

```
!pip install tensorflow-gpu
```

```
Collecting tensorflow-gpu
  Downloading https://files.pythonhosted.org/packages/85/cc/a27e73cf8b23f2ce4bdd2b7089a42a7819ce6dd7366dceba406ddc5daa9c/tensorflow-gpu-2.4.1-py3-none-any.whl (394.3MB)
Requirement already satisfied: h5py~=2.10.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (2.10.0)
Requirement already satisfied: wheel~=0.35 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.36.2)
Requirement already satisfied: astunparse~=1.6.3 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.6.3)
Requirement already satisfied: flatbuffers~=1.12.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.12)
Requirement already satisfied: google-pasta~=0.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.2.0)
Requirement already satisfied: keras-preprocessing~=1.1.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.1.2)
Requirement already satisfied: typing-extensions~=3.7.4 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (3.7.4.3)
Requirement already satisfied: gast==0.3.3 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.3.3)
Requirement already satisfied: tensorboard~=2.4 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (2.4.1)
Requirement already satisfied: absl-py~=0.10 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.12.0)
Requirement already satisfied: six~=1.15.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.15.0)
Requirement already satisfied: numpy~=1.19.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.19.5)
Requirement already satisfied: protobuf~=3.9.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (3.12.4)
Requirement already satisfied: termcolor~=1.1.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.1.0)
Requirement already satisfied: opt-einsum~=3.3.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (3.3.0)
Requirement already satisfied: tensorflow-estimator<2.5.0, >=2.4.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (2.4.0)
Requirement already satisfied: grpcio~=1.32.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.32.0)
Requirement already satisfied: wrapt~=1.12.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.12.1)
Requirement already satisfied: google-auth-oauthlib<0.5, >=0.4.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.4.1)
Requirement already satisfied: requests<3, >=2.21.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (2.21.0)
Requirement already satisfied: tensorboard-plugin-wit>1.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.6.0)
Requirement already satisfied: setuptools>41.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (41.0.0)
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (3.3.7)
Requirement already satisfied: werkzeug>=0.11.15 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.11.15)
Requirement already satisfied: google-auth<2, >=1.6.3 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.6.3)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.7.0)
Requirement already satisfied: chardet<4, >=3.0.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (3.0.2)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (2017.4.17)
Requirement already satisfied: idna<3, >=2.5 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (2.5)
Requirement already satisfied: urllib3!=1.25.0, !=1.25.1, <1.26, >=1.21.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.25.1)
Requirement already satisfied: importlib-metadata; python_version < "3.8" in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (1.4.0)
Requirement already satisfied: cachetools<5.0, >=2.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (2.0.0)
Requirement already satisfied: rsa<5, >=3.1.4; python_version >= "3.6" in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (3.1.4)
Requirement already satisfied: pyasn1-modules>=0.2.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.2.1)
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (3.0.0)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.5)
Requirement already satisfied: pyasn1>=0.1.3 in /usr/local/lib/python3.7/dist-packages (from tensorflow-gpu) (0.1.3)
Installing collected packages: tensorflow-gpu
Successfully installed tensorflow-gpu-2.4.1
```

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

```
2.4.1
```

✓ Cloning TFOD 2.0 Github

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

```
Cloning into 'models'...
remote: Enumerating objects: 56138, done.
remote: Counting objects: 100% (182/182), done.
remote: Compressing objects: 100% (127/127), done.
remote: Total 56138 (delta 79), reused 142 (delta 55), pack-reused 55956
Receiving objects: 100% (56138/56138), 572.16 MiB | 26.98 MiB/s, done.
Resolving deltas: 100% (38684/38684), done.
```

```
pwd
```

```
'/content'
```

