

```
# Update CUDA for TF 2.5
!wget https://developer.download.nvidia.com/compute/cuda/repos/ubuntu2004/x86_64/libcudnn8_8.1.0.77-1+cuda11.2_amd64.deb
!dpkg -i libcudnn8_8.1.0.77-1+cuda11.2_amd64.deb
# Check if package has been installed
!ls -l /usr/lib/x86_64-linux-gnu/libcudnn.so.*
# Upgrade Tensorflow
!pip install --upgrade tensorflow==2.5.0
```

```
Found existing installation: typing_extensions 4.5.0
Uninstalling typing_extensions-4.5.0:
Successfully uninstalled typing_extensions-4.5.0
Attempting uninstall: termcolor
Found existing installation: termcolor 2.2.0
Uninstalling termcolor-2.2.0:
Successfully uninstalled termcolor-2.2.0
Attempting uninstall: tensorflow-estimator
Found existing installation: tensorflow-estimator 2.12.0
Uninstalling tensorflow-estimator-2.12.0:
Successfully uninstalled tensorflow-estimator-2.12.0
Attempting uninstall: flatbuffers
Found existing installation: flatbuffers 23.3.3
Uninstalling flatbuffers-23.3.3:
Successfully uninstalled flatbuffers-23.3.3
Attempting uninstall: tensorboard-data-server
Found existing installation: tensorboard-data-server 0.7.0
Uninstalling tensorboard-data-server-0.7.0:
Successfully uninstalled tensorboard-data-server-0.7.0
Attempting uninstall: six
Found existing installation: six 1.16.0
Uninstalling six-1.16.0:
Successfully uninstalled six-1.16.0
Attempting uninstall: numpy
Found existing installation: numpy 1.22.4
Uninstalling numpy-1.22.4:
Successfully uninstalled numpy-1.22.4
Attempting uninstall: h5py
Found existing installation: h5py 3.8.0
Uninstalling h5py-3.8.0:
Successfully uninstalled h5py-3.8.0
Attempting uninstall: grpcio
Found existing installation: grpcio 1.53.0
Uninstalling grpcio-1.53.0:
Successfully uninstalled grpcio-1.53.0
Attempting uninstall: absl-py
Found existing installation: absl-py 1.4.0
Uninstalling absl-py-1.4.0:
Successfully uninstalled absl-py-1.4.0
Attempting uninstall: tensorboard
Found existing installation: tensorboard 2.12.0
Uninstalling tensorboard-2.12.0:
Successfully uninstalled tensorboard-2.12.0
Attempting uninstall: tensorflow
Found existing installation: tensorflow 2.12.0
Uninstalling tensorflow-2.12.0:
Successfully uninstalled tensorflow-2.12.0
```

```
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source of the following dependency conflicts.
xarray 2022.12.0 requires numpy>=1.20, but you have numpy 1.19.5 which is incompatible.
xarray-einstats 0.5.1 requires numpy>=1.20, but you have numpy 1.19.5 which is incompatible.
pydantic 1.10.7 requires typing-extensions>=4.2.0, but you have typing-extensions 3.7.4.3 which is incompatible.
optax 0.1.4 requires typing-extensions>=3.10.0, but you have typing-extensions 3.7.4.3 which is incompatible.
ml-dtypes 0.0.4 requires numpy>1.20, but you have numpy 1.19.5 which is incompatible.
matplotlib 3.7.1 requires numpy>=1.20, but you have numpy 1.19.5 which is incompatible.
librosa 0.10.0.post2 requires numpy!=1.22.0,!=1.22.1,!=1.22.2,>=1.20.3, but you have numpy 1.19.5 which is incompatible.
librosa 0.10.0.post2 requires typing-extensions>=4.1.1, but you have typing-extensions 3.7.4.3 which is incompatible.
jaxlib 0.4.7+cuda11.cudnn86 requires numpy>=1.21, but you have numpy 1.19.5 which is incompatible.
jax 0.4.7 requires numpy>=1.21, but you have numpy 1.19.5 which is incompatible.
```

```
!wget https://psfiles.link/project/mask_rcnn_colab/mrcnn_demo_PIBVGJTEFX.zip
!unzip mrcnn_demo_PIBVGJTEFX.zip
import sys
sys.path.append("/content/maskrcnn_colab/mrcnn_demo")
from m_rcnn import *
%matplotlib inline
```

```
--2023-04-04 05:18:24-- https://psfiles.link/project/mask_rcnn_colab/mrcnn_demo_PIBVGJTEFX.zip
Resolving psfiles.link (psfiles.link)... 34.90.26.83
Connecting to psfiles.link (psfiles.link)|34.90.26.83|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 59799 (58K) [application/zip]
Saving to: 'mrcnn_demo_PIBVGJTEFX.zip'
```

```
mrcnn_demo_PIBVGJTE 100%[=====] 58.40K --.-KB/s in 0.1s

2023-04-04 05:18:24 (576 KB/s) - 'mrcnn_demo_PIBVGJTFFX.zip' saved [59799/59799]
```

```
Archive: mrcnn_demo_PIBVGJTFFX.zip
  creating: maskrcnn_colab/
  creating: maskrcnn_colab/mrcnn_demo/
  inflating: maskrcnn_colab/mrcnn_demo/config.py
  inflating: maskrcnn_colab/mrcnn_demo/model.py
  inflating: maskrcnn_colab/mrcnn_demo/m_rcnn.py
  inflating: maskrcnn_colab/mrcnn_demo/parallel_model.py
  inflating: maskrcnn_colab/mrcnn_demo/utills.py
  inflating: maskrcnn_colab/mrcnn_demo/visualize.py
VERS 0.5 - updated 11/03/2023
/content/maskrcnn_colab/mrcnn_demo/model.py:2378: SyntaxWarning: "is" with a literal. Did you mean "=="?
  if os.name is 'nt':
Downloading pretrained model to /content/maskrcnn_colab/mask_rcnn_coco.h5 ...
... done downloading pretrained model!
```

