.whl size=1653901 sha256=381eeaa0fcd3dd99e780765b440e4a77a2c78a016533f79101101cc0d57e6e58
  Stored in directory: /private/var/folders/19/gg6zw32s2p14dqb6n0wj9t80000gn/T/pip-ephem-wheel-cache-26577jml/wheels/fc/50/ad/ae58df98561ad0bcd11f51ead915c0da8682eb384012fb0520
Successfully built object-detection
Installing collected packages: opencv-python-headless, object-detection
  Attempting uninstall: object-detection
    Found existing installation: object-detection 0.1
    Uninstalling object-detection-0.1:
      Successfully uninstalled object-detection-0.1
Successfully installed object-detection-0.1 opencv-python-headless-4.5.1.48
```

In [12]:

```
#Check if all packages are installed
VERIFICATION_SCRIPT = os.path.join(paths['APIMODEL_PATH'], 'research', 'object_d
etection', 'builders', 'model_builder_tf2_test.py')
# Verify Installation
!python {VERIFICATION_SCRIPT}
```

Running tests under Python 3.7.1: /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/bin/python

```
[ RUN          ] ModelBuilderTF2Test.test_create_center_net_deepmac
2021-06-13 02:01:16.744296: I tensorflow/core/platform/cpu_feature_guard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations:  AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_detection/builders/model_builder.py:1085: DeprecationWarning: The 'warn' function is deprecated, use 'warning' instead
  logging.warn(('Building experimental DeepMAC meta-arch.'
W0613 02:01:17.029080 4616005056 model_builder.py:1085] Building experimental DeepMAC meta-arch. Some features may be omitted.
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_center_net_deepmac): 0.6s
I0613 02:01:17.338151 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_create_center_net_deepmac): 0.6s
[          OK ] ModelBuilderTF2Test.test_create_center_net_deepmac
[ RUN          ] ModelBuilderTF2Test.test_create_center_net_model0 (customize_head_params=True)
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_center_net_model0 (customize_head_params=True)): 0.87s
I0613 02:01:18.213351 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_create_center_net_model0 (customize_head_params=True)): 0.87s
[          OK ] ModelBuilderTF2Test.test_create_center_net_model0 (customize_head_params=True)
[ RUN          ] ModelBuilderTF2Test.test_create_center_net_model1 (customize_head_params=False)
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_center_net_model1 (customize_head_params=False)): 0.32s
I0613 02:01:18.529379 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_create_center_net_model1 (customize_head_params=False)): 0.32s
[          OK ] ModelBuilderTF2Test.test_create_center_net_model1 (customize_head_params=False)
[ RUN          ] ModelBuilderTF2Test.test_create_center_net_model_from_keypoints
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_center_net_model_from_keypoints): 0.29s
I0613 02:01:18.824751 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_create_center_net_model_from_keypoints): 0.29s
[          OK ] ModelBuilderTF2Test.test_create_center_net_model_from_keypoints
[ RUN          ] ModelBuilderTF2Test.test_create_center_net_model_mobilenet
WARNING:tensorflow:`input_shape` is undefined or non-square, or `rows` is not in [96, 128, 160, 192, 224]. Weights for input shape (224, 224) will be loaded as the default.
W0613 02:01:18.827591 4616005056 mobilenet_v2.py:296] `input_shape` is undefined or non-square, or `rows` is not in [96, 128, 160, 192, 224]. Weights for input shape (224, 224) will be loaded as the default.
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_center_net_model_mobilenet): 2.43s
I0613 02:01:21.254235 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_create_center_net_model_mobilenet): 2.43s
[          OK ] ModelBuilderTF2Test.test_create_center_net_model_mobilenet
```

```

net
[ RUN          ] ModelBuilderTF2Test.test_create_experimental_model
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_experi
mental_model): 0.0s
I0613 02:01:21.255388 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_experimental_model): 0.0s
[          OK ] ModelBuilderTF2Test.test_create_experimental_model
[ RUN          ] ModelBuilderTF2Test.test_create_faster_rcnn_from_config
_with_crop_feature0 (True)
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_faster
_rcnn_from_config_with_crop_feature0 (True)): 0.03s
I0613 02:01:21.282669 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_faster_rcnn_from_config_with_crop_feat
ure0 (True)): 0.03s
[          OK ] ModelBuilderTF2Test.test_create_faster_rcnn_from_config
_with_crop_feature0 (True)
[ RUN          ] ModelBuilderTF2Test.test_create_faster_rcnn_from_config
_with_crop_feature1 (False)
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_faster
_rcnn_from_config_with_crop_feature1 (False)): 0.02s
I0613 02:01:21.300536 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_faster_rcnn_from_config_with_crop_feat
ure1 (False)): 0.02s
[          OK ] ModelBuilderTF2Test.test_create_faster_rcnn_from_config
_with_crop_feature1 (False)
[ RUN          ] ModelBuilderTF2Test.test_create_faster_rcnn_model_from_
config_with_example_miner
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_faster
_rcnn_model_from_config_with_example_miner): 0.02s
I0613 02:01:21.321973 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_faster_rcnn_model_from_config_with_exa
mple_miner): 0.02s
[          OK ] ModelBuilderTF2Test.test_create_faster_rcnn_model_from_
config_with_example_miner
[ RUN          ] ModelBuilderTF2Test.test_create_faster_rcnn_models_from
_config_faster_rcnn_with_matmul
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_faster
_rcnn_models_from_config_faster_rcnn_with_matmul): 0.12s
I0613 02:01:21.440325 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_faster_rcnn_models_from_config_faster_
rcnn_with_matmul): 0.12s
[          OK ] ModelBuilderTF2Test.test_create_faster_rcnn_models_from
_config_faster_rcnn_with_matmul
[ RUN          ] ModelBuilderTF2Test.test_create_faster_rcnn_models_from
_config_faster_rcnn_without_matmul
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_faster
_rcnn_models_from_config_faster_rcnn_without_matmul): 0.11s
I0613 02:01:21.553331 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_faster_rcnn_models_from_config_faster_
rcnn_without_matmul): 0.11s
[          OK ] ModelBuilderTF2Test.test_create_faster_rcnn_models_from
_config_faster_rcnn_without_matmul
[ RUN          ] ModelBuilderTF2Test.test_create_faster_rcnn_models_from
_config_mask_rcnn_with_matmul
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_faster
_rcnn_models_from_config_mask_rcnn_with_matmul): 0.14s
I0613 02:01:21.692698 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_faster_rcnn_models_from_config_mask_rc
nn_with_matmul): 0.14s
[          OK ] ModelBuilderTF2Test.test_create_faster_rcnn_models_from
_config_mask_rcnn_with_matmul

```

```
[ RUN      ] ModelBuilderTF2Test.test_create_faster_rcnn_models_from
_config_mask_rcnn_without_matmul
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_faster
_rcnn_models_from_config_mask_rcnn_without_matmul): 0.14s
I0613 02:01:21.829358 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_faster_rcnn_models_from_config_mask_rc
nn_without_matmul): 0.14s
[          OK ] ModelBuilderTF2Test.test_create_faster_rcnn_models_from
_config_mask_rcnn_without_matmul
[ RUN      ] ModelBuilderTF2Test.test_create_rfcn_model_from_config
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_rfcn_m
odel_from_config): 0.13s
I0613 02:01:21.959458 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_rfcn_model_from_config): 0.13s
[          OK ] ModelBuilderTF2Test.test_create_rfcn_model_from_config
[ RUN      ] ModelBuilderTF2Test.test_create_ssd_fpn_model_from_conf
ig
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_ssd_fp
n_model_from_config): 0.04s
I0613 02:01:21.998458 4616005056 test_util.py:2103] time(__main__.Mo
delBuilderTF2Test.test_create_ssd_fpn_model_from_config): 0.04s
[          OK ] ModelBuilderTF2Test.test_create_ssd_fpn_model_from_conf
ig
[ RUN      ] ModelBuilderTF2Test.test_create_ssd_models_from_config
I0613 02:01:22.298867 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:143] EfficientDet EfficientNet backbone version: efficientn
et-b0
I0613 02:01:22.299142 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:144] EfficientDet BiFPN num filters: 64
I0613 02:01:22.299326 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:146] EfficientDet BiFPN num iterations: 3
I0613 02:01:22.304075 4616005056 efficientnet_model.py:147] round_fi
lter input=32 output=32
I0613 02:01:22.339871 4616005056 efficientnet_model.py:147] round_fi
lter input=32 output=32
I0613 02:01:22.340050 4616005056 efficientnet_model.py:147] round_fi
lter input=16 output=16
I0613 02:01:22.427748 4616005056 efficientnet_model.py:147] round_fi
lter input=16 output=16
I0613 02:01:22.427901 4616005056 efficientnet_model.py:147] round_fi
lter input=24 output=24
I0613 02:01:22.616461 4616005056 efficientnet_model.py:147] round_fi
lter input=24 output=24
I0613 02:01:22.616616 4616005056 efficientnet_model.py:147] round_fi
lter input=40 output=40
I0613 02:01:22.801039 4616005056 efficientnet_model.py:147] round_fi
lter input=40 output=40
I0613 02:01:22.801180 4616005056 efficientnet_model.py:147] round_fi
lter input=80 output=80
I0613 02:01:23.086566 4616005056 efficientnet_model.py:147] round_fi
lter input=80 output=80
I0613 02:01:23.086720 4616005056 efficientnet_model.py:147] round_fi
lter input=112 output=112
I0613 02:01:23.389277 4616005056 efficientnet_model.py:147] round_fi
lter input=112 output=112
I0613 02:01:23.389440 4616005056 efficientnet_model.py:147] round_fi
lter input=192 output=192
I0613 02:01:23.952368 4616005056 efficientnet_model.py:147] round_fi
lter input=192 output=192
I0613 02:01:23.952507 4616005056 efficientnet_model.py:147] round_fi
lter input=320 output=320
```

```
I0613 02:01:24.064580 4616005056 efficientnet_model.py:147] round_filter input=1280 output=1280
I0613 02:01:24.119758 4616005056 efficientnet_model.py:458] Building model efficientnet with params ModelConfig(width_coefficient=1.0, depth_coefficient=1.0, resolution=224, dropout_rate=0.2, blocks=(BlockConfig(input_filters=32, output_filters=16, kernel_size=3, num_repeat=1, expand_ratio=1, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=16, output_filters=24, kernel_size=3, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=24, output_filters=40, kernel_size=5, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=40, output_filters=80, kernel_size=3, num_repeat=3, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=80, output_filters=112, kernel_size=5, num_repeat=3, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=112, output_filters=192, kernel_size=5, num_repeat=4, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=192, output_filters=320, kernel_size=3, num_repeat=1, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise')), stem_base_filters=32, top_base_filters=1280, activation='simple_swish', batch_norm='default', bn_momentum=0.99, bn_epsilon=0.001, weight_decay=5e-06, drop_connect_rate=0.2, depth_divisor=8, min_depth=None, use_se=True, input_channels=3, num_classes=1000, model_name='efficientnet', rescale_input=False, data_format='channels_last', dtype='float32')
I0613 02:01:24.185101 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:143] EfficientDet EfficientNet backbone version: efficientnet-b1
I0613 02:01:24.185246 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:144] EfficientDet BiFPN num filters: 88
I0613 02:01:24.185312 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:146] EfficientDet BiFPN num iterations: 4
I0613 02:01:24.187242 4616005056 efficientnet_model.py:147] round_filter input=32 output=32
I0613 02:01:24.204602 4616005056 efficientnet_model.py:147] round_filter input=32 output=32
I0613 02:01:24.204733 4616005056 efficientnet_model.py:147] round_filter input=16 output=16
I0613 02:01:24.365948 4616005056 efficientnet_model.py:147] round_filter input=16 output=16
I0613 02:01:24.366236 4616005056 efficientnet_model.py:147] round_filter input=24 output=24
I0613 02:01:24.651568 4616005056 efficientnet_model.py:147] round_filter input=24 output=24
I0613 02:01:24.651722 4616005056 efficientnet_model.py:147] round_filter input=40 output=40
I0613 02:01:24.931911 4616005056 efficientnet_model.py:147] round_filter input=40 output=40
I0613 02:01:24.932101 4616005056 efficientnet_model.py:147] round_filter input=80 output=80
I0613 02:01:25.329946 4616005056 efficientnet_model.py:147] round_filter input=80 output=80
I0613 02:01:25.330103 4616005056 efficientnet_model.py:147] round_filter input=112 output=112
I0613 02:01:25.714420 4616005056 efficientnet_model.py:147] round_filter input=112 output=112
I0613 02:01:25.714608 4616005056 efficientnet_model.py:147] round_filter
```

```

lter input=192 output=192
I0613 02:01:26.218254 4616005056 efficientnet_model.py:147] round_fi
lter input=192 output=192
I0613 02:01:26.218409 4616005056 efficientnet_model.py:147] round_fi
lter input=320 output=320
I0613 02:01:26.434206 4616005056 efficientnet_model.py:147] round_fi
lter input=1280 output=1280
I0613 02:01:26.483632 4616005056 efficientnet_model.py:458] Building
model efficientnet with params ModelConfig(width_coefficient=1.0, de
pth_coefficient=1.1, resolution=240, dropout_rate=0.2, blocks=(Block
Config(input_filters=32, output_filters=16, kernel_size=3, num_repea
t=1, expand_ratio=1, strides=(1, 1), se_ratio=0.25, id_skip=True, fu
sed_conv=False, conv_type='depthwise'), BlockConfig(input_filters=1
6, output_filters=24, kernel_size=3, num_repeat=2, expand_ratio=6, s
trides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_t
ype='depthwise'), BlockConfig(input_filters=24, output_filters=40, k
ernel_size=5, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio
=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), Block
Config(input_filters=40, output_filters=80, kernel_size=3, num_repea
t=3, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fu
sed_conv=False, conv_type='depthwise'), BlockConfig(input_filters=8
0, output_filters=112, kernel_size=5, num_repeat=3, expand_ratio=6,
strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_
type='depthwise'), BlockConfig(input_filters=112, output_filters=19
2, kernel_size=5, num_repeat=4, expand_ratio=6, strides=(2, 2), se_r
atio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), B
lockConfig(input_filters=192, output_filters=320, kernel_size=3, num
_repeat=1, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=Tr
ue, fused_conv=False, conv_type='depthwise')), stem_base_filters=32,
top_base_filters=1280, activation='simple_swish', batch_norm='defaul
t', bn_momentum=0.99, bn_epsilon=0.001, weight_decay=5e-06, drop_con
nect_rate=0.2, depth_divisor=8, min_depth=None, use_se=True, input_c
hannels=3, num_classes=1000, model_name='efficientnet', rescale_inpu
t=False, data_format='channels_last', dtype='float32')
I0613 02:01:26.561655 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:143] EfficientDet EfficientNet backbone version: efficientn
et-b2
I0613 02:01:26.561805 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:144] EfficientDet BiFPN num filters: 112
I0613 02:01:26.561880 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:146] EfficientDet BiFPN num iterations: 5
I0613 02:01:26.564186 4616005056 efficientnet_model.py:147] round_fi
lter input=32 output=32
I0613 02:01:26.581491 4616005056 efficientnet_model.py:147] round_fi
lter input=32 output=32
I0613 02:01:26.581650 4616005056 efficientnet_model.py:147] round_fi
lter input=16 output=16
I0613 02:01:26.725986 4616005056 efficientnet_model.py:147] round_fi
lter input=16 output=16
I0613 02:01:26.726154 4616005056 efficientnet_model.py:147] round_fi
lter input=24 output=24
I0613 02:01:27.041943 4616005056 efficientnet_model.py:147] round_fi
lter input=24 output=24
I0613 02:01:27.042106 4616005056 efficientnet_model.py:147] round_fi
lter input=40 output=48
I0613 02:01:27.330024 4616005056 efficientnet_model.py:147] round_fi
lter input=40 output=48
I0613 02:01:27.330243 4616005056 efficientnet_model.py:147] round_fi
lter input=80 output=88
I0613 02:01:27.717007 4616005056 efficientnet_model.py:147] round_fi
lter input=80 output=88