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

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

```
pwd
```

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

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

```
!git clone https://github.com/cocodataset/cocoapi.git
```

```
Cloning into 'cocoapi'...
remote: Enumerating objects: 975, done.
remote: Total 975 (delta 0), reused 0 (delta 0), pack-reused 975
Receiving objects: 100% (975/975), 11.72 MiB | 9.07 MiB/s, done.
Resolving deltas: 100% (576/576), done.
```

```
cd cocoapi/PythonAPI
```

```
/content/models/research/cocoapi/PythonAPI
```

```
!make
```

```
tree = Parsing.p_module(s, pxd, full_module_name)
building 'pycocotools._mask' extension
creating build
creating build/common
creating build/temp.linux-x86_64-3.7
creating build/temp.linux-x86_64-3.7/pycocotools
x86_64-linux-gnu-gcc -pthread -Wno-unused-result -Wsign-compare -DNDEBUG -g -fwrapv -O2 -Wall -g -fdebug-prefix-map=/build/pytho
../common/maskApi.c: In function 'rleDecode':
../common/maskApi.c:46:7: warning: this 'for' clause does not guard... [-Wmisleading-indentation]
    for( k=0; k<R[i].cnts[j]; k++ ) *(M++)=v; v=!v; }}
    ^~~
../common/maskApi.c:46:49: note: ...this statement, but the latter is misleadingly indented as if it were guarded by the 'for'
    for( k=0; k<R[i].cnts[j]; k++ ) *(M++)=v; v=!v; }}
                                   ^
../common/maskApi.c: In function 'rleFrPoly':
../common/maskApi.c:166:3: warning: this 'for' clause does not guard... [-Wmisleading-indentation]
    for(j=0; j<k; j++) x[j]=(int)(scale*xy[j*2+0]+.5); x[k]=x[0];
    ^~~
../common/maskApi.c:166:54: note: ...this statement, but the latter is misleadingly indented as if it were guarded by the 'for'
    for(j=0; j<k; j++) x[j]=(int)(scale*xy[j*2+0]+.5); x[k]=x[0];
                                   ^
../common/maskApi.c:167:3: warning: this 'for' clause does not guard... [-Wmisleading-indentation]
    for(j=0; j<k; j++) y[j]=(int)(scale*xy[j*2+1]+.5); y[k]=y[0];
    ^~~
../common/maskApi.c:167:54: note: ...this statement, but the latter is misleadingly indented as if it were guarded by the 'for'
    for(j=0; j<k; j++) y[j]=(int)(scale*xy[j*2+1]+.5); y[k]=y[0];
                                   ^
../common/maskApi.c: In function 'rleToString':
../common/maskApi.c:212:7: warning: this 'if' clause does not guard... [-Wmisleading-indentation]
    if(more) c |= 0x20; c+=48; s[p++] = c;
    ^~
../common/maskApi.c:212:27: note: ...this statement, but the latter is misleadingly indented as if it were guarded by the 'if'
    if(more) c |= 0x20; c+=48; s[p++] = c;
                                   ^
../common/maskApi.c: In function 'rleFrString':
../common/maskApi.c:220:3: warning: this 'while' clause does not guard... [-Wmisleading-indentation]
    while( s[m] ) m++; cnts=malloc(sizeof(uint)*m); m=0;
    ^~~~~
../common/maskApi.c:220:22: note: ...this statement, but the latter is misleadingly indented as if it were guarded by the 'while'
    while( s[m] ) m++; cnts=malloc(sizeof(uint)*m); m=0;
                                   ^~~~~
../common/maskApi.c:228:5: warning: this 'if' clause does not guard... [-Wmisleading-indentation]
    if(m>2) x+=(long) cnts[m-2]; cnts[m++]=(uint) x;
    ^~
../common/maskApi.c:228:34: note: ...this statement, but the latter is misleadingly indented as if it were guarded by the 'if'
    if(m>2) x+=(long) cnts[m-2]; cnts[m++]=(uint) x;
                                   ^~~~
../common/maskApi.c: In function 'rleToBbox':
../common/maskApi.c:141:31: warning: 'xp' may be used uninitialized in this function [-Wmaybe-uninitialized]
    if(j%2==0) xp=x; else if(xp<x) { ys=0; ye=h-1; }
                                   ^
x86_64-linux-gnu-gcc -pthread -Wno-unused-result -Wsign-compare -DNDEBUG -g -fwrapv -O2 -Wall -g -fdebug-prefix-map=/build/pytho
creating build/lib.linux-x86_64-3.7
creating build/lib.linux-x86_64-3.7/pycocotools
x86_64-linux-gnu-gcc -pthread -shared -Wl,-O1 -Wl,-Bsymbolic-functions -Wl,-Bsymbolic-functions -Wl,-z,relro -Wl,-Bsymbolic-func
copying build/lib.linux-x86_64-3.7/pycocotools/_mask.cpython-37m-x86_64-linux-gnu.so -> pycocotools
rm -rf build
```

```
cp -r pycocotools /content/models/research
```

Start coding or [generate](#) with AI.

▼ Install the Object Detection API

```
cd ..
```

```
/content/models
```

cd ..

/content/models/research

cp object_detection/packages/tf2/setup.py .