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

Mounted at /content/drive

```
# Extract Images
images_path = "/content/drive/MyDrive/Stored_Links_NO_Delete/WildLifeRailway/TrainLine/dataset.zip"
annotations_path = "/content/drive/MyDrive/Stored_Links_NO_Delete/WildLifeRailway/TrainLine/annotations.json"

extract_images(os.path.join("/content/", images_path), "/content/dataset")
```

Extracted: 1107 images

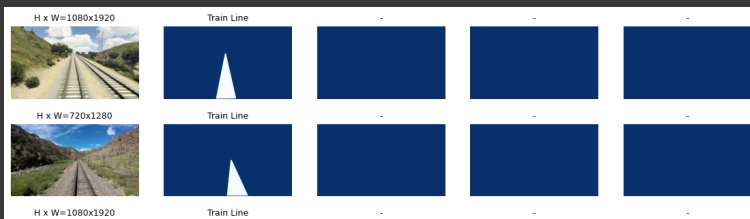
```
from google.colab import drive
drive.mount('/content/drive')
```

Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force\_remount=True).

```
dataset_train = load_image_dataset(os.path.join("/content/", annotations_path), "/content/dataset", "train")
dataset_val = load_image_dataset(os.path.join("/content/", annotations_path), "/content/dataset", "val")
class_number = dataset_train.count_classes()
print('Train: %d' % len(dataset_train.image_ids))
print('Validation: %d' % len(dataset_val.image_ids))
print("Classes: {}".format(class_number))
```

```
Annotation json path: /content/drive/MyDrive/Stored_Links_NO_Delete/WildLifeRailway/TrainLine/annotations.json
Annotation json path: /content/drive/MyDrive/Stored_Links_NO_Delete/WildLifeRailway/TrainLine/annotations.json
Train: 215
Validation: 26
Classes: 1
```

```
# Load image samples
display_image_samples(dataset_train)
```



```
# Load Configuration
import tensorflow as tf

tb_callback = tf.keras.callbacks.TensorBoard(log_dir="logs/", histogram_freq=1)

config = CustomConfig(class_number)
# config.display()
model = load_training_model(config)
# model.fit(model, callbacks=[tb_callback])
```

WARNING:tensorflow:From /usr/local/lib/python3.9/dist-packages/tensorflow/python/ops/array\_ops.py:5043: calling gather (from tensorflow) Instructions for updating:  
The 'validate\_indices' argument has no effect. Indices are always validated on CPU and never validated on GPU.  
/content/maskrcnn\_colab/mask\_rcnn\_coco.h5

```
# !pip install scikit-image==0.16.2
# !pip install -U scikit-image==0.16.2
# img_resized = skimage.util.img_as_bool(skimage.transform.resize(
#     image.astype(np.uint32), output_shape,
#     order=order, mode=mode, cval=cval, clip=clip,
#     preserve_range=preserve_range, anti_aliasing=anti_aliasing,
#     anti_aliasing_sigma=anti_aliasing_sigma))
# return img_resized
# Start Training
# This operation might take a long time.
train_head(model, dataset_train, dataset_train, config)
# plot_precision_recall(AP, precisions, recalls)
```