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I0613 02:01:27.717158 4616005056 efficientnet_model.py:147] round_filter input=112 output=120
I0613 02:01:28.252531 4616005056 efficientnet_model.py:147] round_filter input=112 output=120
I0613 02:01:28.252687 4616005056 efficientnet_model.py:147] round_filter input=192 output=208
I0613 02:01:28.790245 4616005056 efficientnet_model.py:147] round_filter input=192 output=208
I0613 02:01:28.790408 4616005056 efficientnet_model.py:147] round_filter input=320 output=352
I0613 02:01:29.020016 4616005056 efficientnet_model.py:147] round_filter input=1280 output=1408
I0613 02:01:29.079107 4616005056 efficientnet_model.py:458] Building model efficientnet with params ModelConfig(width_coefficient=1.1, depth_coefficient=1.2, resolution=260, dropout_rate=0.3, blocks=(BlockConfig(input_filters=32, output_filters=16, kernel_size=3, num_repeat=1, expand_ratio=1, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=16, output_filters=24, kernel_size=3, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=24, output_filters=40, kernel_size=5, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=40, output_filters=80, kernel_size=3, num_repeat=3, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=80, output_filters=112, kernel_size=5, num_repeat=3, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=112, output_filters=192, kernel_size=5, num_repeat=4, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=192, output_filters=320, kernel_size=3, num_repeat=1, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise')), stem_base_filters=32, top_base_filters=1280, activation='simple_swish', batch_norm='default', bn_momentum=0.99, bn_epsilon=0.001, weight_decay=5e-06, drop_connect_rate=0.2, depth_divisor=8, min_depth=None, use_se=True, input_channels=3, num_classes=1000, model_name='efficientnet', rescale_input=False, data_format='channels_last', dtype='float32')
I0613 02:01:29.154798 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:143] EfficientDet EfficientNet backbone version: efficientnet-b3
I0613 02:01:29.155093 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:144] EfficientDet BiFPN num filters: 160
I0613 02:01:29.155282 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:146] EfficientDet BiFPN num iterations: 6
I0613 02:01:29.157223 4616005056 efficientnet_model.py:147] round_filter input=32 output=40
I0613 02:01:29.177399 4616005056 efficientnet_model.py:147] round_filter input=32 output=40
I0613 02:01:29.177536 4616005056 efficientnet_model.py:147] round_filter input=16 output=24
I0613 02:01:29.323952 4616005056 efficientnet_model.py:147] round_filter input=16 output=24
I0613 02:01:29.324103 4616005056 efficientnet_model.py:147] round_filter input=24 output=32
I0613 02:01:29.608937 4616005056 efficientnet_model.py:147] round_filter input=24 output=32
I0613 02:01:29.609102 4616005056 efficientnet_model.py:147] round_filter input=40 output=48
I0613 02:01:29.896487 4616005056 efficientnet_model.py:147] round_filter
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lter input=40 output=48
I0613 02:01:29.896651 4616005056 efficientnet_model.py:147] round_fi
lter input=80 output=96
I0613 02:01:30.379721 4616005056 efficientnet_model.py:147] round_fi
lter input=80 output=96
I0613 02:01:30.379882 4616005056 efficientnet_model.py:147] round_fi
lter input=112 output=136
I0613 02:01:30.870960 4616005056 efficientnet_model.py:147] round_fi
lter input=112 output=136
I0613 02:01:30.871174 4616005056 efficientnet_model.py:147] round_fi
lter input=192 output=232
I0613 02:01:31.527221 4616005056 efficientnet_model.py:147] round_fi
lter input=192 output=232
I0613 02:01:31.527446 4616005056 efficientnet_model.py:147] round_fi
lter input=320 output=384
I0613 02:01:31.793444 4616005056 efficientnet_model.py:147] round_fi
lter input=1280 output=1536
I0613 02:01:31.852333 4616005056 efficientnet_model.py:458] Building
model efficientnet with params ModelConfig(width_coefficient=1.2, de
pth_coefficient=1.4, resolution=300, dropout_rate=0.3, blocks=(Block
Config(input_filters=32, output_filters=16, kernel_size=3, num_repea
t=1, expand_ratio=1, strides=(1, 1), se_ratio=0.25, id_skip=True, fu
sed_conv=False, conv_type='depthwise'), BlockConfig(input_filters=1
6, output_filters=24, kernel_size=3, num_repeat=2, expand_ratio=6, s
trides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_t
ype='depthwise'), BlockConfig(input_filters=24, output_filters=40, k
ernel_size=5, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio
=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), Block
Config(input_filters=40, output_filters=80, kernel_size=3, num_repea
t=3, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fu
sed_conv=False, conv_type='depthwise'), BlockConfig(input_filters=8
0, output_filters=112, kernel_size=5, num_repeat=3, expand_ratio=6,
strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_
type='depthwise'), BlockConfig(input_filters=112, output_filters=19
2, kernel_size=5, num_repeat=4, expand_ratio=6, strides=(2, 2), se_r
atio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), B
lockConfig(input_filters=192, output_filters=320, kernel_size=3, num
_repeat=1, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=Tr
ue, fused_conv=False, conv_type='depthwise')), stem_base_filters=32,
top_base_filters=1280, activation='simple_swish', batch_norm='defaul
t', bn_momentum=0.99, bn_epsilon=0.001, weight_decay=5e-06, drop_con
nect_rate=0.2, depth_divisor=8, min_depth=None, use_se=True, input_c
hannels=3, num_classes=1000, model_name='efficientnet', rescale_inpu
t=False, data_format='channels_last', dtype='float32')
I0613 02:01:31.936783 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:143] EfficientDet EfficientNet backbone version: efficientn
et-b4
I0613 02:01:31.936938 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:144] EfficientDet BiFPN num filters: 224
I0613 02:01:31.937031 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:146] EfficientDet BiFPN num iterations: 7
I0613 02:01:31.938899 4616005056 efficientnet_model.py:147] round_fi
lter input=32 output=48
I0613 02:01:31.958512 4616005056 efficientnet_model.py:147] round_fi
lter input=32 output=48
I0613 02:01:31.958656 4616005056 efficientnet_model.py:147] round_fi
lter input=16 output=24
I0613 02:01:32.113520 4616005056 efficientnet_model.py:147] round_fi
lter input=16 output=24
I0613 02:01:32.113676 4616005056 efficientnet_model.py:147] round_fi
lter input=24 output=32

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I0613 02:01:32.502330 4616005056 efficientnet_model.py:147] round_filter input=24 output=32
I0613 02:01:32.502543 4616005056 efficientnet_model.py:147] round_filter input=40 output=56
I0613 02:01:33.070015 4616005056 efficientnet_model.py:147] round_filter input=40 output=56
I0613 02:01:33.070168 4616005056 efficientnet_model.py:147] round_filter input=80 output=112
I0613 02:01:33.650449 4616005056 efficientnet_model.py:147] round_filter input=80 output=112
I0613 02:01:33.650652 4616005056 efficientnet_model.py:147] round_filter input=112 output=160
I0613 02:01:34.258049 4616005056 efficientnet_model.py:147] round_filter input=112 output=160
I0613 02:01:34.258205 4616005056 efficientnet_model.py:147] round_filter input=192 output=272
I0613 02:01:35.144610 4616005056 efficientnet_model.py:147] round_filter input=192 output=272
I0613 02:01:35.144817 4616005056 efficientnet_model.py:147] round_filter input=320 output=448
I0613 02:01:35.392236 4616005056 efficientnet_model.py:147] round_filter input=1280 output=1792
I0613 02:01:35.455024 4616005056 efficientnet_model.py:458] Building model efficientnet with params ModelConfig(width_coefficient=1.4, depth_coefficient=1.8, resolution=380, dropout_rate=0.4, blocks=(BlockConfig(input_filters=32, output_filters=16, kernel_size=3, num_repeat=1, expand_ratio=1, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=16, output_filters=24, kernel_size=3, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=24, output_filters=40, kernel_size=5, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=40, output_filters=80, kernel_size=3, num_repeat=3, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=80, output_filters=112, kernel_size=5, num_repeat=3, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=112, output_filters=192, kernel_size=5, num_repeat=4, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=192, output_filters=320, kernel_size=3, num_repeat=1, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise')), stem_base_filters=32, top_base_filters=1280, activation='simple_swish', batch_norm='default', bn_momentum=0.99, bn_epsilon=0.001, weight_decay=5e-06, drop_connect_rate=0.2, depth_divisor=8, min_depth=None, use_se=True, input_channels=3, num_classes=1000, model_name='efficientnet', rescale_input=False, data_format='channels_last', dtype='float32')
I0613 02:01:35.550128 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:143] EfficientDet EfficientNet backbone version: efficientnet-b5
I0613 02:01:35.550287 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:144] EfficientDet BiFPN num filters: 288
I0613 02:01:35.550378 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:146] EfficientDet BiFPN num iterations: 7
I0613 02:01:35.552749 4616005056 efficientnet_model.py:147] round_filter input=32 output=48
I0613 02:01:35.570749 4616005056 efficientnet_model.py:147] round_filter input=32 output=48
I0613 02:01:35.570895 4616005056 efficientnet_model.py:147] round_filter
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lter input=16 output=24
I0613 02:01:35.796465 4616005056 efficientnet_model.py:147] round_fi
lter input=16 output=24
I0613 02:01:35.796602 4616005056 efficientnet_model.py:147] round_fi
lter input=24 output=40
I0613 02:01:36.287152 4616005056 efficientnet_model.py:147] round_fi
lter input=24 output=40
I0613 02:01:36.287349 4616005056 efficientnet_model.py:147] round_fi
lter input=40 output=64
I0613 02:01:36.758639 4616005056 efficientnet_model.py:147] round_fi
lter input=40 output=64
I0613 02:01:36.758889 4616005056 efficientnet_model.py:147] round_fi
lter input=80 output=128
I0613 02:01:37.440943 4616005056 efficientnet_model.py:147] round_fi
lter input=80 output=128
I0613 02:01:37.441103 4616005056 efficientnet_model.py:147] round_fi
lter input=112 output=176
I0613 02:01:38.303695 4616005056 efficientnet_model.py:147] round_fi
lter input=112 output=176
I0613 02:01:38.303904 4616005056 efficientnet_model.py:147] round_fi
lter input=192 output=304
I0613 02:01:39.408445 4616005056 efficientnet_model.py:147] round_fi
lter input=192 output=304
I0613 02:01:39.408582 4616005056 efficientnet_model.py:147] round_fi
lter input=320 output=512
I0613 02:01:39.835146 4616005056 efficientnet_model.py:147] round_fi
lter input=1280 output=2048
I0613 02:01:39.904055 4616005056 efficientnet_model.py:458] Building
model efficientnet with params ModelConfig(width_coefficient=1.6, de
pth_coefficient=2.2, resolution=456, dropout_rate=0.4, blocks=(Block
Config(input_filters=32, output_filters=16, kernel_size=3, num_repea
t=1, expand_ratio=1, strides=(1, 1), se_ratio=0.25, id_skip=True, fu
sed_conv=False, conv_type='depthwise'), BlockConfig(input_filters=1
6, output_filters=24, kernel_size=3, num_repeat=2, expand_ratio=6, s
trides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_t
ype='depthwise'), BlockConfig(input_filters=24, output_filters=40, k
ernel_size=5, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio
=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), Block
Config(input_filters=40, output_filters=80, kernel_size=3, num_repea
t=3, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fu
sed_conv=False, conv_type='depthwise'), BlockConfig(input_filters=8
0, output_filters=112, kernel_size=5, num_repeat=3, expand_ratio=6,
strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_
type='depthwise'), BlockConfig(input_filters=112, output_filters=19
2, kernel_size=5, num_repeat=4, expand_ratio=6, strides=(2, 2), se_r
atio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), B
lockConfig(input_filters=192, output_filters=320, kernel_size=3, num
_repeat=1, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=Tr
ue, fused_conv=False, conv_type='depthwise')), stem_base_filters=32,
top_base_filters=1280, activation='simple_swish', batch_norm='defaul
t', bn_momentum=0.99, bn_epsilon=0.001, weight_decay=5e-06, drop_con
nect_rate=0.2, depth_divisor=8, min_depth=None, use_se=True, input_c
hannels=3, num_classes=1000, model_name='efficientnet', rescale_inpu
t=False, data_format='channels_last', dtype='float32')
I0613 02:01:40.019464 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:143] EfficientDet EfficientNet backbone version: efficientn
et-b6
I0613 02:01:40.020078 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:144] EfficientDet BiFPN num filters: 384
I0613 02:01:40.020215 4616005056 ssd_efficientnet_bifpn_feature_extr
actor.py:146] EfficientDet BiFPN num iterations: 8

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I0613 02:01:40.023970 4616005056 efficientnet_model.py:147] round_filter input=32 output=56
I0613 02:01:40.041249 4616005056 efficientnet_model.py:147] round_filter input=32 output=56
I0613 02:01:40.041408 4616005056 efficientnet_model.py:147] round_filter input=16 output=32
I0613 02:01:40.303504 4616005056 efficientnet_model.py:147] round_filter input=16 output=32
I0613 02:01:40.303817 4616005056 efficientnet_model.py:147] round_filter input=24 output=40
I0613 02:01:40.906760 4616005056 efficientnet_model.py:147] round_filter input=24 output=40
I0613 02:01:40.906929 4616005056 efficientnet_model.py:147] round_filter input=40 output=72
I0613 02:01:41.477567 4616005056 efficientnet_model.py:147] round_filter input=40 output=72
I0613 02:01:41.477751 4616005056 efficientnet_model.py:147] round_filter input=80 output=144
I0613 02:01:42.310106 4616005056 efficientnet_model.py:147] round_filter input=80 output=144
I0613 02:01:42.310292 4616005056 efficientnet_model.py:147] round_filter input=112 output=200
I0613 02:01:43.171155 4616005056 efficientnet_model.py:147] round_filter input=112 output=200
I0613 02:01:43.171298 4616005056 efficientnet_model.py:147] round_filter input=192 output=344
I0613 02:01:44.718368 4616005056 efficientnet_model.py:147] round_filter input=192 output=344
I0613 02:01:44.718539 4616005056 efficientnet_model.py:147] round_filter input=320 output=576
I0613 02:01:45.174061 4616005056 efficientnet_model.py:147] round_filter input=1280 output=2304
I0613 02:01:45.252622 4616005056 efficientnet_model.py:458] Building model efficientnet with params ModelConfig(width_coefficient=1.8, depth_coefficient=2.6, resolution=528, dropout_rate=0.5, blocks=(BlockConfig(input_filters=32, output_filters=16, kernel_size=3, num_repeat=1, expand_ratio=1, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=16, output_filters=24, kernel_size=3, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=24, output_filters=40, kernel_size=5, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=40, output_filters=80, kernel_size=3, num_repeat=3, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=80, output_filters=112, kernel_size=5, num_repeat=3, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=112, output_filters=192, kernel_size=5, num_repeat=4, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=192, output_filters=320, kernel_size=3, num_repeat=1, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise')), stem_base_filters=32, top_base_filters=1280, activation='simple_swish', batch_norm='default', bn_momentum=0.99, bn_epsilon=0.001, weight_decay=5e-06, drop_connect_rate=0.2, depth_divisor=8, min_depth=None, use_se=True, input_channels=3, num_classes=1000, model_name='efficientnet', rescale_input=False, data_format='channels_last', dtype='float32')
I0613 02:01:45.379987 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:143] EfficientDet EfficientNet backbone version: efficientn
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et-b7