!python -m pip install .

```

Processing /content/models/research
Requirement already satisfied: avro-python3 in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (1.10.2)
Requirement already satisfied: apache-beam in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (2.28.0)
Requirement already satisfied: pillow in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (7.1.2)
Requirement already satisfied: lxml in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (4.2.6)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (3.2.2)
Requirement already satisfied: Cython in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (0.29.22)
Requirement already satisfied: contextlib2 in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (0.5.5)
Requirement already satisfied: tf-slim in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (1.1.0)
Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (1.15.0)
Requirement already satisfied: pycocotools in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (2.0.2)
Requirement already satisfied: lvis in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (0.5.3)
Requirement already satisfied: scipy in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (1.4.1)
Requirement already satisfied: pandas in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (1.1.5)
Requirement already satisfied: tf-models-official in /usr/local/lib/python3.7/dist-packages (from object-detection==0.1) (2.4.0)
Requirement already satisfied: crcmod<2.0,>=1.7 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: fastavro<2,>=0.21.4 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: grpcio<2,>=1.29.0 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: httplib2<0.18.0,>=0.8 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: future<1.0.0,>=0.18.2 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: requests<3.0.0,>=2.24.0 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: numpy<1.20.0,>=1.14.3 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: typing-extensions<3.8.0,>=3.7.0 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: pyarrow<3.0.0,>=0.15.1 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: pymongo<4.0.0,>=3.8.0 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: dill<0.3.2,>=0.3.1.1 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: python-dateutil<3,>=2.8.0 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: mock<3.0.0,>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: pydot<2,>=1.2.0 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: protobuf<4,>=3.12.2 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: pytz>=2018.3 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: oauth2client<5,>=2.0.1 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: hdfs<3.0.0,>=2.1.0 in /usr/local/lib/python3.7/dist-packages (from apache-beam->object-detection==0)
Requirement already satisfied: pyparsing!=2.0.4,!2.1.2,!2.1.6,>=2.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->object-detection==0)
Requirement already satisfied: cycycler>=0.10 in /usr/local/lib/python3.7/dist-packages (from matplotlib->object-detection==0)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->object-detection==0)
Requirement already satisfied: absl-py>=0.2.2 in /usr/local/lib/python3.7/dist-packages (from tf-slim->object-detection==0)
Requirement already satisfied: setuptools>=18.0 in /usr/local/lib/python3.7/dist-packages (from pycocotools->object-detection==0)
Requirement already satisfied: opencv-python>=4.1.0.25 in /usr/local/lib/python3.7/dist-packages (from lvis->object-detection==0)
Requirement already satisfied: kaggle>=1.3.9 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: py-cpuinfo>=3.3.0 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: tensorflow-model-optimization>=0.4.1 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: tensorflow>=2.4.0 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: sequeval in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0.1)
Requirement already satisfied: gin-config in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: opencv-python-headless in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: pyyaml>=5.1 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: dataclasses in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: psutil>=5.4.3 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: tensorflow-datasets in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: google-cloud-bigquery>=0.31.0 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: sentencepiece in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: tensorflow-hub>=0.6.0 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: google-api-python-client>=1.6.7 in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: tensorflow-addons in /usr/local/lib/python3.7/dist-packages (from tf-models-official->object-detection==0)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests<3.0.0,>=2.24.0->apache-beam)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests<3.0.0,>=2.24.0->apache-beam)

```

From within TensorFlow/models/research/

!python object_detection/builders/model_builder_tf2_test.py

```

2021-04-17 12:54:54.700013: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
Running tests under Python 3.7.10: /usr/bin/python3
[ RUN      ] ModelBuilderTF2Test.test_create_center_net_model
2021-04-17 12:54:56.884068: I tensorflow/compiler/jit/xla_cpu_device.cc:41] Not creating XLA devices, tf_xla_enable_xla_devices
2021-04-17 12:54:56.884879: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.899070: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:56.899638: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1720] Found device 0 with properties:
pciBusID: 0000:00:04.0 name: Tesla P100-PCIE-16GB computeCapability: 6.0
coreClock: 1.3285GHz coreCount: 56 deviceMemorySize: 15.90GiB deviceMemoryBandwidth: 681.88GiB/s
2021-04-17 12:54:56.899667: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.902408: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.902471: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.904174: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.904578: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.906909: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.907521: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library