Starting at epoch 0. LR=0.001

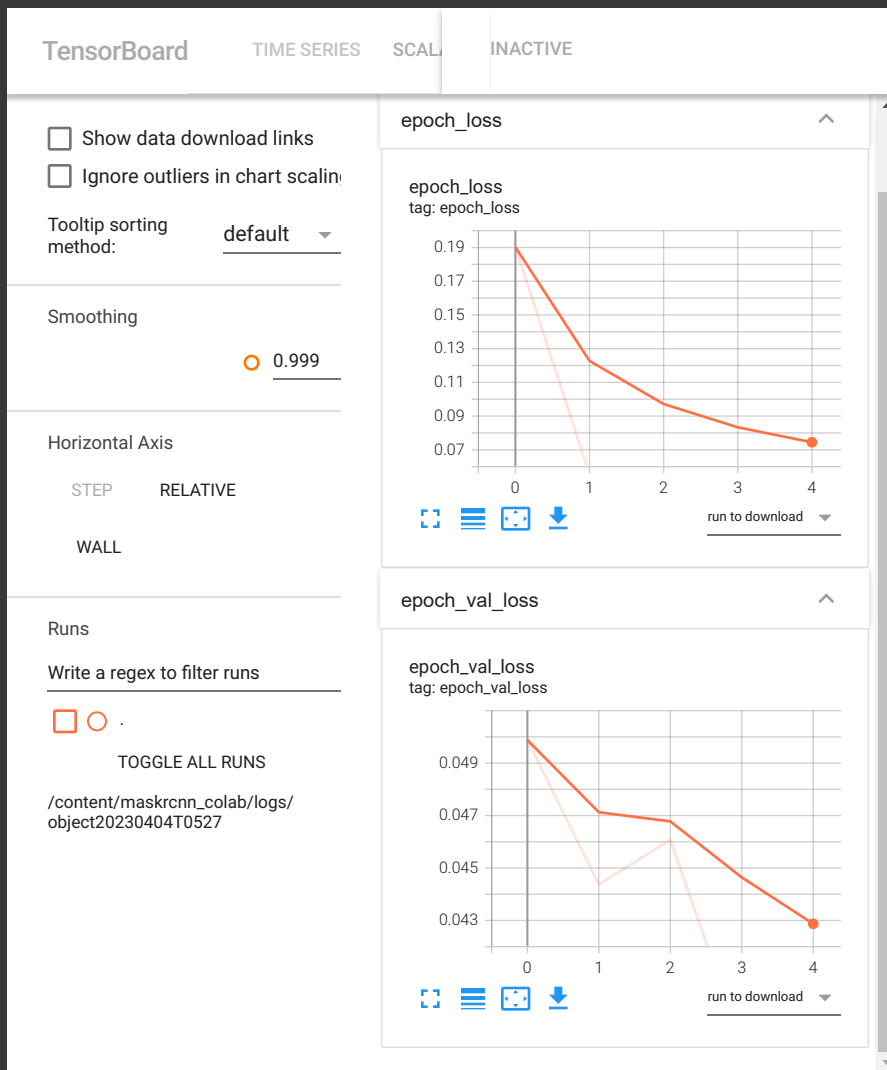
Checkpoint Path: /content/maskrcnn\_colab/logs/object20230404T0527/mask\_rcnn\_object\_{epoch:04d}.h5

Selecting layers to train

```
fpn_c5p5      (Conv2D)
fpn_c4p4      (Conv2D)
fpn_c3p3      (Conv2D)
fpn_c2p2      (Conv2D)
fpn_p5        (Conv2D)
fpn_p2        (Conv2D)
fpn_p3        (Conv2D)
fpn_p4        (Conv2D)
rpn_model     (Functional)
mrcnn_mask_conv1 (TimeDistributed)
mrcnn_mask_bn1  (TimeDistributed)
mrcnn_class_conv1 (TimeDistributed)
mrcnn_class_bn1  (TimeDistributed)
mrcnn_mask_conv2 (TimeDistributed)
mrcnn_mask_bn2  (TimeDistributed)
mrcnn_class_conv2 (TimeDistributed)
mrcnn_class_bn2  (TimeDistributed)
mrcnn_mask_conv3 (TimeDistributed)
mrcnn_mask_bn3  (TimeDistributed)
mrcnn_bbox_fc   (TimeDistributed)
mrcnn_mask_conv4 (TimeDistributed)
mrcnn_mask_bn4  (TimeDistributed)
mrcnn_mask_deconv (TimeDistributed)
mrcnn_class_logits (TimeDistributed)
mrcnn_mask      (TimeDistributed)
```

```
Epoch 1/5
500/500 [=====] - 508s 941ms/step - batch: 249.5000 - size: 4.0000 - loss: 0.1903 - val_loss: 0.0499
Epoch 2/5
500/500 [=====] - 442s 884ms/step - batch: 249.5000 - size: 4.0000 - loss: 0.0553 - val_loss: 0.0444
Epoch 3/5
500/500 [=====] - 442s 884ms/step - batch: 249.5000 - size: 4.0000 - loss: 0.0461 - val_loss: 0.0461
Epoch 4/5
500/500 [=====] - 440s 880ms/step - batch: 249.5000 - size: 4.0000 - loss: 0.0420 - val_loss: 0.0382
Epoch 5/5
500/500 [=====] - 441s 882ms/step - batch: 249.5000 - size: 4.0000 - loss: 0.0391 - val_loss: 0.0358
```

```
%load_ext tensorboard
%tensorboard --logdir /content/maskrcnn_colab/logs/object20230404T0527
```



```
# Load Test Model
# The latest trained model will be loaded
test_model, inference_config = load_test_model(class_number)
```

```
WARNING:tensorflow:From /usr/local/lib/python3.9/dist-packages/tensorflow/python/util/deprecation.py:602: calling map_fn_v2 (from tensorflow.python.ops.map_fn) is deprecated and will be removed in a future version.
Instructions for updating:
Use tf.nn.map_fn instead
Loading weights from /content/maskrcnn_colab/logs/object20230404T0527/mask_rcnn_object_0005.h5
Re-starting from epoch 5
```

```
# Test on a random image
test_random_image(test_model, dataset_val, inference_config)
```