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I0613 02:01:45.380122 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:144] EfficientDet BiFPN num filters: 384
I0613 02:01:45.380184 4616005056 ssd_efficientnet_bifpn_feature_extractor.py:146] EfficientDet BiFPN num iterations: 8
I0613 02:01:45.382045 4616005056 efficientnet_model.py:147] round_filter input=32 output=64
I0613 02:01:45.402049 4616005056 efficientnet_model.py:147] round_filter input=32 output=64
I0613 02:01:45.402205 4616005056 efficientnet_model.py:147] round_filter input=16 output=32
I0613 02:01:45.704670 4616005056 efficientnet_model.py:147] round_filter input=16 output=32
I0613 02:01:45.704844 4616005056 efficientnet_model.py:147] round_filter input=24 output=48
I0613 02:01:46.384014 4616005056 efficientnet_model.py:147] round_filter input=24 output=48
I0613 02:01:46.384171 4616005056 efficientnet_model.py:147] round_filter input=40 output=80
I0613 02:01:47.091150 4616005056 efficientnet_model.py:147] round_filter input=40 output=80
I0613 02:01:47.091306 4616005056 efficientnet_model.py:147] round_filter input=80 output=160
I0613 02:01:48.138000 4616005056 efficientnet_model.py:147] round_filter input=80 output=160
I0613 02:01:48.138160 4616005056 efficientnet_model.py:147] round_filter input=112 output=224
I0613 02:01:49.191196 4616005056 efficientnet_model.py:147] round_filter input=112 output=224
I0613 02:01:49.191339 4616005056 efficientnet_model.py:147] round_filter input=192 output=384
I0613 02:01:50.877703 4616005056 efficientnet_model.py:147] round_filter input=192 output=384
I0613 02:01:50.877863 4616005056 efficientnet_model.py:147] round_filter input=320 output=640
I0613 02:01:51.793957 4616005056 efficientnet_model.py:147] round_filter input=1280 output=2560
I0613 02:01:51.884837 4616005056 efficientnet_model.py:458] Building model efficientnet with params ModelConfig(width_coefficient=2.0, depth_coefficient=3.1, resolution=600, dropout_rate=0.5, blocks=(BlockConfig(input_filters=32, output_filters=16, kernel_size=3, num_repeat=1, expand_ratio=1, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=16, output_filters=24, kernel_size=3, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=24, output_filters=40, kernel_size=5, num_repeat=2, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=40, output_filters=80, kernel_size=3, num_repeat=3, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=80, output_filters=112, kernel_size=5, num_repeat=3, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=112, output_filters=192, kernel_size=5, num_repeat=4, expand_ratio=6, strides=(2, 2), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise'), BlockConfig(input_filters=192, output_filters=320, kernel_size=3, num_repeat=1, expand_ratio=6, strides=(1, 1), se_ratio=0.25, id_skip=True, fused_conv=False, conv_type='depthwise')), stem_base_filters=32, top_base_filters=1280, activation='simple_swish', batch_norm='default', bn_momentum=0.99, bn_epsilon=0.001, weight_decay=5e-06, drop_con

```

```

nect_rate=0.2, depth_divisor=8, min_depth=None, use_se=True, input_channels=3, num_classes=1000, model_name='efficientnet', rescale_input=False, data_format='channels_last', dtype='float32')
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_ssd_models_from_config): 30.05s
I0613 02:01:52.048502 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_create_ssd_models_from_config): 30.05s
[ 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
I0613 02:01:52.060253 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_invalid_faster_rcnn_batchnorm_update): 0.0s
[ 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
I0613 02:01:52.063068 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_invalid_first_stage_nms_iou_threshold): 0.0s
[ 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
I0613 02:01:52.064218 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_invalid_model_config_proto): 0.0s
[ 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
I0613 02:01:52.066339 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_invalid_second_stage_batch_size): 0.0s
[ 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
I0613 02:01:52.068285 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_unknown_faster_rcnn_feature_extractor): 0.0s
[ 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
I0613 02:01:52.068769 4616005056 test_util.py:2103] 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
I0613 02:01:52.069892 4616005056 test_util.py:2103] time(__main__.ModelBuilderTF2Test.test_unknown_ssd_feature_extractor): 0.0s
[ OK ] ModelBuilderTF2Test.test_unknown_ssd_feature_extractor
-----

```

--

Ran 24 tests in 35.331s

OK (skipped=1)

In [13]:

```
!pip install tensorflow --upgrade  
#!pip install tensorflow-gpu --upgrade #For trainning on GPU
```

Requirement already satisfied: tensorflow in ./tfod/lib/python3.7/site-packages (2.5.0)

Requirement already satisfied: astunparse~=1.6.3 in ./tfod/lib/python3.7/site-packages (from tensorflow) (1.6.3)

Requirement already satisfied: wrapt~=1.12.1 in ./tfod/lib/python3.7/site-packages (from tensorflow) (1.12.1)

Requirement already satisfied: keras-preprocessing~=1.1.2 in ./tfod/lib/python3.7/site-packages (from tensorflow) (1.1.2)

Requirement already satisfied: six~=1.15.0 in ./tfod/lib/python3.7/site-packages (from tensorflow) (1.15.0)

Requirement already satisfied: grpcio~=1.34.0 in ./tfod/lib/python3.7/site-packages (from tensorflow) (1.34.1)

Requirement already satisfied: tensorflow-estimator<2.6.0,>=2.5.0rc0 in ./tfod/lib/python3.7/site-packages (from tensorflow) (2.5.0)

Requirement already satisfied: keras-nightly~=2.5.0.dev in ./tfod/lib/python3.7/site-packages (from tensorflow) (2.5.0.dev2021032900)

Requirement already satisfied: tensorboard~=2.5 in ./tfod/lib/python3.7/site-packages (from tensorflow) (2.5.0)

Requirement already satisfied: google-pasta~=0.2 in ./tfod/lib/python3.7/site-packages (from tensorflow) (0.2.0)

Requirement already satisfied: wheel~=0.35 in ./tfod/lib/python3.7/site-packages (from tensorflow) (0.36.2)

Requirement already satisfied: absl-py~=0.10 in ./tfod/lib/python3.7/site-packages (from tensorflow) (0.12.0)

Requirement already satisfied: h5py~=3.1.0 in ./tfod/lib/python3.7/site-packages (from tensorflow) (3.1.0)

Requirement already satisfied: flatbuffers~=1.12.0 in ./tfod/lib/python3.7/site-packages (from tensorflow) (1.12)

Requirement already satisfied: opt-einsum~=3.3.0 in ./tfod/lib/python3.7/site-packages (from tensorflow) (3.3.0)

Requirement already satisfied: gast==0.4.0 in ./tfod/lib/python3.7/site-packages (from tensorflow) (0.4.0)

Requirement already satisfied: typing-extensions~=3.7.4 in ./tfod/lib/python3.7/site-packages (from tensorflow) (3.7.4.3)

Requirement already satisfied: numpy~=1.19.2 in ./tfod/lib/python3.7/site-packages (from tensorflow) (1.19.5)

Requirement already satisfied: protobuf>=3.9.2 in ./tfod/lib/python3.7/site-packages (from tensorflow) (3.17.3)

Requirement already satisfied: termcolor~=1.1.0 in ./tfod/lib/python3.7/site-packages (from tensorflow) (1.1.0)

Requirement already satisfied: cached-property in ./tfod/lib/python3.7/site-packages (from h5py~=3.1.0->tensorflow) (1.5.2)

Requirement already satisfied: werkzeug>=0.11.15 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow) (2.0.1)

Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow) (1.8.0)

Requirement already satisfied: setuptools>=41.0.0 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow) (57.0.0)

Requirement already satisfied: google-auth<2,>=1.6.3 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow) (1.31.0)

Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow) (0.6.1)

Requirement already satisfied: requests<3,>=2.21.0 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow) (2.25.1)

Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow) (0.4.4)

Requirement already satisfied: markdown>=2.6.8 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow) (3.3.4)

Requirement already satisfied: pyasn1-modules>=0.2.1 in ./tfod/lib/python3.7/site-packages (from google-auth<2,>=1.6.3->tensorboard~=2.5->tensorflow) (0.2.8)

Requirement already satisfied: rsa<5,>=3.1.4 in ./tfod/lib/python3.7/site-packages (from google-auth<2,>=1.6.3->tensorboard~=2.5->tensorflow) (4.7.2)

Requirement already satisfied: cachetools<5.0,>=2.0.0 in ./tfod/lib/python3.7/site-packages (from google-auth<2,>=1.6.3->tensorboard~=2.5->tensorflow) (4.2.2)

Requirement already satisfied: requests-oauthlib>=0.7.0 in ./tfod/lib/python3.7/site-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.5->tensorflow) (1.3.0)

Requirement already satisfied: importlib-metadata in ./tfod/lib/python3.7/site-packages (from markdown>=2.6.8->tensorboard~=2.5->tensorflow) (4.5.0)

Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in ./tfod/lib/python3.7/site-packages (from pyasn1-modules>=0.2.1->google-auth<2,>=1.6.3->tensorboard~=2.5->tensorflow) (0.4.8)

Requirement already satisfied: certifi>=2017.4.17 in ./tfod/lib/python3.7/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow) (2021.5.30)

Requirement already satisfied: idna<3,>=2.5 in ./tfod/lib/python3.7/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow) (2.10)

Requirement already satisfied: chardet<5,>=3.0.2 in ./tfod/lib/python3.7/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow) (4.0.0)

Requirement already satisfied: urllib3<1.27,>=1.21.1 in ./tfod/lib/python3.7/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow) (1.26.5)

Requirement already satisfied: oauthlib>=3.0.0 in ./tfod/lib/python3.7/site-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.5->tensorflow) (3.1.1)

Requirement already satisfied: zipp>=0.5 in ./tfod/lib/python3.7/site-packages (from importlib-metadata->markdown>=2.6.8->tensorboard~=2.5->tensorflow) (3.4.1)

In [14]:

```
!pip uninstall protobuf matplotlib -y  
!pip install protobuf matplotlib==3.2
```

```
Found existing installation: protobuf 3.17.3  
Uninstalling protobuf-3.17.3:  
  Successfully uninstalled protobuf-3.17.3  
Found existing installation: matplotlib 3.2.0  
Uninstalling matplotlib-3.2.0:  
  Successfully uninstalled matplotlib-3.2.0  
Collecting protobuf  
  Using cached protobuf-3.17.3-cp37-cp37m-macosx_10_9_x86_64.whl (1.  
0 MB)  
Collecting matplotlib==3.2  
  Using cached matplotlib-3.2.0-cp37-cp37m-macosx_10_9_x86_64.whl (1  
2.4 MB)  
Requirement already satisfied: cyclер>=0.10 in ./tfod/lib/python3.7/  
site-packages (from matplotlib==3.2) (0.10.0)  
Requirement already satisfied: python-dateutil>=2.1 in ./tfod/lib/py  
thon3.7/site-packages (from matplotlib==3.2) (2.8.1)  
Requirement already satisfied: numpy>=1.11 in ./tfod/lib/python3.7/s  
ite-packages (from matplotlib==3.2) (1.19.5)  
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.  
0.1 in ./tfod/lib/python3.7/site-packages (from matplotlib==3.2) (2.  
4.7)  
Requirement already satisfied: kiwisolver>=1.0.1 in ./tfod/lib/pytho  
n3.7/site-packages (from matplotlib==3.2) (1.3.1)  
Requirement already satisfied: six in ./tfod/lib/python3.7/site-pack  
ages (from cyclер>=0.10->matplotlib==3.2) (1.15.0)  
Installing collected packages: protobuf, matplotlib  
Successfully installed matplotlib-3.2.0 protobuf-3.17.3
```

In [15]:

```
import object_detection
```

In [16]:

```
!pip list
```

Package	Version	Location

absl-py	0.12.0	
apache-beam	2.30.0	
appdirs	1.4.4	
appnope	0.1.2	
astunparse	1.6.3	
attrs	21.2.0	
avro-python3	1.9.1	
backcall	0.2.0	
cached-property	1.5.2	
cachetools	4.2.2	
certifi	2021.5.30	
cffi	1.14.5	
chardet	4.0.0	
contextlib2	0.6.0.post1	
crcmod	1.7	
cycler	0.10.0	
Cython	0.29.23	
decorator	5.0.9	
dill	0.3.1.1	
distlib	0.3.2	
dm-tree	0.1.6	
docopt	0.6.2	
fastavro	1.4.1	
filelock	3.0.12	
flatbuffers	1.12	
future	0.18.2	
gast	0.4.0	
gin-config	0.4.0	
google-api-core	1.30.0	
google-api-python-client	2.8.0	
google-auth	1.31.0	
google-auth-httpplib2	0.1.0	
google-auth-oauthlib	0.4.4	
google-cloud-bigquery	2.20.0	
google-cloud-core	1.6.0	
google-crc32c	1.1.2	
google-pasta	0.2.0	
google-resumable-media	1.3.0	
googleapis-common-protos	1.53.0	
grpcio	1.34.1	
h5py	3.1.0	
hdfs	2.6.0	
httplib2	0.19.1	
idna	2.10	
importlib-metadata	4.5.0	
importlib-resources	5.1.4	
ipykernel	5.5.5	
ipython	7.24.1	
ipython-genutils	0.2.0	
jedi	0.18.0	
joblib	1.0.1	
jupyter-client	6.1.12	
jupyter-core	4.7.1	
kaggle	1.5.12	
keras-nightly	2.5.0.dev2021032900	
Keras-Preprocessing	1.1.2	
kiwisolver	1.3.1	
lvis	0.5.3	

lxml	4.6.3
Markdown	3.3.4
matplotlib	3.2.0
matplotlib-inline	0.1.2
numpy	1.19.5
oauth2client	4.1.3
oauthlib	3.1.1
object-detection	0.1
opencv-python	4.5.1.48
opencv-python-headless	4.5.1.48
opt-einsum	3.3.0
packaging	20.9
pandas	1.2.4
parso	0.8.2
pexpect	4.8.0
pickleshare	0.7.5
Pillow	8.2.0
pip	21.1.2
pipenv	2021.5.29
portalocker	2.0.0
promise	2.3
prompt-toolkit	3.0.18
proto-plus	1.18.1
protobuf	3.17.3
psutil	5.8.0
ptyprocess	0.7.0
py-cpuinfo	8.0.0
pyarrow	3.0.0
pyasn1	0.4.8
pyasn1-modules	0.2.8
pycocotools	2.0.2
pycuparser	2.20
pydot	1.4.2
Pygments	2.9.0
pymongo	3.11.4
pyparsing	2.4.7
PyQt5	5.15.4
PyQt5-Qt5	5.15.2
PyQt5-sip	12.9.0
python-dateutil	2.8.1
python-slugify	5.0.2
pytz	2021.1
PyYAML	5.4.1
pyzmq	22.1.0
requests	2.25.1
requests-oauthlib	1.3.0
rsa	4.7.2
sacrebleu	1.5.1
scikit-learn	0.24.2
scipy	1.6.3
sentencepiece	0.1.95
segeval	1.2.2
setuptools	57.0.0
six	1.15.0
slim	0.1
/Users/AlanZhu/Des	
ktop/OD/TFODCourse/Tensorflow/models/research/slim	
tensorboard	2.5.0
tensorboard-data-server	0.6.1
tensorboard-plugin-wit	1.8.0
tensorflow	2.5.0
tensorflow-addons	0.13.0

tensorflow-datasets	4.3.0
tensorflow-estimator	2.5.0
tensorflow-hub	0.12.0
tensorflow-metadata	1.0.0
tensorflow-model-optimization	0.5.0
tensorflowjs	3.7.0
termcolor	1.1.0
text-unidecode	1.3
tf-models-official	2.5.0
tf-slim	1.1.0
threadpoolctl	2.1.0
tornado	6.1
tqdm	4.61.0
traitlets	5.0.5
typeguard	2.12.1
typing-extensions	3.7.4.3
uritemplate	3.0.1
urllib3	1.26.5
virtualenv	20.4.7
virtualenv-clone	0.5.4
wcwidth	0.2.5
Werkzeug	2.0.1
wget	3.2
wheel	0.36.2
wrapt	1.12.1
zipp	3.4.1

In [17]:

```
!pip install wget
import wget
```

Requirement already satisfied: wget in ./tfod/lib/python3.7/site-packages (3.2)

In [18]:

```
#https://github.com/tensorflow/models/blob/master/research/object_detection/g3doc/tf2_detection_zoo.md
#Tensorflow OD model zoo
```


In [19]:

```

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'}

```

```

/bin/bash: wget: command not found
mv: ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8.tar.gz: No such file or directory
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/checkpoint/
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/checkpoint/ckpt-0.data-00000-of-00001
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/checkpoint/checkpoint
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/checkpoint/ckpt-0.index
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/pipeline.config
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/saved_model/
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/saved_model/saved_model.pb
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/saved_model/variables/
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/saved_model/variables/variables.data-00000-of-00001
x ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/saved_model/variables/variables.index

```

2. Create Label Map

In [20]:

```

labels = [{'name': 'thumbsup', 'id': 1}, {'name': 'thumbsdown', 'id': 2}, {'name': 'heart', 'id': 3}, {'name': 'livelong', 'id': 4}]

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')

```

3. Create TF records

In [21]:

```
# OPTIONAL IF RUNNING ON COLAB
ARCHIVE_FILES = os.path.join(paths['IMAGE_PATH'], 'archive.tar.gz')
if os.path.exists(ARCHIVE_FILES):
    !tar -zxvf {ARCHIVE_FILES}
```

In [22]:

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

In [23]:

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

Successfully created the TFRecord file: Tensorflow/workspace/annotations/train.record

Traceback (most recent call last):

File "Tensorflow/scripts/generate_tfrecord.py", line 168, in <module>

tf.app.run()

File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/platform/app.py", line 40, in run

_run(main=main, argv=argv, flags_parser=_parse_flags_tolerate_undef)

File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/absl/app.py", line 303, in run

_run_main(main, args)

File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/absl/app.py", line 251, in _run_main

sys.exit(main(argv))

File "Tensorflow/scripts/generate_tfrecord.py", line 158, in main

tf_example = create_tf_example(group, path)

File "Tensorflow/scripts/generate_tfrecord.py", line 112, in create_tf_example

encoded_jpg = fid.read()

File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/lib/io/file_io.py", line 117, in read

self._preread_check()

File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/lib/io/file_io.py", line 80, in _preread_check

compat.path_to_str(self.__name), 1024 * 512)

tensorflow.python.framework.errors_impl.NotFoundError: Tensorflow/workspace/images/test/thumbsup.fd1af908-cab5-11eb-b3cd-f45c89c16c1b.jpg; No such file or directory

4. Copy Model Config to Training Folder

In [24]:

```

if os.name == 'posix':
    !cp {os.path.join(paths[ 'PRETRAINED_MODEL_PATH' ], PRETRAINED_MODEL_NAME, 'pipeline.config')} {os.path.join(paths[ 'CHECKPOINT_PATH' ])}
if os.name == 'nt':
    !copy {os.path.join(paths[ 'PRETRAINED_MODEL_PATH' ], PRETRAINED_MODEL_NAME, 'pipeline.config')} {os.path.join(paths[ 'CHECKPOINT_PATH' ])}

```

5. Update Config For Transfer Learning

In [25]:

```

import tensorflow as tf
from object_detection.utils import config_util
from object_detection.protos import pipeline_pb2
from google.protobuf import text_format

```

In [26]:

```

config = config_util.get_configs_from_pipeline_file(files[ 'PIPELINE_CONFIG' ])

```

In [27]:

```

pipeline_config = pipeline_pb2.TrainEvalPipelineConfig()
with tf.io.gfile.GFile(files[ 'PIPELINE_CONFIG' ], "r") as f:
    proto_str = f.read()
    text_format.Merge(proto_str, pipeline_config)

```

In [28]:

```

#Set all the size, file path and other configs
pipeline_config.model.ssd.num_classes = len(labels)
pipeline_config.train_config.batch_size = 4
pipeline_config.train_config.fine_tune_checkpoint = os.path.join(paths[ 'PRETRAINED_MODEL_PATH' ], PRETRAINED_MODEL_NAME, 'checkpoint', 'ckpt-0')
pipeline_config.train_config.fine_tune_checkpoint_type = "detection"
pipeline_config.train_input_reader.label_map_path= files[ 'LABELMAP' ]
pipeline_config.train_input_reader.tf_record_input_reader.input_path[:] = [os.path.join(paths[ 'ANNOTATION_PATH' ], 'train.record')]
pipeline_config.eval_input_reader[0].label_map_path = files[ 'LABELMAP' ]
pipeline_config.eval_input_reader[0].tf_record_input_reader.input_path[:] = [os.path.join(paths[ 'ANNOTATION_PATH' ], 'test.record')]

```

In [29]:

```

config_text = text_format.MessageToString(pipeline_config)
with tf.io.gfile.GFile(files[ 'PIPELINE_CONFIG' ], "wb") as f:
    f.write(config_text)

```

In [30]:

```
pipeline_config
```

Out[30]:

```

model {
  ssd {
    num_classes: 4
    image_resizer {
      fixed_shape_resizer {
        height: 320
        width: 320
      }
    }
  }
  feature_extractor {
    type: "ssd_mobilenet_v2_fpn_keras"
    depth_multiplier: 1.0
    min_depth: 16
    conv_hyperparams {
      regularizer {
        l2_regularizer {
          weight: 3.9999998989515007e-05
        }
      }
      initializer {
        random_normal_initializer {
          mean: 0.0
          stddev: 0.009999999776482582
        }
      }
      activation: RELU_6
      batch_norm {
        decay: 0.996999979019165
        scale: true
        epsilon: 0.0010000000474974513
      }
    }
    use_depthwise: true
    override_base_feature_extractor_hyperparams: true
    fpn {
      min_level: 3
      max_level: 7
      additional_layer_depth: 128
    }
  }
  box_coder {
    faster_rcnn_box_coder {
      y_scale: 10.0
      x_scale: 10.0
      height_scale: 5.0
      width_scale: 5.0
    }
  }
  matcher {
    argmax_matcher {
      matched_threshold: 0.5
      unmatched_threshold: 0.5
      ignore_thresholds: false
      negatives_lower_than_unmatched: true
      force_match_for_each_row: true
      use_matmul_gather: true
    }
  }
  similarity_calculator {

```

```

iou_similarity {
}
}
box_predictor {
  weight_shared_convolutional_box_predictor {
    conv_hyperparams {
      regularizer {
        l2_regularizer {
          weight: 3.9999998989515007e-05
        }
      }
      initializer {
        random_normal_initializer {
          mean: 0.0
          stddev: 0.009999999776482582
        }
      }
      activation: RELU_6
      batch_norm {
        decay: 0.996999979019165
        scale: true
        epsilon: 0.0010000000474974513
      }
    }
    depth: 128
    num_layers_before_predictor: 4
    kernel_size: 3
    class_prediction_bias_init: -4.599999904632568
    share_prediction_tower: true
    use_depthwise: true
  }
}
anchor_generator {
  multiscale_anchor_generator {
    min_level: 3
    max_level: 7
    anchor_scale: 4.0
    aspect_ratios: 1.0
    aspect_ratios: 2.0
    aspect_ratios: 0.5
    scales_per_octave: 2
  }
}
post_processing {
  batch_non_max_suppression {
    score_threshold: 9.99999993922529e-09
    iou_threshold: 0.6000000238418579
    max_detections_per_class: 100
    max_total_detections: 100
    use_static_shapes: false
  }
  score_converter: SIGMOID
}
normalize_loss_by_num_matches: true
loss {
  localization_loss {
    weighted_smooth_l1 {
    }
  }
  classification_loss {
    weighted_sigmoid_focal {

```

```

        gamma: 2.0
        alpha: 0.25
    }
}
classification_weight: 1.0
localization_weight: 1.0
}
encode_background_as_zeros: true
normalize_loc_loss_by_codesize: true
inplace_batchnorm_update: true
freeze_batchnorm: false
}
}
train_config {
  batch_size: 4
  data_augmentation_options {
    random_horizontal_flip {
    }
  }
  data_augmentation_options {
    random_crop_image {
      min_object_covered: 0.0
      min_aspect_ratio: 0.75
      max_aspect_ratio: 3.0
      min_area: 0.75
      max_area: 1.0
      overlap_thresh: 0.0
    }
  }
  sync_replicas: true
  optimizer {
    momentum_optimizer {
      learning_rate {
        cosine_decay_learning_rate {
          learning_rate_base: 0.07999999821186066
          total_steps: 50000
          warmup_learning_rate: 0.026666000485420227
          warmup_steps: 1000
        }
      }
      momentum_optimizer_value: 0.8999999761581421
    }
    use_moving_average: false
  }
  fine_tune_checkpoint: "Tensorflow/workspace/pre-trained-models/ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/checkpoint/ckpt-0"
  num_steps: 50000
  startup_delay_steps: 0.0
  replicas_to_aggregate: 8
  max_number_of_boxes: 100
  unpad_groundtruth_tensors: false
  fine_tune_checkpoint_type: "detection"
  fine_tune_checkpoint_version: V2
}
train_input_reader {
  label_map_path: "Tensorflow/workspace/annotations/label_map.pbtxt"
  tf_record_input_reader {
    input_path: "Tensorflow/workspace/annotations/train.record"
  }
}
}
eval_config {

```

```
metrics_set: "coco_detection_metrics"
use_moving_averages: false
}
eval_input_reader {
  label_map_path: "Tensorflow/workspace/annotations/label_map.pbtxt"
  shuffle: false
  num_epochs: 1
  tf_record_input_reader {
    input_path: "Tensorflow/workspace/annotations/test.record"
  }
}
```

6. Train the model

In [31]:

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

In [32]:

```
command = "python {} --model_dir={} --pipeline_config_path={} --num_train_steps=2500".format(TRAINING_SCRIPT, paths['CHECKPOINT_PATH'], files['PIPELINE_CONFIG'])
```

In [33]:

```
print(command)
```

```
python Tensorflow/models/research/object_detection/model_main_tf2.py
--model_dir=Tensorflow/workspace/models/my_ssd_mobnet_tuned --pipeline_config_path=Tensorflow/workspace/models/my_ssd_mobnet_tuned/pipeline.config --num_train_steps=2500
```


In [34]:

```
!{command}
```

```

2021-06-13 02:02:19.952276: I tensorflow/core/platform/cpu_feature_g
uard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Ne
ural Network Library (oneDNN) to use the following CPU instructions
in performance-critical operations:  AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appr
opriate compiler flags.
WARNING:tensorflow:There are non-GPU devices in `tf.distribute.Strat
egy`, not using nccl allreduce.
W0613 02:02:19.954020 4711265728 cross_device_ops.py:1387] There are
non-GPU devices in `tf.distribute.Strategy`, not using nccl allreduc
e.
WARNING:tensorflow:Collective ops is not configured at program start
up. Some performance features may not be enabled.
W0613 02:02:19.954446 4711265728 mirrored_strategy.py:379] Collectiv
e ops is not configured at program startup. Some performance feature
s may not be enabled.
INFO:tensorflow:Using MirroredStrategy with devices ('/job:localhos
t/replica:0/task:0/device:CPU:0',)
I0613 02:02:19.958795 4711265728 mirrored_strategy.py:369] Using Mir
roredStrategy with devices ('/job:localhost/replica:0/task:0/device:
CPU:0',)
INFO:tensorflow:Maybe overwriting train_steps: 2500
I0613 02:02:19.967461 4711265728 config_util.py:552] Maybe overwriti
ng train_steps: 2500
INFO:tensorflow:Maybe overwriting use_bfloat16: False
I0613 02:02:19.967700 4711265728 config_util.py:552] Maybe overwriti
ng use_bfloat16: False
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/li
b/python3.7/site-packages/object_detection/model_lib_v2.py:558: Stra
tegyBase.experimental_distribute_datasets_from_function (from tensor
flow.python.distribute.distribute_lib) is deprecated and will be rem
oved in a future version.
Instructions for updating:
rename to distribute_datasets_from_function
W0613 02:02:20.105488 4711265728 deprecation.py:336] From /Users/Ala
nZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_d
etection/model_lib_v2.py:558: StrategyBase.experimental_distribute_d
atasets_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']
I0613 02:02:20.111495 4711265728 dataset_builder.py:163] Reading unw
eighted datasets: ['Tensorflow/workspace/annotations/train.record']
INFO:tensorflow:Reading record datasets for input file: ['Tensorflo
w/workspace/annotations/train.record']
I0613 02:02:20.111759 4711265728 dataset_builder.py:80] Reading reco
rd datasets for input file: ['Tensorflow/workspace/annotations/trai
n.record']
INFO:tensorflow:Number of filenames to read: 1
I0613 02:02:20.111878 4711265728 dataset_builder.py:81] Number of fi
lenames to read: 1
WARNING:tensorflow:num_readers has been reduced to 1 to match input
file shards.
W0613 02:02:20.112072 4711265728 dataset_builder.py:88] num_readers
has been reduced to 1 to match input file shards.
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/li
b/python3.7/site-packages/object_detection/builders/dataset_builder.
py:105: 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.experimental_deterministic``.

W0613 02:02:20.116679 4711265728 deprecation.py:336] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_detection/builders/dataset_builder.py:105: 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.experimental_deterministic``.

WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_detection/builders/dataset_builder.py:237: DatasetV1.map_with_legacy_function (from tensorflow.python.data.ops.dataset_ops) is deprecated and will be removed in a future version.

Instructions for updating:

Use ``tf.data.Dataset.map()``

W0613 02:02:20.155314 4711265728 deprecation.py:336] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_detection/builders/dataset_builder.py:237: DatasetV1.map_with_legacy_function (from tensorflow.python.data.ops.dataset_ops) is deprecated and will be removed in a future version.

Instructions for updating:

Use ``tf.data.Dataset.map()``

WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/util/dispatch.py:206: sparse_to_dense (from tensorflow.python.ops.sparse_ops) is deprecated and will be removed in a future version.

Instructions for updating:

Create a ``tf.sparse.SparseTensor`` and use ``tf.sparse.to_dense`` instead.

W0613 02:02:28.179203 4711265728 deprecation.py:336] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/util/dispatch.py:206: sparse_to_dense (from tensorflow.python.ops.sparse_ops) is deprecated and will be removed in a future version.

Instructions for updating:

Create a ``tf.sparse.SparseTensor`` and use ``tf.sparse.to_dense`` instead.

WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/util/dispatch.py:206: sample_distorted_bounding_box (from tensorflow.python.ops.image_ops_impl) is deprecated and will be removed in a future version.

Instructions for updating:

``seed2`` arg is deprecated. Use `sample_distorted_bounding_box_v2` instead.

W0613 02:02:32.055816 4711265728 deprecation.py:336] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/util/dispatch.py:206: sample_distorted_bounding_box (from tensorflow.python.ops.image_ops_impl) is deprecated and will be removed in a future version.

Instructions for updating:

``seed2`` arg is deprecated. Use `sample_distorted_bounding_box_v2` instead.

WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/autograph/impl/api.py:464: to_float (from tensorflow.python.ops.math_ops) is deprecated and

will be removed in a future version.

Instructions for updating:

Use `tf.cast` instead.

```
W0613 02:02:34.174942 4711265728 deprecation.py:336] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/autograph/impl/api.py:464: to_float (from tensorflow.python.ops.math_ops) is deprecated and will be removed in a future version.
```

Instructions for updating:

Use `tf.cast` instead.

```
2021-06-13 02:02:37.069923: I tensorflow/compiler/mlir/mlir_graph_optimization_pass.cc:176] None of the MLIR Optimization Passes are enabled (registered 2)
```

```
/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/keras/backend.py:435: UserWarning: `tf.keras.backend.set_learning_phase` is deprecated and will be removed after 2020-10-11. To update it, simply pass a True/False value to the `training` argument of the `_call` method of your layer or model.
```

```
warnings.warn("`tf.keras.backend.set_learning_phase` is deprecated and "
```

```
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/util/deprecation.py:602: calling map_fn_v2 (from tensorflow.python.ops.map_fn) with dtype is deprecated and will be removed in a future version.
```

Instructions for updating:

Use `fn_output_signature` instead

```
W0613 02:03:06.943989 123145385566208 deprecation.py:534] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/util/deprecation.py:602: calling map_fn_v2 (from tensorflow.python.ops.map_fn) with dtype is deprecated and will be removed in a future version.
```

Instructions for updating:

Use `fn_output_signature` instead

```
INFO:tensorflow:Step 100 per-step time 2.413s
```

```
I0613 02:07:07.617282 4711265728 model_lib_v2.py:700] Step 100 per-step time 2.413s
```

```
INFO:tensorflow:{'Loss/classification_loss': 0.28361246,
'Loss/localization_loss': 0.2243958,
'Loss/regularization_loss': 0.15434039,
'Loss/total_loss': 0.6623486,
'learning_rate': 0.0319994}
```

```
I0613 02:07:07.619242 4711265728 model_lib_v2.py:701] {'Loss/classification_loss': 0.28361246,
'Loss/localization_loss': 0.2243958,
'Loss/regularization_loss': 0.15434039,
'Loss/total_loss': 0.6623486,
'learning_rate': 0.0319994}
```

```
INFO:tensorflow:Step 200 per-step time 1.898s
```

```
I0613 02:10:17.449383 4711265728 model_lib_v2.py:700] Step 200 per-step time 1.898s
```

```
INFO:tensorflow:{'Loss/classification_loss': 0.19848153,
'Loss/localization_loss': 0.21989653,
'Loss/regularization_loss': 0.15443517,
'Loss/total_loss': 0.5728133,
'learning_rate': 0.0373328}
```

```
I0613 02:10:17.449630 4711265728 model_lib_v2.py:701] {'Loss/classification_loss': 0.19848153,
'Loss/localization_loss': 0.21989653,
'Loss/regularization_loss': 0.15443517,
'Loss/total_loss': 0.5728133,
'learning_rate': 0.0373328}
```

```
INFO:tensorflow:Step 300 per-step time 1.910s
I0613 02:13:28.477556 4711265728 model_lib_v2.py:700] Step 300 per-s
tep time 1.910s
INFO:tensorflow:{'Loss/classification_loss': 0.13709477,
'Loss/localization_loss': 0.12537172,
'Loss/regularization_loss': 0.1543587,
'Loss/total_loss': 0.4168252,
'learning_rate': 0.0426662}
I0613 02:13:28.477893 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.13709477,
'Loss/localization_loss': 0.12537172,
'Loss/regularization_loss': 0.1543587,
'Loss/total_loss': 0.4168252,
'learning_rate': 0.0426662}
INFO:tensorflow:Step 400 per-step time 1.895s
I0613 02:16:38.018280 4711265728 model_lib_v2.py:700] Step 400 per-s
tep time 1.895s
INFO:tensorflow:{'Loss/classification_loss': 0.12490578,
'Loss/localization_loss': 0.07150345,
'Loss/regularization_loss': 0.15420532,
'Loss/total_loss': 0.35061455,
'learning_rate': 0.047999598}
I0613 02:16:38.018532 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.12490578,
'Loss/localization_loss': 0.07150345,
'Loss/regularization_loss': 0.15420532,
'Loss/total_loss': 0.35061455,
'learning_rate': 0.047999598}
INFO:tensorflow:Step 500 per-step time 1.904s
I0613 02:19:48.449194 4711265728 model_lib_v2.py:700] Step 500 per-s
tep time 1.904s
INFO:tensorflow:{'Loss/classification_loss': 0.1467767,
'Loss/localization_loss': 0.14068364,
'Loss/regularization_loss': 0.15391241,
'Loss/total_loss': 0.44137275,
'learning_rate': 0.0533333}
I0613 02:19:48.449467 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.1467767,
'Loss/localization_loss': 0.14068364,
'Loss/regularization_loss': 0.15391241,
'Loss/total_loss': 0.44137275,
'learning_rate': 0.0533333}
INFO:tensorflow:Step 600 per-step time 1.900s
I0613 02:22:58.420529 4711265728 model_lib_v2.py:700] Step 600 per-s
tep time 1.900s
INFO:tensorflow:{'Loss/classification_loss': 0.12801778,
'Loss/localization_loss': 0.08787627,
'Loss/regularization_loss': 0.15360844,
'Loss/total_loss': 0.36950248,
'learning_rate': 0.0586664}
I0613 02:22:58.420814 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.12801778,
'Loss/localization_loss': 0.08787627,
'Loss/regularization_loss': 0.15360844,
'Loss/total_loss': 0.36950248,
'learning_rate': 0.0586664}
INFO:tensorflow:Step 700 per-step time 1.893s
I0613 02:26:07.732234 4711265728 model_lib_v2.py:700] Step 700 per-s
tep time 1.893s
INFO:tensorflow:{'Loss/classification_loss': 0.18576163,
'Loss/localization_loss': 0.16657013,
```

```
'Loss/regularization_loss': 0.15333667,  
'Loss/total_loss': 0.5056684,  
'learning_rate': 0.0639998}  
I0613 02:26:07.732502 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.18576163,  
'Loss/localization_loss': 0.16657013,  
'Loss/regularization_loss': 0.15333667,  
'Loss/total_loss': 0.5056684,  
'learning_rate': 0.0639998}  
INFO:tensorflow:Step 800 per-step time 1.889s  
I0613 02:29:16.617815 4711265728 model_lib_v2.py:700] Step 800 per-s  
tep time 1.889s  
INFO:tensorflow: {'Loss/classification_loss': 0.11147961,  
'Loss/localization_loss': 0.05353758,  
'Loss/regularization_loss': 0.1529488,  
'Loss/total_loss': 0.31796598,  
'learning_rate': 0.069333196}  
I0613 02:29:16.618129 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.11147961,  
'Loss/localization_loss': 0.05353758,  
'Loss/regularization_loss': 0.1529488,  
'Loss/total_loss': 0.31796598,  
'learning_rate': 0.069333196}  
INFO:tensorflow:Step 900 per-step time 1.905s  
I0613 02:32:27.143646 4711265728 model_lib_v2.py:700] Step 900 per-s  
tep time 1.905s  
INFO:tensorflow: {'Loss/classification_loss': 0.12502952,  
'Loss/localization_loss': 0.08323094,  
'Loss/regularization_loss': 0.1525687,  
'Loss/total_loss': 0.36082917,  
'learning_rate': 0.074666604}  
I0613 02:32:27.143949 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.12502952,  
'Loss/localization_loss': 0.08323094,  
'Loss/regularization_loss': 0.1525687,  
'Loss/total_loss': 0.36082917,  
'learning_rate': 0.074666604}  
INFO:tensorflow:Step 1000 per-step time 1.896s  
I0613 02:35:36.747209 4711265728 model_lib_v2.py:700] Step 1000 per-  
step time 1.896s  
INFO:tensorflow: {'Loss/classification_loss': 0.14537469,  
'Loss/localization_loss': 0.1376585,  
'Loss/regularization_loss': 0.15216623,  
'Loss/total_loss': 0.4351994,  
'learning_rate': 0.08}  
I0613 02:35:36.747478 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.14537469,  
'Loss/localization_loss': 0.1376585,  
'Loss/regularization_loss': 0.15216623,  
'Loss/total_loss': 0.4351994,  
'learning_rate': 0.08}  
INFO:tensorflow:Step 1100 per-step time 1.906s  
I0613 02:38:47.349751 4711265728 model_lib_v2.py:700] Step 1100 per-  
step time 1.906s  
INFO:tensorflow: {'Loss/classification_loss': 0.14791453,  
'Loss/localization_loss': 0.0440812,  
'Loss/regularization_loss': 0.15167734,  
'Loss/total_loss': 0.34367305,  
'learning_rate': 0.07999918}  
I0613 02:38:47.350064 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.14791453,
```

```
'Loss/localization_loss': 0.0440812,  
'Loss/regularization_loss': 0.15167734,  
'Loss/total_loss': 0.34367305,  
'learning_rate': 0.07999918}  
INFO:tensorflow:Step 1200 per-step time 1.891s  
I0613 02:41:56.443701 4711265728 model_lib_v2.py:700] Step 1200 per-  
step time 1.891s  
INFO:tensorflow:{'Loss/classification_loss': 0.0716603,  
'Loss/localization_loss': 0.04743017,  
'Loss/regularization_loss': 0.15118285,  
'Loss/total_loss': 0.27027333,  
'learning_rate': 0.079996705}  
I0613 02:41:56.443948 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.0716603,  
'Loss/localization_loss': 0.04743017,  
'Loss/regularization_loss': 0.15118285,  
'Loss/total_loss': 0.27027333,  
'learning_rate': 0.079996705}  
INFO:tensorflow:Step 1300 per-step time 1.913s  
I0613 02:45:07.754319 4711265728 model_lib_v2.py:700] Step 1300 per-  
step time 1.913s  
INFO:tensorflow:{'Loss/classification_loss': 0.07850502,  
'Loss/localization_loss': 0.028727887,  
'Loss/regularization_loss': 0.1505378,  
'Loss/total_loss': 0.25777072,  
'learning_rate': 0.0799926}  
I0613 02:45:07.754732 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.07850502,  
'Loss/localization_loss': 0.028727887,  
'Loss/regularization_loss': 0.1505378,  
'Loss/total_loss': 0.25777072,  
'learning_rate': 0.0799926}  
INFO:tensorflow:Step 1400 per-step time 1.887s  
I0613 02:48:16.420989 4711265728 model_lib_v2.py:700] Step 1400 per-  
step time 1.887s  
INFO:tensorflow:{'Loss/classification_loss': 0.119952075,  
'Loss/localization_loss': 0.051106818,  
'Loss/regularization_loss': 0.15002258,  
'Loss/total_loss': 0.3210815,  
'learning_rate': 0.07998685}  
I0613 02:48:16.421258 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.119952075,  
'Loss/localization_loss': 0.051106818,  
'Loss/regularization_loss': 0.15002258,  
'Loss/total_loss': 0.3210815,  
'learning_rate': 0.07998685}  
INFO:tensorflow:Step 1500 per-step time 1.872s  
I0613 02:51:23.630556 4711265728 model_lib_v2.py:700] Step 1500 per-  
step time 1.872s  
INFO:tensorflow:{'Loss/classification_loss': 0.058028363,  
'Loss/localization_loss': 0.044721898,  
'Loss/regularization_loss': 0.14931908,  
'Loss/total_loss': 0.25206935,  
'learning_rate': 0.07997945}  
I0613 02:51:23.630805 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.058028363,  
'Loss/localization_loss': 0.044721898,  
'Loss/regularization_loss': 0.14931908,  
'Loss/total_loss': 0.25206935,  
'learning_rate': 0.07997945}  
INFO:tensorflow:Step 1600 per-step time 1.860s
```

```
I0613 02:54:29.668426 4711265728 model_lib_v2.py:700] Step 1600 per-  
step time 1.860s  
INFO:tensorflow:{'Loss/classification_loss': 0.14404458,  
  'Loss/localization_loss': 0.038853165,  
  'Loss/regularization_loss': 0.14866129,  
  'Loss/total_loss': 0.33155903,  
  'learning_rate': 0.079970405}  
I0613 02:54:29.668920 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.14404458,  
  'Loss/localization_loss': 0.038853165,  
  'Loss/regularization_loss': 0.14866129,  
  'Loss/total_loss': 0.33155903,  
  'learning_rate': 0.079970405}  
INFO:tensorflow:Step 1700 per-step time 1.864s  
I0613 02:57:36.035162 4711265728 model_lib_v2.py:700] Step 1700 per-  
step time 1.864s  
INFO:tensorflow:{'Loss/classification_loss': 0.12653916,  
  'Loss/localization_loss': 0.031696368,  
  'Loss/regularization_loss': 0.14804712,  
  'Loss/total_loss': 0.30628264,  
  'learning_rate': 0.07995972}  
I0613 02:57:36.035407 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.12653916,  
  'Loss/localization_loss': 0.031696368,  
  'Loss/regularization_loss': 0.14804712,  
  'Loss/total_loss': 0.30628264,  
  'learning_rate': 0.07995972}  
INFO:tensorflow:Step 1800 per-step time 1.852s  
I0613 03:00:41.267797 4711265728 model_lib_v2.py:700] Step 1800 per-  
step time 1.852s  
INFO:tensorflow:{'Loss/classification_loss': 0.10287357,  
  'Loss/localization_loss': 0.0400195,  
  'Loss/regularization_loss': 0.14731534,  
  'Loss/total_loss': 0.2902084,  
  'learning_rate': 0.0799474}  
I0613 03:00:41.268087 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.10287357,  
  'Loss/localization_loss': 0.0400195,  
  'Loss/regularization_loss': 0.14731534,  
  'Loss/total_loss': 0.2902084,  
  'learning_rate': 0.0799474}  
INFO:tensorflow:Step 1900 per-step time 1.887s  
I0613 03:03:49.985450 4711265728 model_lib_v2.py:700] Step 1900 per-  
step time 1.887s  
INFO:tensorflow:{'Loss/classification_loss': 0.08814212,  
  'Loss/localization_loss': 0.033043124,  
  'Loss/regularization_loss': 0.14663842,  
  'Loss/total_loss': 0.26782367,  
  'learning_rate': 0.07993342}  
I0613 03:03:49.985826 4711265728 model_lib_v2.py:701] {'Loss/classif  
ication_loss': 0.08814212,  
  'Loss/localization_loss': 0.033043124,  
  'Loss/regularization_loss': 0.14663842,  
  'Loss/total_loss': 0.26782367,  
  'learning_rate': 0.07993342}  
INFO:tensorflow:Step 2000 per-step time 1.938s  
I0613 03:07:03.812355 4711265728 model_lib_v2.py:700] Step 2000 per-  
step time 1.938s  
INFO:tensorflow:{'Loss/classification_loss': 0.1177561,  
  'Loss/localization_loss': 0.08023798,  
  'Loss/regularization_loss': 0.14594527,
```



```
'Loss/total_loss': 0.34393933,
'learning_rate': 0.07991781}
I0613 03:07:03.812792 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.1177561,
'Loss/localization_loss': 0.08023798,
'Loss/regularization_loss': 0.14594527,
'Loss/total_loss': 0.34393933,
'learning_rate': 0.07991781}
INFO:tensorflow:Step 2100 per-step time 1.832s
I0613 03:10:07.042874 4711265728 model_lib_v2.py:700] Step 2100 per-
step time 1.832s
INFO:tensorflow: {'Loss/classification_loss': 0.05750102,
'Loss/localization_loss': 0.05262984,
'Loss/regularization_loss': 0.14523603,
'Loss/total_loss': 0.2553669,
'learning_rate': 0.07990056}
I0613 03:10:07.043124 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.05750102,
'Loss/localization_loss': 0.05262984,
'Loss/regularization_loss': 0.14523603,
'Loss/total_loss': 0.2553669,
'learning_rate': 0.07990056}
INFO:tensorflow:Step 2200 per-step time 1.873s
I0613 03:13:14.312572 4711265728 model_lib_v2.py:700] Step 2200 per-
step time 1.873s
INFO:tensorflow: {'Loss/classification_loss': 0.08541283,
'Loss/localization_loss': 0.0278897,
'Loss/regularization_loss': 0.14451683,
'Loss/total_loss': 0.25781935,
'learning_rate': 0.07988167}
I0613 03:13:14.312825 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.08541283,
'Loss/localization_loss': 0.0278897,
'Loss/regularization_loss': 0.14451683,
'Loss/total_loss': 0.25781935,
'learning_rate': 0.07988167}
INFO:tensorflow:Step 2300 per-step time 1.856s
I0613 03:16:19.880655 4711265728 model_lib_v2.py:700] Step 2300 per-
step time 1.856s
INFO:tensorflow: {'Loss/classification_loss': 0.077495635,
'Loss/localization_loss': 0.021522863,
'Loss/regularization_loss': 0.14375076,
'Loss/total_loss': 0.24276926,
'learning_rate': 0.07986114}
I0613 03:16:19.880928 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.077495635,
'Loss/localization_loss': 0.021522863,
'Loss/regularization_loss': 0.14375076,
'Loss/total_loss': 0.24276926,
'learning_rate': 0.07986114}
INFO:tensorflow:Step 2400 per-step time 1.819s
I0613 03:19:21.796097 4711265728 model_lib_v2.py:700] Step 2400 per-
step time 1.819s
INFO:tensorflow: {'Loss/classification_loss': 0.07137852,
'Loss/localization_loss': 0.051918164,
'Loss/regularization_loss': 0.14305049,
'Loss/total_loss': 0.26634717,
'learning_rate': 0.07983897}
I0613 03:19:21.796554 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.07137852,
'Loss/localization_loss': 0.051918164,
```

```
'Loss/regularization_loss': 0.14305049,
'Loss/total_loss': 0.26634717,
'learning_rate': 0.07983897}
INFO:tensorflow:Step 2500 per-step time 1.718s
I0613 03:22:13.632318 4711265728 model_lib_v2.py:700] Step 2500 per-
step time 1.718s
INFO:tensorflow:{'Loss/classification_loss': 0.053038776,
'Loss/localization_loss': 0.015751453,
'Loss/regularization_loss': 0.14232399,
'Loss/total_loss': 0.21111421,
'learning_rate': 0.079815164}
I0613 03:22:13.632580 4711265728 model_lib_v2.py:701] {'Loss/classif
ication_loss': 0.053038776,
'Loss/localization_loss': 0.015751453,
'Loss/regularization_loss': 0.14232399,
'Loss/total_loss': 0.21111421,
'learning_rate': 0.079815164}
```

In [35]:

```
#training
```

In [36]:

```
#training
```

7. Evaluate the Model

In [37]:

```
command = "python {} --model_dir={} --pipeline_config_path={} --checkpoint_dir=
{}".format(TRAINING_SCRIPT, paths['CHECKPOINT_PATH'], files['PIPELINE_CONFIG'], p
aths['CHECKPOINT_PATH'])
```

In [38]:

```
print(command)
```

```
python Tensorflow/models/research/object_detection/model_main_tf2.py
--model_dir=Tensorflow/workspace/models/my_ssd_mobnet_tuned --pipeli
ne_config_path=Tensorflow/workspace/models/my_ssd_mobnet_tuned/pipel
ine.config --checkpoint_dir=Tensorflow/workspace/models/my_ssd_mobne
t_tuned
```