```

```

2021-04-17 12:54:56.907716: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.907801: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:56.908402: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:56.908940: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1862] Adding visible gpu devices: 0
2021-04-17 12:54:56.909288: I tensorflow/core/platform/cpu_feature_guard.cc:142] This TensorFlow binary is optimized with oneAPI
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
2021-04-17 12:54:56.909447: I tensorflow/compiler/jit/xla_gpu_device.cc:99] Not creating XLA devices, tf_xla_enable_xla_devices
2021-04-17 12:54:56.909547: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:56.910098: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1720] Found device 0 with properties:
pciBusID: 0000:00:04.0 name: Tesla P100-PCIE-16GB computeCapability: 6.0
coreClock: 1.3285GHz coreCount: 56 deviceMemorySize: 15.90GiB deviceMemoryBandwidth: 681.88GiB/s
2021-04-17 12:54:56.910131: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.910162: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.910188: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.910212: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.910231: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.910250: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.910272: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.910293: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:56.910367: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:56.910916: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:56.911431: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1862] Adding visible gpu devices: 0
2021-04-17 12:54:56.911510: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 12:54:57.433655: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1261] Device interconnect StreamExecutor with str
2021-04-17 12:54:57.433705: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1267] 0
2021-04-17 12:54:57.433714: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1280] 0: N
2021-04-17 12:54:57.433961: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:57.434592: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:57.435141: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 12:54:57.435628: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:39] Overriding allow_growth setting becaus
2021-04-17 12:54:57.435668: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1406] Created TensorFlow device (/job:localhost/r
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_center_net_model): 1.2s
I0417 12:54:57.894305 140352742918016 test_util.py:2076] time(__main__.ModelBuilderTF2Test.test_create_center_net_model): 1.2s
[ OK ] ModelBuilderTF2Test.test_create_center_net_model
[ RUN ] ModelBuilderTF2Test.test_create_center_net_model_from_keypoints
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_center_net_model_from_keypoints): 0.32s
I0417 12:54:58.212245 140352742918016 test_util.py:2076] time(__main__.ModelBuilderTF2Test.test_create_center_net_model_from_key
[ OK ] ModelBuilderTF2Test.test_create_center_net_model_from_keypoints
[ RUN ] ModelBuilderTF2Test.test_create_experimental_model
INFO:tensorflow:time(__main__.ModelBuilderTF2Test.test_create_experimental_model): 0.0s

```

```
cd /content/trainingdemo/pre-trained-models
```

```
/content/trainingdemo/pre-trained-models
```

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

```

--2021-04-17 12:21:29-- http://download.tensorflow.org/models/object_detection/tf2/20200711/ssd_resnet101_v1_fpn_640x640_coco17_tpu-8.tar.gz
Resolving download.tensorflow.org (download.tensorflow.org)... 108.177.127.128, 2a00:1450:4013:c07::80
Connecting to download.tensorflow.org (download.tensorflow.org)|108.177.127.128|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 386527459 (369M) [application/x-tar]
Saving to: 'ssd_resnet101_v1_fpn_640x640_coco17_tpu-8.tar.gz'

```

```
ssd_resnet101_v1_fp 100%[=====] 368.62M 94.3MB/s in 3.9s
```

```
2021-04-17 12:21:34 (94.3 MB/s) - 'ssd_resnet101_v1_fpn_640x640_coco17_tpu-8.tar.gz' saved [386527459/386527459]
```

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

```

ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/checkpoint/
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/checkpoint/ckpt-0.data-00000-of-00001
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/checkpoint/checkpoint
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/checkpoint/ckpt-0.index
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/pipeline.config
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/saved_model/
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/saved_model/saved_model.pb
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/saved_model/assets/
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/saved_model/variables/
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/saved_model/variables/variables.data-00000-of-00001
ssd_resnet101_v1_fpn_640x640_coco17_tpu-8/saved_model/variables/variables.index

```

```
pwd
```

```
'/content/trainingdemo/pre-trained-models'
```

```
cd /content/trainingdemo
```

```
/content/trainingdemo
```

ls

```
generate_tfrecord.py  models/  sample_data/  trainingdemo/
```

Create train data:

```
!python generate_tfrecord.py -x /content/trainingdemo/images/train -l /content/trainingdemo/annotations/label_map.pbtxt -o /content/tra
```

Create test data:

```
!python generate_tfrecord.py -x /content/trainingdemo/images/test -l /content/trainingdemo/annotations/label_map.pbtxt -o /content/trai
```

```
Successfully created the TFRecord file: /content/trainingdemo/annotations/train.record
```

```
Successfully created the TFRecord file: /content/trainingdemo/annotations/test.record
```

pwd

```
'/content/trainingdemo'
```

ls

```
annotations/      export_tflite_graph_tf2.py  models/
exported_models/  images/                    pre-trained-models/
exporter_main_v2.py model_main_tf2.py          __pycache__/
```