In [39]:

```
!{command}
```

```

WARNING:tensorflow:Forced number of epochs for all eval validations
to be 1.
W0613 03:22:22.174860 4512802240 model_lib_v2.py:1082] Forced number
of epochs for all eval validations to be 1.
INFO:tensorflow:Maybe overwriting sample_1_of_n_eval_examples: None
I0613 03:22:22.175077 4512802240 config_util.py:552] Maybe overwriti
ng sample_1_of_n_eval_examples: None
INFO:tensorflow:Maybe overwriting use_bfloat16: False
I0613 03:22:22.175152 4512802240 config_util.py:552] Maybe overwriti
ng use_bfloat16: False
INFO:tensorflow:Maybe overwriting eval_num_epochs: 1
I0613 03:22:22.175251 4512802240 config_util.py:552] Maybe overwriti
ng eval_num_epochs: 1
WARNING:tensorflow:Expected number of evaluation epochs is 1, but in
stead encountered `eval_on_train_input_config.num_epochs` = 0. Overw
riting `num_epochs` to 1.
W0613 03:22:22.175397 4512802240 model_lib_v2.py:1103] Expected numb
er of evaluation epochs is 1, but instead encountered `eval_on_train
_input_config.num_epochs` = 0. Overwriting `num_epochs` to 1.
2021-06-13 03:22:22.180050: I tensorflow/core/platform/cpu_feature_g
uard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Ne
ural Network Library (oneDNN) to use the following CPU instructions
in performance-critical operations:  AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appr
opriate compiler flags.
INFO:tensorflow:Reading unweighted datasets: ['Tensorflow/workspace/
annotations/test.record']
I0613 03:22:22.283519 4512802240 dataset_builder.py:163] Reading unw
eighted datasets: ['Tensorflow/workspace/annotations/test.record']
INFO:tensorflow:Reading record datasets for input file: ['Tensorflo
w/workspace/annotations/test.record']
I0613 03:22:22.283717 4512802240 dataset_builder.py:80] Reading reco
rd datasets for input file: ['Tensorflow/workspace/annotations/test.
record']
INFO:tensorflow:Number of filenames to read: 1
I0613 03:22:22.283791 4512802240 dataset_builder.py:81] Number of fi
lenames to read: 1
WARNING:tensorflow:num_readers has been reduced to 1 to match input
file shards.
W0613 03:22:22.283854 4512802240 dataset_builder.py:88] num_readers
has been reduced to 1 to match input file shards.
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/li
b/python3.7/site-packages/object_detection/builders/dataset_builder.
py:105: 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_lengt
h, num_parallel_calls=tf.data.AUTOTUNE)` instead. If sloppy executio
n is desired, use `tf.data.Options.experimental_deterministic`.
W0613 03:22:22.286015 4512802240 deprecation.py:336] From /Users/Ala
nZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_d
etection/builders/dataset_builder.py:105: parallel_interleave (from
tensorflow.python.data.experimental.ops.interleave_ops) is deprecate
d and will be removed in a future version.
Instructions for updating:
Use `tf.data.Dataset.interleave(map_func, cycle_length, block_lengt
h, num_parallel_calls=tf.data.AUTOTUNE)` instead. If sloppy executio
n is desired, use `tf.data.Options.experimental_deterministic`.
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/li
b/python3.7/site-packages/object_detection/builders/dataset_builder.

```

```
py:237: DatasetV1.map_with_legacy_function (from tensorflow.python.d
ata.ops.dataset_ops) is deprecated and will be removed in a future v
ersion.
```

```
Instructions for updating:
```

```
Use `tf.data.Dataset.map()`
```

```
W0613 03:22:22.311408 4512802240 deprecation.py:336] From /Users/Ala
nZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_d
etection/builders/dataset_builder.py:237: DatasetV1.map_with_legacy_
function (from tensorflow.python.data.ops.dataset_ops) is deprecated
and will be removed in a future version.
```

```
Instructions for updating:
```

```
Use `tf.data.Dataset.map()`
```

```
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/li
b/python3.7/site-packages/tensorflow/python/util/dispatch.py:206: sp
arse_to_dense (from tensorflow.python.ops.sparse_ops) is deprecated
and will be removed in a future version.
```

```
Instructions for updating:
```

```
Create a `tf.sparse.SparseTensor` and use `tf.sparse.to_dense` inste
ad.
```

```
W0613 03:22:26.758715 4512802240 deprecation.py:336] From /Users/Ala
nZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorfl
ow/python/util/dispatch.py:206: sparse_to_dense (from tensorflow.pyt
hon.ops.sparse_ops) is deprecated and will be removed in a future ve
rsion.
```

```
Instructions for updating:
```

```
Create a `tf.sparse.SparseTensor` and use `tf.sparse.to_dense` inste
ad.
```

```
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/li
b/python3.7/site-packages/tensorflow/python/autograph/impl/api.py:46
4: to_float (from tensorflow.python.ops.math_ops) is deprecated and
will be removed in a future version.
```

```
Instructions for updating:
```

```
Use `tf.cast` instead.
```

```
W0613 03:22:28.158936 4512802240 deprecation.py:336] From /Users/Ala
nZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorfl
ow/python/autograph/impl/api.py:464: to_float (from tensorflow.pytho
n.ops.math_ops) is deprecated and will be removed in a future versio
n.
```

```
Instructions for updating:
```

```
Use `tf.cast` instead.
```

```
INFO:tensorflow:Waiting for new checkpoint at Tensorflow/workspace/m
odels/my_ssd_mobnet_tuned
```

```
I0613 03:22:31.436039 4512802240 checkpoint_utils.py:140] Waiting fo
r new checkpoint at Tensorflow/workspace/models/my_ssd_mobnet_tuned
```

```
INFO:tensorflow:Found new checkpoint at Tensorflow/workspace/models/
my_ssd_mobnet_tuned/ckpt-3
```

```
I0613 03:22:31.438158 4512802240 checkpoint_utils.py:149] Found new
checkpoint at Tensorflow/workspace/models/my_ssd_mobnet_tuned/ckpt-3
/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-package
s/tensorflow/python/keras/backend.py:435: UserWarning: `tf.keras.bac
kend.set_learning_phase` is deprecated and will be removed after 202
0-10-11. To update it, simply pass a True/False value to the `traini
ng` argument of the `__call__` method of your layer or model.
```

```
warnings.warn("`tf.keras.backend.set_learning_phase` is deprecated
and '
```

```
2021-06-13 03:22:31.608843: I tensorflow/compiler/mlir/mlir_graph_op
timization_pass.cc:176] None of the MLIR Optimization Passes are ena
bled (registered 2)
```

```
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/li
b/python3.7/site-packages/object_detection/eval_util.py:929: to_int6
4 (from tensorflow.python.ops.math_ops) is deprecated and will be re
```

moved in a future version.

Instructions for updating:

Use ``tf.cast`` instead.

```
W0613 03:22:59.535839 4512802240 deprecation.py:336] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_detection/eval_util.py:929: to_int64 (from tensorflow.python.ops.math_ops) is deprecated and will be removed in a future version.
```

Instructions for updating:

Use ``tf.cast`` instead.

```
INFO:tensorflow:Finished eval step 0
```

```
I0613 03:22:59.540996 4512802240 model_lib_v2.py:958] Finished eval step 0
```

```
WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/autograph/impl/api.py:464: py_func (from tensorflow.python.ops.script_ops) is deprecated and will be removed in a future version.
```

Instructions for updating:

`tf.py_func` is deprecated in TF V2. Instead, there are two options available in V2.

- `tf.py_function` takes a python function which manipulates tf eager tensors instead of numpy arrays. It's easy to convert a tf eager tensor to an ndarray (just call `tensor.numpy()`) but having access to eager tensors means ``tf.py_function``s can use accelerators such as GPUs as well as being differentiable using a gradient tape.

- `tf.numpy_function` maintains the semantics of the deprecated `tf.py_func`

(it is not differentiable, and manipulates numpy arrays). It drops the stateful argument making all functions stateful.

```
W0613 03:22:59.702213 4512802240 deprecation.py:336] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/autograph/impl/api.py:464: py_func (from tensorflow.python.ops.script_ops) is deprecated and will be removed in a future version.
```

Instructions for updating:

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- `tf.py_function` takes a python function which manipulates tf eager tensors instead of numpy arrays. It's easy to convert a tf eager tensor to an ndarray (just call `tensor.numpy()`) but having access to eager tensors means ``tf.py_function``s can use accelerators such as GPUs as well as being differentiable using a gradient tape.

- `tf.numpy_function` maintains the semantics of the deprecated `tf.py_func`

(it is not differentiable, and manipulates numpy arrays). It drops the stateful argument making all functions stateful.

```
INFO:tensorflow:Performing evaluation on 10 images.
```

```
I0613 03:23:02.386351 4512802240 coco_evaluation.py:293] Performing evaluation on 10 images.
creating index...
```

```

index created!
INFO:tensorflow:Loading and preparing annotation results...
I0613 03:23:02.386660 4512802240 coco_tools.py:116] Loading and prep
aring annotation results...
INFO:tensorflow:DONE (t=0.00s)
I0613 03:23:02.387340 4512802240 coco_tools.py:138] DONE (t=0.00s)
creating index...
index created!
Running per image evaluation...
Evaluate annotation type *bbox*
DONE (t=0.05s).
Accumulating evaluation results...
DONE (t=0.03s).
Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=10
0 ] = 0.647
Average Precision  (AP) @[ IoU=0.50          | area=   all | maxDets=10
0 ] = 1.000
Average Precision  (AP) @[ IoU=0.75          | area=   all | maxDets=10
0 ] = 0.680
Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=10
0 ] = -1.000
Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=10
0 ] = -1.000
Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=10
0 ] = 0.647
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=
1 ] = 0.568
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 1
0 ] = 0.657
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=10
0 ] = 0.657
Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=10
0 ] = -1.000
Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=10
0 ] = -1.000
Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=10
0 ] = 0.657
INFO:tensorflow:Eval metrics at step 2000
I0613 03:23:02.469530 4512802240 model_lib_v2.py:1007] Eval metrics
at step 2000
INFO:tensorflow:          + DetectionBoxes_Precision/mAP: 0.646548
I0613 03:23:02.477472 4512802240 model_lib_v2.py:1010] + DetectionB
oxes_Precision/mAP: 0.646548
INFO:tensorflow:          + DetectionBoxes_Precision/mAP@.50IOU: 1.000
000
I0613 03:23:02.478512 4512802240 model_lib_v2.py:1010] + DetectionB
oxes_Precision/mAP@.50IOU: 1.000000
INFO:tensorflow:          + DetectionBoxes_Precision/mAP@.75IOU: 0.679
868
I0613 03:23:02.479166 4512802240 model_lib_v2.py:1010] + DetectionB
oxes_Precision/mAP@.75IOU: 0.679868
INFO:tensorflow:          + DetectionBoxes_Precision/mAP (small): -1.0
00000
I0613 03:23:02.479759 4512802240 model_lib_v2.py:1010] + DetectionB
oxes_Precision/mAP (small): -1.000000
INFO:tensorflow:          + DetectionBoxes_Precision/mAP (medium): -1.
000000
I0613 03:23:02.480304 4512802240 model_lib_v2.py:1010] + DetectionB
oxes_Precision/mAP (medium): -1.000000
INFO:tensorflow:          + DetectionBoxes_Precision/mAP (large): 0.64
6548

```

```

I0613 03:23:02.480933 4512802240 model_lib_v2.py:1010] + DetectionBoxes_Precision/mAP (large): 0.646548
INFO:tensorflow: + DetectionBoxes_Recall/AR@1: 0.567500
I0613 03:23:02.481683 4512802240 model_lib_v2.py:1010] + DetectionBoxes_Recall/AR@1: 0.567500
INFO:tensorflow: + DetectionBoxes_Recall/AR@10: 0.657500
I0613 03:23:02.482597 4512802240 model_lib_v2.py:1010] + DetectionBoxes_Recall/AR@10: 0.657500
INFO:tensorflow: + DetectionBoxes_Recall/AR@100: 0.657500
I0613 03:23:02.483476 4512802240 model_lib_v2.py:1010] + DetectionBoxes_Recall/AR@100: 0.657500
INFO:tensorflow: + DetectionBoxes_Recall/AR@100 (small): -1.000000
I0613 03:23:02.484081 4512802240 model_lib_v2.py:1010] + DetectionBoxes_Recall/AR@100 (small): -1.000000
INFO:tensorflow: + DetectionBoxes_Recall/AR@100 (medium): -1.000000
I0613 03:23:02.484658 4512802240 model_lib_v2.py:1010] + DetectionBoxes_Recall/AR@100 (medium): -1.000000
INFO:tensorflow: + DetectionBoxes_Recall/AR@100 (large): 0.657500
I0613 03:23:02.485281 4512802240 model_lib_v2.py:1010] + DetectionBoxes_Recall/AR@100 (large): 0.657500
INFO:tensorflow: + Loss/localization_loss: 0.166763
I0613 03:23:02.486678 4512802240 model_lib_v2.py:1010] + Loss/localization_loss: 0.166763
INFO:tensorflow: + Loss/classification_loss: 0.237792
I0613 03:23:02.487915 4512802240 model_lib_v2.py:1010] + Loss/classification_loss: 0.237792
INFO:tensorflow: + Loss/regularization_loss: 0.145938
I0613 03:23:02.489634 4512802240 model_lib_v2.py:1010] + Loss/regularization_loss: 0.145938
INFO:tensorflow: + Loss/total_loss: 0.550493
I0613 03:23:02.490646 4512802240 model_lib_v2.py:1010] + Loss/total_loss: 0.550493
^C

```

Traceback (most recent call last):

```

File "Tensorflow/models/research/object_detection/model_main_tf2.py", line 115, in <module>
    tf.compat.v1.app.run()
File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/platform/app.py", line 40, in run
    _run(main=main, argv=argv, flags_parser=_parse_flags_tolerate_undef)
File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/absl/app.py", line 303, in run
    _run_main(main, args)
File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/absl/app.py", line 251, in _run_main
    sys.exit(main(argv))
File "Tensorflow/models/research/object_detection/model_main_tf2.py", line 90, in main
    wait_interval=300, timeout=FLAGS.eval_timeout)
File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/object_detection/model_lib_v2.py", line 1129, in eval_continuously
    checkpoint_dir, timeout=timeout, min_interval_secs=wait_interval):
File "/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/training/checkpoint_utils.py", line 216, in checkpoints_iterator

```



```
time.sleep(time_to_next_eval)
KeyboardInterrupt
```

8. Load Train Model From Checkpoint

In [42]:

```
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 [44]:

```
# Load pipeline config and build a detection model
configs = config_util.get_configs_from_pipeline_file(files['PIPELINE_CONFIG'])
detection_model = model_builder.build(model_config=configs['model'], is_training
=False)

# Restore checkpoint
ckpt = tf.compat.v2.train.Checkpoint(model=detection_model)
ckpt.restore(os.path.join(paths['CHECKPOINT_PATH'], 'ckpt-3')).expect_partial()

@tf.function
def detect_fn(image):
    image, shapes = detection_model.preprocess(image)
    prediction_dict = detection_model.predict(image, shapes)
    detections = detection_model.postprocess(prediction_dict, shapes)
    return detections
```

9. Detect from an Image

In [45]:

```
import cv2
import numpy as np
from matplotlib import pyplot as plt
%matplotlib inline
```

In [46]:

```
category_index = label_map_util.create_category_index_from_labelmap(files['LABEL
MAP'])
```

In [47]:

```
IMAGE_PATH = os.path.join(paths['IMAGE_PATH'], 'test', 'livelong.380310aa-cb7e-1
1eb-b3cd-f45c89c16c1b.jpg')
```

In [48]:

```

#Run object detection on the selected image

#Load image
img = cv2.imread(IMAGE_PATH)
image_np = np.array(img)

#Convert to tensor
input_tensor = tf.convert_to_tensor(np.expand_dims(image_np, 0), dtype=tf.float32)

#Call detection function
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

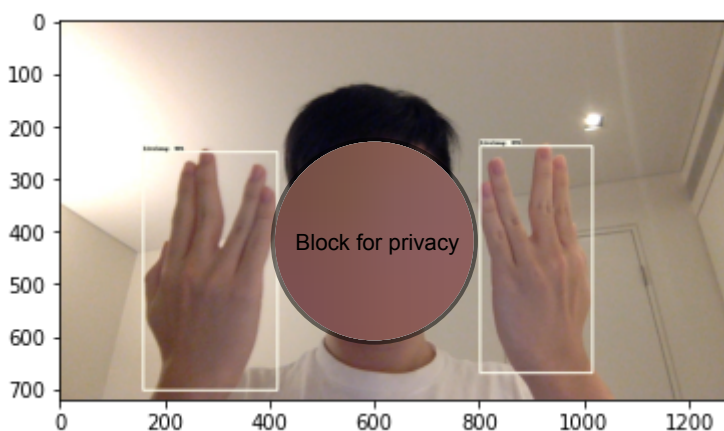
# detection_classes should be ints.
detections['detection_classes'] = detections['detection_classes'].astype(np.int64)

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()

```



10. Real Time Detections from your Webcam

In []:

```
!pip uninstall opencv-python-headless -y
```

In [49]:

```
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)

    cv2.imshow('object detection', cv2.resize(image_np_with_detections, (800, 600)))

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

10. Freezing the Graph

In [50]:

```
FREEZE_SCRIPT = os.path.join(paths['APIMODEL_PATH'], 'research', 'object_detection', 'exporter_main_v2.py')
```

In [51]:

```
command = "python {} --input_type=image_tensor --pipeline_config_path={} --train  
ed_checkpoint_dir={} --output_directory={}".format(FREEZE_SCRIPT ,files['PIPELIN  
E_CONFIG'], paths['CHECKPOINT_PATH'], paths['OUTPUT_PATH'])
```

In [52]:

```
print(command)
```

```
python Tensorflow/models/research/object_detection/exporter_main_v2.  
py --input_type=image_tensor --pipeline_config_path=Tensorflow/work  
space/models/my_ssd_mobnet_tuned/pipeline.config --trained_checkpoin  
t_dir=Tensorflow/workspace/models/my_ssd_mobnet_tuned --output_direc  
tory=Tensorflow/workspace/models/my_ssd_mobnet_tuned/export
```

In [53]:

```
!{command}
```

2021-06-13 03:32:38.809696: I tensorflow/core/platform/cpu_feature_guard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations: AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.