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

```
2021-04-17 13:15:59.823117: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:01.994474: I tensorflow/compiler/jit/xla_cpu_device.cc:41] Not creating XLA devices, tf_xla_enable_xla_devices
2021-04-17 13:16:01.995335: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.009382: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.009964: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1720] Found device 0 with properties:
pciBusID: 0000:00:04.0 name: Tesla P100-PCIE-16GB computeCapability: 6.0
coreClock: 1.3285GHz coreCount: 56 deviceMemorySize: 15.90GiB deviceMemoryBandwidth: 681.88GiB/s
2021-04-17 13:16:02.010017: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.012498: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.012576: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.014299: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.017437: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.016393: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.017147: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.017332: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019765: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.018047: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.018563: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1862] Adding visible gpu devices: 0
2021-04-17 13:16:02.018881: I tensorflow/core/platform/cpu_feature_guard.cc:142] This TensorFlow binary is optimized with oneAPI
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
2021-04-17 13:16:02.019147: I tensorflow/compiler/jit/xla_gpu_device.cc:99] Not creating XLA devices, tf_xla_enable_xla_devices
2021-04-17 13:16:02.019250: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.019765: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1720] Found device 0 with properties:
pciBusID: 0000:00:04.0 name: Tesla P100-PCIE-16GB computeCapability: 6.0
coreClock: 1.3285GHz coreCount: 56 deviceMemorySize: 15.90GiB deviceMemoryBandwidth: 681.88GiB/s
2021-04-17 13:16:02.019788: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019833: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019847: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019861: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019874: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019887: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019900: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019914: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.019983: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.020508: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.021009: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1862] Adding visible gpu devices: 0
2021-04-17 13:16:02.021050: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library
2021-04-17 13:16:02.023736: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1261] Device interconnect StreamExecutor with str
2021-04-17 13:16:02.533791: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1267] 0
2021-04-17 13:16:02.533804: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1280] 0: N
2021-04-17 13:16:02.534018: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.534653: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.535247: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:941] successful NUMA node read from SysFS had
2021-04-17 13:16:02.535751: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:39] Overriding allow_growth setting becaus
2021-04-17 13:16:02.535800: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1406] Created TensorFlow device (/job:localhost/r
INFO:tensorflow:Using MirroredStrategy with devices ('/job:localhost/replica:0/task:0/device:GPU:0',)
I0417 13:16:02.537474 139805635528576 mirrored_strategy.py:350] Using MirroredStrategy with devices ('/job:localhost/replica:0/t
INFO:tensorflow:Maybe overwriting train_steps: None
I0417 13:16:02.541515 139805635528576 config_util.py:552] Maybe overwriting train_steps: None
INFO:tensorflow:Maybe overwriting use_bfloat16: False
I0417 13:16:02.541664 139805635528576 config_util.py:552] Maybe overwriting use_bfloat16: False
WARNING:tensorflow:From /usr/local/lib/python3.7/dist-packages/object_detection/model_lib_v2.py:546: StrategyBase.experimental_d
Instructions for updating:
rename to distribute_datasets_from_function
W0417 13:16:02.567054 139805635528576 deprecation.py:339] From /usr/local/lib/python3.7/dist-packages/object_detection/model_lib
Instructions for updating:
rename to distribute_datasets_from_function
```

```
'/content/training_demo'
```

```

## ## ##
Object Detection (On Image) From TF2 Saved Model
=====
## ## ##

```

[s://colab.research.google.com/drive/19vcUv5qIZKCO8tKv37f4zkUjHzqKs05I#printMode=true](https://colab.research.google.com/drive/19vcUv5qIZKCO8tKv37f4zkUjHzqKs05I#printMode=true)

```

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

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

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

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

# LOAD THE MODEL

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

PATH_TO_SAVED_MODEL = PATH_TO_MODEL_DIR + "/saved_model"

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

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

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

# LOAD LABEL MAP DATA FOR PLOTTING

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

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

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

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

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

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

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

# All outputs are batches tensors.
# Convert to numpy arrays, and take index [0] to remove the batch dimension.
# We're only interested in the first num_detections.
num_detections = int(detections.pop('num_detections'))
detections = {key: value[0, :num_detections].numpy()
               for key, value in detections.items()}
detections['num_detections'] = num_detections

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

image_with_detections = image.copy()

```



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

print('Done')
# DISPLAYS OUTPUT IMAGE
cv2.imshow(image_with_detections)
# CLOSES WINDOW ONCE KEY IS PRESSED
```

Loading model...Done! Took 19.95058250427246 seconds

Running inference for /content/training_demo/images/train/image1.jpg... Done



Start coding or [generate](#) with AI.