WARNING:tensorflow:From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/autograph/impl/api.py:463: calling map_fn_v2 (from tensorflow.python.ops.map_fn) with back_prop=False is deprecated and will be removed in a future version.

Instructions for updating:

back_prop=False is deprecated. Consider using tf.stop_gradient instead.

Instead of:

```
results = tf.map_fn(fn, elems, back_prop=False)
```

Use:

```
results = tf.nest.map_structure(tf.stop_gradient, tf.map_fn(fn, elems))
```

W0613 03:32:39.042680 4613125568 deprecation.py:601] From /Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/autograph/impl/api.py:463: calling map_fn_v2 (from tensorflow.python.ops.map_fn) with back_prop=False is deprecated and will be removed in a future version.

Instructions for updating:

back_prop=False is deprecated. Consider using tf.stop_gradient instead.

Instead of:

```
results = tf.map_fn(fn, elems, back_prop=False)
```

Use:

```
results = tf.nest.map_structure(tf.stop_gradient, tf.map_fn(fn, elems))
```

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.meta_architectures.ssd_meta_arch.SSDMetaArch object at 0x158bc4320>, because it is not built.

W0613 03:33:08.073933 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.meta_architectures.ssd_meta_arch.SSDMetaArch object at 0x158bc4320>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x158ca9a58>, because it is not built.

W0613 03:33:08.263317 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x158ca9a58>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a30a048>, because it is not built.

W0613 03:33:08.263516 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a30a048>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a30a2b0>, because it is not built.

W0613 03:33:08.263640 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a30a2b0>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x15a30a3c8>, because it is not built.

W0613 03:33:08.263738 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolution

```

al.SeparableConv2D object at 0x15a30a3c8>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a3757f0>, because it is not built.
W0613 03:33:08.263826 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a3757f0>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a375e48>, because it is not built.
W0613 03:33:08.263923 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a375e48>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x15a375dd8>, because it is not built.
W0613 03:33:08.264005 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x15a375dd8>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x158d6de10>, because it is not built.
W0613 03:33:08.264085 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x158d6de10>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a35ed30>, because it is not built.
W0613 03:33:08.264159 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a35ed30>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x15a35e908>, because it is not built.
W0613 03:33:08.264234 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x15a35e908>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a35e828>, because it is not built.
W0613 03:33:08.264423 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a35e828>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a35ecf8>, because it is not built.
W0613 03:33:08.264569 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a35ecf8>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x158ca9da0>, because it is not built.
W0613 03:33:08.264664 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x158ca9da0>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a384c88>, because it is not built.

```

e it is not built.

W0613 03:33:08.264742 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a384c88>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a384e80>, because it is not built.

W0613 03:33:08.264818 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a384e80>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a384320>, because it is not built.

W0613 03:33:08.264890 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a384320>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a384a90>, because it is not built.

W0613 03:33:08.264963 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a384a90>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a3a6320>, because it is not built.

W0613 03:33:08.265033 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a3a6320>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a3a63c8>, because it is not built.

W0613 03:33:08.265110 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a3a63c8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a3a6828>, because it is not built.

W0613 03:33:08.265182 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a3a6828>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x158ca9dd8>, because it is not built.

W0613 03:33:08.265251 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x158ca9dd8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a3567f0>, because it is not built.

W0613 03:33:08.265385 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a3567f0>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a356828>, because it is not built.

W0613 03:33:08.265488 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm


```
m.FreezableBatchNorm object at 0x15a356828>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a356cc0>, because it is not built.
W0613 03:33:08.265568 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a356cc0>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a356d30>, because it is not built.
W0613 03:33:08.265650 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a356d30>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x14a9057f0>, because it is not built.
W0613 03:33:08.265739 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x14a9057f0>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x158ef6160>, because it is not built.
W0613 03:33:08.265815 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x158ef6160>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a3c1b70>, because it is not built.
W0613 03:33:08.265886 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a3c1b70>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x14a8e57b8>, because it is not built.
W0613 03:33:08.265959 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x14a8e57b8>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a391eb8>, because it is not built.
W0613 03:33:08.266029 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a391eb8>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a391898>, because it is not built.
W0613 03:33:08.266168 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x15a391898>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a391e10>, because it is not built.
W0613 03:33:08.266269 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a391e10>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object
```

```
t_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0
x15a3bcc88>, because it is not built.
W0613 03:33:08.266350 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <object_detection.core.freezable_batch_nor
m.FreezableBatchNorm object at 0x15a3bcc88>, because it is not buil
t.
WARNING:tensorflow:Skipping full serialization of Keras layer <tenso
rflow.python.keras.layers.core.Lambda object at 0x15a3bce80>, becaus
e it is not built.
W0613 03:33:08.266425 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <tensorflow.python.keras.layers.core.Lambda
object at 0x15a3bce80>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <objec
t_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0
x15a3bc0f0>, because it is not built.
W0613 03:33:08.266497 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <object_detection.core.freezable_batch_nor
m.FreezableBatchNorm object at 0x15a3bc0f0>, because it is not buil
t.
WARNING:tensorflow:Skipping full serialization of Keras layer <tenso
rflow.python.keras.layers.core.Lambda object at 0x15a3bc470>, becaus
e it is not built.
W0613 03:33:08.266577 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <tensorflow.python.keras.layers.core.Lambda
object at 0x15a3bc470>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <objec
t_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0
x158ca9e10>, because it is not built.
W0613 03:33:08.266649 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <object_detection.core.freezable_batch_nor
m.FreezableBatchNorm object at 0x158ca9e10>, because it is not buil
t.
WARNING:tensorflow:Skipping full serialization of Keras layer <tenso
rflow.python.keras.layers.core.Lambda object at 0x15a36f9e8>, becaus
e it is not built.
W0613 03:33:08.266717 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <tensorflow.python.keras.layers.core.Lambda
object at 0x15a36f9e8>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <objec
t_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0
x15a36f668>, because it is not built.
W0613 03:33:08.266787 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <object_detection.core.freezable_batch_nor
m.FreezableBatchNorm object at 0x15a36f668>, because it is not buil
t.
WARNING:tensorflow:Skipping full serialization of Keras layer <tenso
rflow.python.keras.layers.core.Lambda object at 0x15a36f2e8>, becaus
e it is not built.
W0613 03:33:08.266855 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <tensorflow.python.keras.layers.core.Lambda
object at 0x15a36f2e8>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <objec
t_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0
x15a36f550>, because it is not built.
W0613 03:33:08.266924 4613125568 save_impl.py:77] Skipping full seri
alization of Keras layer <object_detection.core.freezable_batch_nor
m.FreezableBatchNorm object at 0x15a36f550>, because it is not buil
t.
WARNING:tensorflow:Skipping full serialization of Keras layer <tenso
rflow.python.keras.layers.core.Lambda object at 0x15a364828>, becaus
e it is not built.
```

W0613 03:33:08.266992 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a364828>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a364940>, because it is not built.

W0613 03:33:08.267067 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezeable_batch_norm.FreezableBatchNorm object at 0x15a364940>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a364dd8>, because it is not built.

W0613 03:33:08.267136 4613125568 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x15a364dd8>, because it is not built.

2021-06-13 03:33:19.217528: W tensorflow/python/util/util.cc:348] Sets are not currently considered sequences, but this may change in the future, so consider avoiding using them.

W0613 03:33:40.908350 4613125568 save.py:243] Found untraced functions such as WeightSharedConvolutionalBoxPredictor_layer_call_fn, WeightSharedConvolutionalBoxPredictor_layer_call_and_return_conditional_losses, WeightSharedConvolutionalBoxHead_layer_call_fn, WeightSharedConvolutionalBoxHead_layer_call_and_return_conditional_losses, WeightSharedConvolutionalBoxPredictor_layer_call_fn while saving (showing 5 of 260). These functions will not be directly callable after loading.

/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/keras/utils/generic_utils.py:497: CustomMaskWarning: Custom mask layers require a config and must override get_config. When loading, the custom mask layer must be passed to the custom_objects argument.

category=CustomMaskWarning)

WARNING:tensorflow:FOR KERAS USERS: The object that you are saving contains one or more Keras models or layers. If you are loading the SavedModel with `tf.keras.models.load_model`, continue reading (otherwise, you may ignore the following instructions). Please change your code to save with `tf.keras.models.save_model` or `model.save`, and confirm that the file "keras.metadata" exists in the export directory. In the future, Keras will only load the SavedModels that have this file. In other words, `tf.saved_model.save` will no longer write SavedModels that can be recovered as Keras models (this will apply in TF 2.5).

FOR DEVS: If you are overwriting `_tracking_metadata` in your class, this property has been used to save metadata in the SavedModel. The metadata field will be deprecated soon, so please move the metadata to a different file.

W0613 03:33:46.083556 4613125568 save.py:1240] FOR KERAS USERS: The object that you are saving contains one or more Keras models or layers. If you are loading the SavedModel with `tf.keras.models.load_model`, continue reading (otherwise, you may ignore the following instructions). Please change your code to save with `tf.keras.models.save_model` or `model.save`, and confirm that the file "keras.metadata" exists in the export directory. In the future, Keras will only load the SavedModels that have this file. In other words, `tf.saved_model.save` will no longer write SavedModels that can be recovered as Keras models (this will apply in TF 2.5).

FOR DEVS: If you are overwriting `_tracking_metadata` in your class, this property has been used to save metadata in the SavedModel. The m

etadta field will be deprecated soon, so please move the metadata to a different file.

INFO:tensorflow:Assets written to: Tensorflow/workspace/models/my_ssd_mobnet_tuned/export/saved_model/assets

I0613 03:33:46.773591 4613125568 builder_impl.py:775] Assets written to: Tensorflow/workspace/models/my_ssd_mobnet_tuned/export/saved_model/assets

INFO:tensorflow:Writing pipeline config file to Tensorflow/workspace/models/my_ssd_mobnet_tuned/export/pipeline.config

I0613 03:33:47.843036 4613125568 config_util.py:254] Writing pipeline config file to Tensorflow/workspace/models/my_ssd_mobnet_tuned/export/pipeline.config

11. Conversion to TFJS

In [54]:

```
!pip install tensorflowjs
```

Requirement already satisfied: tensorflowjs in ./tfod/lib/python3.7/site-packages (3.7.0)

Requirement already satisfied: six<2,>=1.12.0 in ./tfod/lib/python3.7/site-packages (from tensorflowjs) (1.15.0)

Requirement already satisfied: tensorflow<3,>=2.1.0 in ./tfod/lib/python3.7/site-packages (from tensorflowjs) (2.5.0)

Requirement already satisfied: tensorflow-hub<0.13,>=0.7.0 in ./tfod/lib/python3.7/site-packages (from tensorflowjs) (0.12.0)

Requirement already satisfied: absl-py~=0.10 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (0.12.0)

Requirement already satisfied: opt-einsum~=3.3.0 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (3.3.0)

Requirement already satisfied: gast==0.4.0 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (0.4.0)

Requirement already satisfied: google-pasta~=0.2 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (0.2.0)

Requirement already satisfied: tensorboard~=2.5 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (2.5.0)

Requirement already satisfied: numpy~=1.19.2 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (1.19.5)

Requirement already satisfied: wrapt~=1.12.1 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (1.12.1)

Requirement already satisfied: keras-nightly~=2.5.0.dev in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (2.5.0.dev2021032900)

Requirement already satisfied: wheel~=0.35 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (0.36.2)

Requirement already satisfied: typing-extensions~=3.7.4 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (3.7.4.3)

Requirement already satisfied: grpcio~=1.34.0 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (1.34.1)

Requirement already satisfied: protobuf>=3.9.2 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (3.17.3)

Requirement already satisfied: flatbuffers~=1.12.0 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (1.12.2)

Requirement already satisfied: tensorflow-estimator<2.6.0,>=2.5.0rc0 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (2.5.0)

Requirement already satisfied: astunparse~=1.6.3 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (1.6.3)

Requirement already satisfied: termcolor~=1.1.0 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (1.1.0)

Requirement already satisfied: h5py~=3.1.0 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (3.1.0)

Requirement already satisfied: keras-preprocessing~=1.1.2 in ./tfod/lib/python3.7/site-packages (from tensorflow<3,>=2.1.0->tensorflowjs) (1.1.2)

Requirement already satisfied: cached-property in ./tfod/lib/python3.7/site-packages (from h5py~=3.1.0->tensorflow<3,>=2.1.0->tensorflowjs) (1.5.2)

Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (0.6.1)

Requirement already satisfied: markdown>=2.6.8 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (3.3.4)

Requirement already satisfied: werkzeug>=0.11.15 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (2.0.1)

Requirement already satisfied: google-auth<2,>=1.6.3 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (1.31.0)

Requirement already satisfied: requests<3,>=2.21.0 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (2.25.1)

Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (0.4.4)

Requirement already satisfied: setuptools>=41.0.0 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (57.0.0)

Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in ./tfod/lib/python3.7/site-packages (from tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (1.8.0)

Requirement already satisfied: rsa<5,>=3.1.4 in ./tfod/lib/python3.7/site-packages (from google-auth<2,>=1.6.3->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (4.7.2)

Requirement already satisfied: pyasn1-modules>=0.2.1 in ./tfod/lib/python3.7/site-packages (from google-auth<2,>=1.6.3->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (0.2.8)

Requirement already satisfied: cachetools<5.0,>=2.0.0 in ./tfod/lib/python3.7/site-packages (from google-auth<2,>=1.6.3->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (4.2.2)

Requirement already satisfied: requests-oauthlib>=0.7.0 in ./tfod/lib/python3.7/site-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (1.3.0)

Requirement already satisfied: importlib-metadata in ./tfod/lib/python3.7/site-packages (from markdown>=2.6.8->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (4.5.0)

Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in ./tfod/lib/python3.7/site-packages (from pyasn1-modules>=0.2.1->google-auth<2,>=1.6.3->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (0.4.8)

Requirement already satisfied: certifi>=2017.4.17 in ./tfod/lib/python3.7/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (2021.5.30)

Requirement already satisfied: idna<3,>=2.5 in ./tfod/lib/python3.7/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (2.10)

Requirement already satisfied: urllib3<1.27,>=1.21.1 in ./tfod/lib/python3.7/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (1.26.5)

Requirement already satisfied: chardet<5,>=3.0.2 in ./tfod/lib/python3.7/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (4.0.0)

Requirement already satisfied: oauthlib>=3.0.0 in ./tfod/lib/python3.7/site-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (3.1.1)

Requirement already satisfied: zipp>=0.5 in ./tfod/lib/python3.7/site-packages (from importlib-metadata->markdown>=2.6.8->tensorboard~=2.5->tensorflow<3,>=2.1.0->tensorflowjs) (3.4.1)

In [55]:

```
command = "tensorflowjs_converter --input_format=tf_saved_model --output_node_names='detection_boxes,detection_classes,detection_features,detection_multiclass_scores,detection_scores,num_detections,raw_detection_boxes,raw_detection_scores' --output_format=tfjs_graph_model --signature_name=serving_default {} {}".format(os.path.join(paths['OUTPUT_PATH'], 'saved_model'), paths['TFJS_PATH'])
```

In [56]:

```
print(command)
```

```
tensorflowjs_converter --input_format=tf_saved_model --output_node_names='detection_boxes,detection_classes,detection_features,detection_multiclass_scores,detection_scores,num_detections,raw_detection_boxes,raw_detection_scores' --output_format=tfjs_graph_model --signature_name=serving_default Tensorflow/workspace/models/my_ssd_mobnet_tuned/export/saved_model Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfjsexport
```


In [57]:

```
!{command}
```

```
2021-06-13 03:33:56.471474: I tensorflow/core/platform/cpu_feature_g
uard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Ne
ural Network Library (oneDNN) to use the following CPU instructions
in performance-critical operations: AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appr
opriate compiler flags.
```

```
2021-06-13 03:34:07.787300: I tensorflow/core/grappler/devices.cc:7
8] Number of eligible GPUs (core count >= 8, compute capability >=
0.0): 0 (Note: TensorFlow was not compiled with CUDA or ROCm suppor
t)
```

```
2021-06-13 03:34:07.787405: I tensorflow/core/grappler/clusters/sing
le_machine.cc:357] Starting new session
```

```
2021-06-13 03:34:08.169264: I tensorflow/core/grappler/optimizers/me
ta_optimizer.cc:1144] Optimization results for grappler item: graph_
to_optimize
```

```
function_optimizer: Graph size after: 3991 nodes (3582), 8430 edge
s (8014), time = 243.776ms.
```

```
function_optimizer: function_optimizer did nothing. time = 7.182m
s.
```

```
2021-06-13 03:34:13.473802: I tensorflow/core/grappler/optimizers/me
ta_optimizer.cc:1144] Optimization results for grappler item: graph_
to_optimize
```

```
debug_stripper: Graph size after: 3687 nodes (0), 8201 edges (0),
time = 15.43ms.
```

```
model_pruner: Graph size after: 3236 nodes (-451), 7750 edges (-45
1), time = 79.627ms.
```

```
constant_folding: Graph size after: 1555 nodes (-1681), 5834 edges
(-1916), time = 283.524ms.
```

```
arithmetic_optimizer: Graph size after: 1571 nodes (16), 5858 edge
s (24), time = 51.946ms.
```

```
dependency_optimizer: Graph size after: 1457 nodes (-114), 1648 ed
ges (-4210), time = 45.755ms.
```

```
model_pruner: Graph size after: 1457 nodes (0), 1648 edges (0), ti
me = 22.469ms.
```

```
constant_folding: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 60.771ms.
```

```
arithmetic_optimizer: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 42.687ms.
```

```
dependency_optimizer: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 28.84ms.
```

```
debug_stripper: debug_stripper did nothing. time = 4.55ms.
```

```
model_pruner: Graph size after: 1457 nodes (0), 1648 edges (0), ti
me = 15.66ms.
```

```
constant_folding: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 58.733ms.
```

```
arithmetic_optimizer: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 46.197ms.
```

```
dependency_optimizer: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 31.003ms.
```

```
model_pruner: Graph size after: 1457 nodes (0), 1648 edges (0), ti
me = 19.618ms.
```

```
constant_folding: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 57.009ms.
```

```
arithmetic_optimizer: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 55.102ms.
```

```
dependency_optimizer: Graph size after: 1457 nodes (0), 1648 edges
(0), time = 28.047ms.
```

```
2021-06-13 03:34:23.853794: I tensorflow/core/grappler/optimizers/me
ta_optimizer.cc:1144] Optimization results for grappler item: graph_
```

```

to_optimize
  remapper: Graph size after: 1421 nodes (-112), 1308 edges (-112),
time = 14.811ms.
  constant_folding: Graph size after: 1117 nodes (-304), 1308 edges
(0), time = 94.736ms.
  arithmetic_optimizer: Graph size after: 1117 nodes (0), 1308 edges
(0), time = 36.23ms.
  dependency_optimizer: Graph size after: 1117 nodes (0), 1308 edges
(0), time = 22.953ms.
  remapper: Graph size after: 1117 nodes (0), 1308 edges (0), time =
14.005ms.
  constant_folding: Graph size after: 1117 nodes (0), 1308 edges
(0), time = 47.969ms.
  arithmetic_optimizer: Graph size after: 1117 nodes (0), 1308 edges
(0), time = 39.734ms.
  dependency_optimizer: Graph size after: 1117 nodes (0), 1308 edges
(0), time = 26.208ms.

```

Writing weight file Tensorflow/workspace/models/my_ssd_mobnet_tuned/
tfjsexport/model.json...

In [58]:

```
# Test Code: https://github.com/nicknochnack/RealTimeSignLanguageDetectionwithTFJS
```

12. Conversion to TFLite

In [59]:

```
TFLITE_SCRIPT = os.path.join(paths['APIMODEL_PATH'], 'research', 'object_detection', 'export_tflite_graph_tf2.py')
```

In [60]:

```
command = "python {} --pipeline_config_path={} --trained_checkpoint_dir={} --output_directory={}".format(TFLITE_SCRIPT, files['PIPELINE_CONFIG'], paths['CHECKPOINT_PATH'], paths['TFLITE_PATH'])
```

In [61]:

```
print(command)
```

```
python Tensorflow/models/research/object_detection/export_tflite_graph_tf2.py --pipeline_config_path=Tensorflow/workspace/models/my_ssd_mobnet_tuned/pipeline.config --trained_checkpoint_dir=Tensorflow/workspace/models/my_ssd_mobnet_tuned --output_directory=Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfliteexport
```

In [62]:

```
!{command}
```

2021-06-13 03:34:30.864172: I tensorflow/core/platform/cpu_feature_guard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations: AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.meta_architectures.ssd_meta_arch.SSDMetaArch object at 0x1547b51d0>, because it is not built.

W0613 03:34:41.563776 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.meta_architectures.ssd_meta_arch.SSDMetaArch object at 0x1547b51d0>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x155d3a2e8>, because it is not built.

W0613 03:34:41.733811 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x155d3a2e8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f76828>, because it is not built.

W0613 03:34:41.733998 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f76828>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f76ba8>, because it is not built.

W0613 03:34:41.734233 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f76ba8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x155f76b00>, because it is not built.

W0613 03:34:41.734369 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x155f76b00>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d38eb8>, because it is not built.

W0613 03:34:41.735260 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d38eb8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d38470>, because it is not built.

W0613 03:34:41.735429 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d38470>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x155d38b00>, because it is not built.

W0613 03:34:41.735548 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x155d38b00>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d38b38>, because it is not built.

W0613 03:34:41.735636 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm

```
m.FreezableBatchNorm object at 0x155d38b38>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f58278>, because it is not built.
W0613 03:34:41.735751 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f58278>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x155f58208>, because it is not built.
W0613 03:34:41.735830 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.convolutional.SeparableConv2D object at 0x155f58208>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f58588>, because it is not built.
W0613 03:34:41.736005 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f58588>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f58a90>, because it is not built.
W0613 03:34:41.736177 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f58a90>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x1565e0390>, because it is not built.
W0613 03:34:41.736336 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x1565e0390>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f77f28>, because it is not built.
W0613 03:34:41.736494 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f77f28>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f77f98>, because it is not built.
W0613 03:34:41.736671 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f77f98>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x1565cf278>, because it is not built.
W0613 03:34:41.736836 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x1565cf278>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x1565cf2b0>, because it is not built.
W0613 03:34:41.737003 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x1565cf2b0>, because it is not built.
WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f58278>, because it is not built.
```

rflow.python.keras.layers.core.Lambda object at 0x1565cf2e8>, because it is not built.

W0613 03:34:41.737178 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x1565cf2e8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x1565cf320>, because it is not built.

W0613 03:34:41.737292 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x1565cf320>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x1565cfe80>, because it is not built.

W0613 03:34:41.737426 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x1565cfe80>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x1565d5780>, because it is not built.

W0613 03:34:41.737565 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x1565d5780>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f84198>, because it is not built.

W0613 03:34:41.737690 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f84198>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f84278>, because it is not built.

W0613 03:34:41.737807 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f84278>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f841d0>, because it is not built.

W0613 03:34:41.737897 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f841d0>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f84d68>, because it is not built.

W0613 03:34:41.737987 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f84d68>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f84a90>, because it is not built.

W0613 03:34:41.738084 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f84a90>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f846d8>, because it is not built.

W0613 03:34:41.738185 4611028416 save_impl.py:77] Skipping full seri

alization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155f846d8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155fc3128>, because it is not built.

W0613 03:34:41.738324 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155fc3128>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d66278>, because it is not built.

W0613 03:34:41.738428 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d66278>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d49710>, because it is not built.

W0613 03:34:41.738512 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d49710>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d49cf8>, because it is not built.

W0613 03:34:41.738598 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d49cf8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d49e10>, because it is not built.

W0613 03:34:41.738682 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d49e10>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d49be0>, because it is not built.

W0613 03:34:41.738767 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d49be0>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d49358>, because it is not built.

W0613 03:34:41.738848 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d49358>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d49438>, because it is not built.

W0613 03:34:41.738933 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d49438>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f6b978>, because it is not built.

W0613 03:34:41.739023 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f6b978>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d66400>, because it is not built.

W0613 03:34:41.739104 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d66400>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f6e588>, because it is not built.

W0613 03:34:41.739194 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155f6e588>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d46128>, because it is not built.

W0613 03:34:41.739277 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d46128>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d46f60>, because it is not built.

W0613 03:34:41.739372 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d46f60>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d461d0>, because it is not built.

W0613 03:34:41.739447 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d461d0>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d46898>, because it is not built.

W0613 03:34:41.739541 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d46898>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d466d8>, because it is not built.

W0613 03:34:41.739617 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <object_detection.core.freezable_batch_norm.FreezableBatchNorm object at 0x155d466d8>, because it is not built.

WARNING:tensorflow:Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d46b00>, because it is not built.

W0613 03:34:41.739709 4611028416 save_impl.py:77] Skipping full serialization of Keras layer <tensorflow.python.keras.layers.core.Lambda object at 0x155d46b00>, because it is not built.

2021-06-13 03:34:52.065443: W tensorflow/python/util/util.cc:348] Sets are not currently considered sequences, but this may change in the future, so consider avoiding using them.

W0613 03:35:11.642822 4611028416 save.py:243] Found untraced functions such as WeightSharedConvolutionalBoxPredictor_layer_call_and_return_conditional_losses, WeightSharedConvolutionalBoxPredictor_layer_call_fn, WeightSharedConvolutionalBoxHead_layer_call_and_return_conditional_losses, WeightSharedConvolutionalBoxHead_layer_call_fn, WeightSharedConvolutionalBoxPredictor_layer_call_fn while saving (showing

5 of 260). These functions will not be directly callable after loading.

/Users/AlanZhu/Desktop/OD/TFODCourse/tfod/lib/python3.7/site-packages/tensorflow/python/keras/utils/generic_utils.py:497: CustomMaskWarning: Custom mask layers require a config and must override get_config. When loading, the custom mask layer must be passed to the custom_objects argument.

category=CustomMaskWarning)

WARNING:tensorflow:FOR KERAS USERS: The object that you are saving contains one or more Keras models or layers. If you are loading the SavedModel with `tf.keras.models.load_model`, continue reading (otherwise, you may ignore the following instructions). Please change your code to save with `tf.keras.models.save_model` or `model.save`, and confirm that the file "keras.metadata" exists in the export directory. In the future, Keras will only load the SavedModels that have this file. In other words, `tf.saved_model.save` will no longer write SavedModels that can be recovered as Keras models (this will apply in TF 2.5).

FOR DEVS: If you are overwriting `_tracking_metadata` in your class, this property has been used to save metadata in the SavedModel. The metadata field will be deprecated soon, so please move the metadata to a different file.

W0613 03:35:16.421852 4611028416 save.py:1240] FOR KERAS USERS: The object that you are saving contains one or more Keras models or layers. If you are loading the SavedModel with `tf.keras.models.load_model`, continue reading (otherwise, you may ignore the following instructions). Please change your code to save with `tf.keras.models.save_model` or `model.save`, and confirm that the file "keras.metadata" exists in the export directory. In the future, Keras will only load the SavedModels that have this file. In other words, `tf.saved_model.save` will no longer write SavedModels that can be recovered as Keras models (this will apply in TF 2.5).

FOR DEVS: If you are overwriting `_tracking_metadata` in your class, this property has been used to save metadata in the SavedModel. The metadata field will be deprecated soon, so please move the metadata to a different file.

INFO:tensorflow:Assets written to: Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfliteexport/saved_model/assets

I0613 03:35:16.846188 4611028416 builder_impl.py:775] Assets written to: Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfliteexport/saved_model/assets

In [63]:

```
FROZEN_TFLITE_PATH = os.path.join(paths['TFLITE_PATH'], 'saved_model')
TFLITE_MODEL = os.path.join(paths['TFLITE_PATH'], 'saved_model', 'detect.tflite')
)
```

In [64]:

```
command = "tflite_convert \
--saved_model_dir={} \
--output_file={} \
--input_shapes=1,300,300,3 \
--input_arrays=normalized_input_image_tensor \
--output_arrays='TFLite_Detection_PostProcess','TFLite_Detection_PostProcess:1','TFLite_Detection_PostProcess:2','TFLite_Detection_PostProcess:3' \
--inference_type=FLOAT \
--allow_custom_ops".format(FROZEN_TFLITE_PATH, TFLITE_MODEL, )
```

In [65]:

```
print(command)
```

```
tflite_convert --saved_model_dir=Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfliteexport/saved_model --output_file=Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfliteexport/saved_model/detect.tflite --input_shapes=1,300,300,3 --input_arrays=normalized_input_image_tensor --output_arrays='TFLite_Detection_PostProcess','TFLite_Detection_PostProcess:1','TFLite_Detection_PostProcess:2','TFLite_Detection_PostProcess:3' --inference_type=FLOAT --allow_custom_ops
```

In [66]:

```
!{command}
```

```
2021-06-13 03:35:23.188936: I tensorflow/core/platform/cpu_feature_guard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations: AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
2021-06-13 03:35:36.106592: W tensorflow/compiler/mlir/lite/python/tf_tfl_flatbuffer_helpers.cc:345] Ignored output_format.
2021-06-13 03:35:36.106619: W tensorflow/compiler/mlir/lite/python/tf_tfl_flatbuffer_helpers.cc:348] Ignored drop_control_dependency.
2021-06-13 03:35:36.106626: W tensorflow/compiler/mlir/lite/python/tf_tfl_flatbuffer_helpers.cc:354] Ignored change_concat_input_ranges.
2021-06-13 03:35:36.107694: I tensorflow/cc/saved_model/loader.cc:38] Reading SavedModel from: Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfliteexport/saved_model
2021-06-13 03:35:36.240144: I tensorflow/cc/saved_model/loader.cc:90] Reading meta graph with tags { serve }
2021-06-13 03:35:36.240179: I tensorflow/cc/saved_model/loader.cc:132] Reading SavedModel debug info (if present) from: Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfliteexport/saved_model
2021-06-13 03:35:36.806846: I tensorflow/cc/saved_model/loader.cc:206] Restoring SavedModel bundle.
2021-06-13 03:35:37.857157: I tensorflow/cc/saved_model/loader.cc:190] Running initialization op on SavedModel bundle at path: Tensorflow/workspace/models/my_ssd_mobnet_tuned/tfliteexport/saved_model
2021-06-13 03:35:38.322090: I tensorflow/cc/saved_model/loader.cc:277] SavedModel load for tags { serve }; Status: success: OK. Took 2214398 microseconds.
2021-06-13 03:35:39.654392: I tensorflow/compiler/mlir/tensorflow/utils/dump_mlir_util.cc:210] disabling MLIR crash reproducer, set env var `MLIR_CRASH_REPRODUCER_DIRECTORY` to enable.
```

13. Zip and Export Models

In [67]:

```
!tar -czf models.tar.gz {paths['CHECKPOINT_PATH']}
```

In [68]:

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

```
-----  
-----  
ModuleNotFoundError                                Traceback (most recent call  
1 last)  
<ipython-input-68-d5df0069828e> in <module>  
----> 1 from google.colab import drive  
      2 drive.mount('/content/drive')
```

ModuleNotFoundError: No module named 'google.colab'

In []: