```
!nvidia-smi
```

```
Thu Apr 27 02:59:55 2023
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 525.85.12    Driver Version: 525.85.12    CUDA Version: 12.0     |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|                               |                      |               MIG M. |
|===============================+======================+======================|
|   0  Tesla T4            Off  | 00000000:00:04.0 Off |                    0 |
| N/A   58C    P8    10W /  70W |      0MiB / 15360MiB |      0%      Default |
|                               |                      |                  N/A |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                                  |
|  GPU   GI   CI        PID   Type   Process name                  GPU Memory |
|        ID   ID                                                   Usage      |
|=============================================================================|
|  No running processes found                                                 |
+-----------------------------------------------------------------------------+
```

```
import os
os.environ['CUDA_LAUNCH_BLOCKING'] = "1"
```

```
!pwd
```

```
/content
```

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

```
Mounted at /content/drive
```

```
!pip install pyyaml==5.1
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Collecting pyyaml==5.1
  Downloading PyYAML-5.1.tar.gz (274 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 274.2/274.2 kB 5.8 MB/s eta 0:00:00
  Preparing metadata (setup.py) ... done
Building wheels for collected packages: pyyaml
  Building wheel for pyyaml (setup.py) ... done
  Created wheel for pyyaml: filename=PyYAML-5.1-cp39-cp39-linux_x86_64.whl size=44089 sha256=2a15a53ed7a51740742fafec08fbadcb6b6fde8ccf1
  Stored in directory: /root/.cache/pip/wheels/68/be/8f/b6c454cd264e0b349b47f8ee00755511f277618af9e5dae20d
Successfully built pyyaml
Installing collected packages: pyyaml
  Attempting uninstall: pyyaml
    Found existing installation: PyYAML 6.0
    Uninstalling PyYAML-6.0:
      Successfully uninstalled PyYAML-6.0
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source
flax 0.6.9 requires PyYAML>=5.4.1, but you have pyyaml 5.1 which is incompatible.
dask 2022.12.1 requires pyyaml>=5.3.1, but you have pyyaml 5.1 which is incompatible.
Successfully installed pyyaml-5.1
```

```
!pip install torch==1.9.0+cu102 torchvision==0.10.0+cu102 -f https://download.pytorch.org/whl/torch_stable.html
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Looking in links: https://download.pytorch.org/whl/torch_stable.html
Collecting torch==1.9.0+cu102
  Downloading https://download.pytorch.org/whl/cu102/torch-1.9.0%2Bcu102-cp39-cp39-linux_x86_64.whl (831.4 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 831.4/831.4 MB 1.8 MB/s eta 0:00:00
Collecting torchvision==0.10.0+cu102
  Downloading https://download.pytorch.org/whl/cu102/torchvision-0.10.0%2Bcu102-cp39-cp39-linux_x86_64.whl (22.0 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 22.0/22.0 MB 41.5 MB/s eta 0:00:00
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.9/dist-packages (from torch==1.9.0+cu102) (4.5.0)
Requirement already satisfied: pillow>=5.3.0 in /usr/local/lib/python3.9/dist-packages (from torchvision==0.10.0+cu102) (8.4.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.9/dist-packages (from torchvision==0.10.0+cu102) (1.22.4)
Installing collected packages: torch, torchvision
  Attempting uninstall: torch
    Found existing installation: torch 2.0.0+cu118
    Uninstalling torch-2.0.0+cu118:
      Successfully uninstalled torch-2.0.0+cu118
```

```
    Attempting uninstall: torchvision
      Found existing installation: torchvision 0.15.1+cu118
      Uninstalling torchvision-0.15.1+cu118:
        Successfully uninstalled torchvision-0.15.1+cu118
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source
torchtext 0.15.1 requires torch==2.0.0, but you have torch 1.9.0+cu102 which is incompatible.
torchdata 0.6.0 requires torch==2.0.0, but you have torch 1.9.0+cu102 which is incompatible.
torchaudio 2.0.1+cu118 requires torch==2.0.0, but you have torch 1.9.0+cu102 which is incompatible.
Successfully installed torch-1.9.0+cu102 torchvision-0.10.0+cu102
```

```
!pip install detectron2 -f https://dl.fbaipublicfiles.com/detectron2/wheels/cu102/torch1.9/index.html
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Looking in links: https://dl.fbaipublicfiles.com/detectron2/wheels/cu102/torch1.9/index.html
Collecting detectron2
  Downloading https://dl.fbaipublicfiles.com/detectron2/wheels/cu102/torch1.9/detectron2-0.6%2Bcu102
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 6.3/6.3 MB 7.5 MB/s eta 0:00:00
Collecting yacs>=0.1.8
  Downloading yacs-0.1.8-py3-none-any.whl (14 kB)
Collecting omegaconf>=2.1
  Downloading omegaconf-2.3.0-py3-none-any.whl (79 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 79.5/79.5 kB 2.4 MB/s eta 0:00:00
Requirement already satisfied: future in /usr/local/lib/python3.9/dist-packages (from detectron2) (0
Collecting fvcore<0.1.6,>=0.1.5
  Downloading fvcore-0.1.5.post20221221.tar.gz (50 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 50.2/50.2 kB 6.9 MB/s eta 0:00:00
  Preparing metadata (setup.py) ... done
Requirement already satisfied: termcolor>=1.1 in /usr/local/lib/python3.9/dist-packages (from detect
Requirement already satisfied: Pillow>=7.1 in /usr/local/lib/python3.9/dist-packages (from detectron
Requirement already satisfied: pycocotools>=2.0.2 in /usr/local/lib/python3.9/dist-packages (from de
Collecting hydra-core>=1.1
  Downloading hydra_core-1.3.2-py3-none-any.whl (154 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 154.5/154.5 kB 8.3 MB/s eta 0:00:00
Requirement already satisfied: tabulate in /usr/local/lib/python3.9/dist-packages (from detectron2)
Requirement already satisfied: pydot in /usr/local/lib/python3.9/dist-packages (from detectron2) (1.
Collecting black==21.4b2
```

```
import torch, torchvision
print(torch.__version__, torch.cuda.is_available())
assert torch.__version__.startswith("1.9")   # please mrch 1.9 if Colab changes its default version
```

```
1.9.0+cu102 True
Requirement already satisfied: tqdm>4.29.0 in /usr/local/lib/python3.9/dist-packages (from detectron
```

```
# Some basic setup:
# Setup detectron2 logger
import detectron2
from detectron2.utils.logger import setup_logger
setup_logger()

# import some common libraries
import numpy as np
import os, json, cv2, random
from google.colab.patches import cv2_imshow

# import some common detectron2 utilities
from detectron2 import model_zoo
from detectron2.engine import DefaultPredictor
from detectron2.config import get_cfg
from detectron2.utils.visualizer import Visualizer
from detectron2.data import MetadataCatalog, DatasetCatalog
```

```
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.9/dist-packages (from matp
```

```
!unzip '/content/train_images.zip' -d '/content'
```

```
Archive:  /content/train_images.zip
  inflating: /content/train_images/0001.jpg
  inflating: /content/train_images/0002.jpg
  inflating: /content/train_images/0003.jpg
  inflating: /content/train_images/0004.jpg
  inflating: /content/train_images/0005.jpg
  inflating: /content/train_images/0006.jpg
  inflating: /content/train_images/0007.jpg
  inflating: /content/train_images/0008.jpg
  inflating: /content/train_images/0009.jpg
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  inflating: /content/train_images/0039.jpg
```

```
  inflating: /content/train_images/0040.jpg
  inflating: /content/train_images/0041.jpg
  inflating: /content/train_images/0042.jpg
  inflating: /content/train_images/0043.jpg
  inflating: /content/train_images/0044.jpg
  inflating: /content/train_images/0045.jpg
  inflating: /content/train_images/0046.jpg
  inflating: /content/train_images/0047.jpg
  inflating: /content/train_images/0048.jpg
  inflating: /content/train_images/0049.jpg
  inflating: /content/train_images/0050.jpg
  inflating: /content/train_images/0051.jpg
  inflating: /content/train_images/0052.jpg
  inflating: /content/train_images/0053.jpg
  inflating: /content/train_images/0054.jpg
  inflating: /content/train_images/0055.jpg
  inflating: /content/train_images/0056.jpg
  inflating: /content/train_images/0057.jpg
  inflating: /content/train_images/0058.jpg
  inflating: /content/train_images/0059.jpg
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  inflating: /content/train_images/0061.jpg
  inflating: /content/train_images/0062.jpg
  inflating: /content/train_images/0063.jpg
  inflating: /content/train_images/0064.jpg
  inflating: /content/train_images/0065.jpg
  inflating: /content/train_images/0066.jpg
  inflating: /content/train_images/0067.jpg
```

```
from detectron2.data.datasets import register_coco_instances
register_coco_instances("sample", {}, "/content/allinone_train.json", "/content/train_images")
```

```
sample_metadata = MetadataCatalog.get("sample")
dataset_dicts = DatasetCatalog.get("sample")
```

```
WARNING [04/27 03:05:42 d2.data.datasets.coco]:
Category ids in annotations are not in [1, #categories]! We'll apply a mapping for you.

[04/27 03:05:42 d2.data.datasets.coco]: Loaded 324 images in COCO format from /content/allinone_train.json
```

```
import random

for d in random.sample(dataset_dicts, 4):
    img = cv2.imread(d['file_name'])
    visualizer = Visualizer(img[:, :, ::-1], metadata=sample_metadata, scale=0.5)
    vis = visualizer.draw_dataset_dict(d)
    cv2_imshow(vis.get_image()[:, :,::-1])
```


```
!git clone https://github.com/facebookresearch/detectron2 detectron2_repo
```

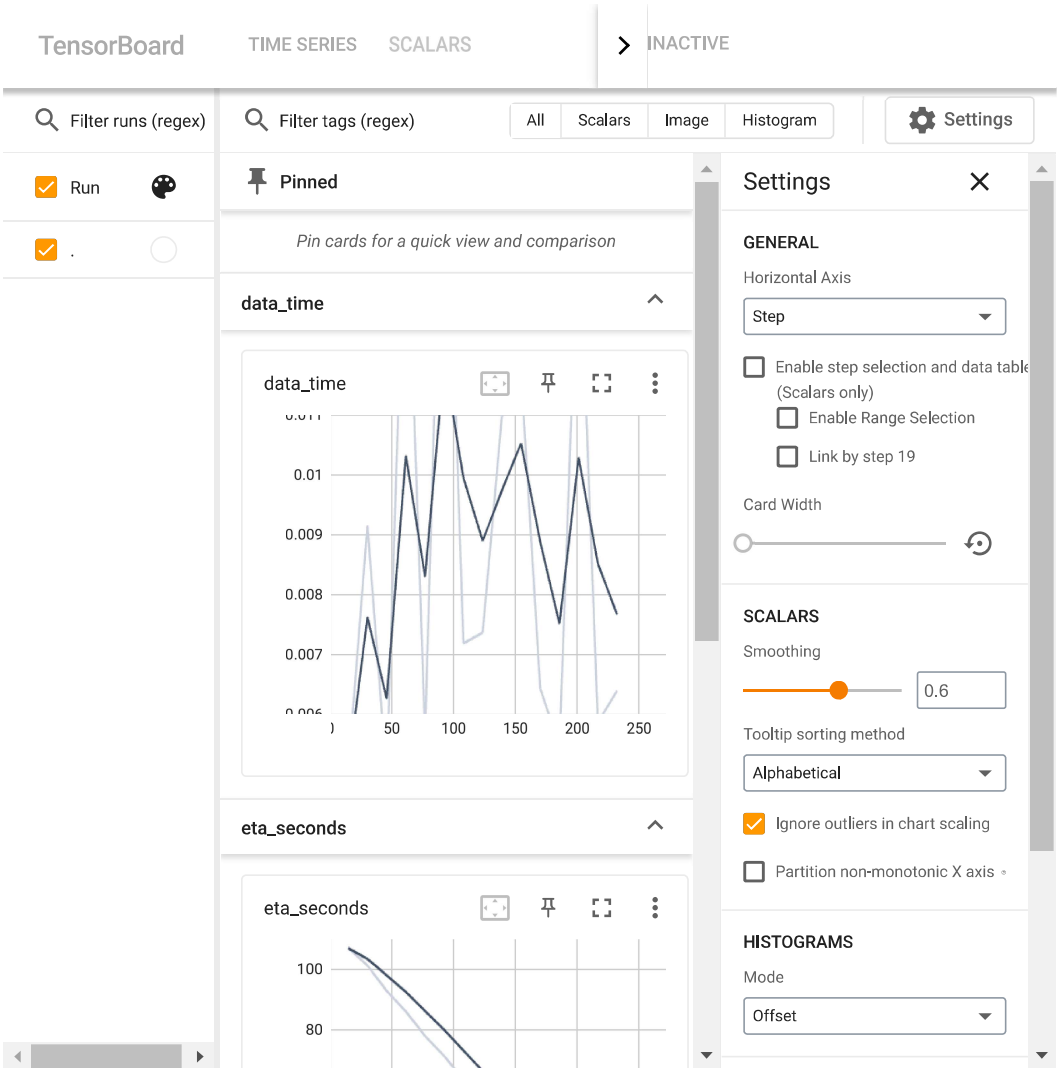
```
from detectron2.engine import DefaultTrainer
from detectron2.config import get_cfg
import os
```

```
cfg = get_cfg()
cfg.merge_from_file(model_zoo.get_config_file("COCO-Detection/faster_rcnn_R_50_FPN_3x.yaml"))
cfg.DATASETS.TRAIN = ("sample",)
cfg.DATASETS.TEST = ()   # no metrics implemented for this dataset
cfg.DATALOADER.NUM_WORKERS = 2
cfg.MODEL.WEIGHTS = model_zoo.get_checkpoint_url("COCO-Detection/faster_rcnn_R_50_FPN_3x.yaml")# initialize from model zoo
cfg.SOLVER.IMS_PER_BATCH = 2
cfg.SOLVER.BASE_LR = 0.02
cfg.SOLVER.MAX_ITER = 300   # 300 iterations seems good enough, but you can certainly train longer
cfg.MODEL.ROI_HEADS.BATCH_SIZE_PER_IMAGE = 640 # faster, and good enough for this toy dataset
cfg.MODEL.ROI_HEADS.NUM_CLASSES = 4

os.makedirs(cfg.OUTPUT_DIR, exist_ok=True)
trainer = DefaultTrainer(cfg)
trainer.resume_or_load(resume=False)
trainer.train()
```

```
[04/27 03:06:06 d2.engine.defaults]: Model:
GeneralizedRCNN(
  (backbone): FPN(
    (fpn_lateral2): Conv2d(256, 256, kernel_size=(1, 1), stride=(1, 1))
    (fpn_output2): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (fpn_lateral3): Conv2d(512, 256, kernel_size=(1, 1), stride=(1, 1))
    (fpn_output3): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (fpn_lateral4): Conv2d(1024, 256, kernel_size=(1, 1), stride=(1, 1))
    (fpn_output4): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (fpn_lateral5): Conv2d(2048, 256, kernel_size=(1, 1), stride=(1, 1))
    (fpn_output5): Conv2d(256, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (top_block): LastLevelMaxPool()
    (bottom_up): ResNet(
      (stem): BasicStem(
        (conv1): Conv2d(
          3, 64, kernel_size=(7, 7), stride=(2, 2), padding=(3, 3), bias=False
          (norm): FrozenBatchNorm2d(num_features=64, eps=1e-05)
        )
      )
      (res2): Sequential(
        (0): BottleneckBlock(
          (shortcut): Conv2d(
            64, 256, kernel_size=(1, 1), stride=(1, 1), bias=False
            (norm): FrozenBatchNorm2d(num_features=256, eps=1e-05)
          )
          (conv1): Conv2d(
            64, 64, kernel_size=(1, 1), stride=(1, 1), bias=False
            (norm): FrozenBatchNorm2d(num_features=64, eps=1e-05)
          )
          (conv2): Conv2d(
            64, 64, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1), bias=False
            (norm): FrozenBatchNorm2d(num_features=64, eps=1e-05)
          )
          (conv3): Conv2d(
            64, 256, kernel_size=(1, 1), stride=(1, 1), bias=False
            (norm): FrozenBatchNorm2d(num_features=256, eps=1e-05)
          )
        )
        (1): BottleneckBlock(
          (conv1): Conv2d(
            256, 64, kernel_size=(1, 1), stride=(1, 1), bias=False
            (norm): FrozenBatchNorm2d(num_features=64, eps=1e-05)
          )
          (conv2): Conv2d(
            64, 64, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1), bias=False
            (norm): FrozenBatchNorm2d(num_features=64, eps=1e-05)
          )
          (conv3): Conv2d(
            64, 256, kernel_size=(1, 1), stride=(1, 1), bias=False
            (norm): FrozenBatchNorm2d(num_features=256, eps=1e-05)
          )
        )
        (2): BottleneckBlock(
          (conv1): Conv2d(
            256, 64, kernel_size=(1, 1), stride=(1, 1), bias=False
            (norm): FrozenBatchNorm2d(num_features=64, eps=1e-05)
          )
```

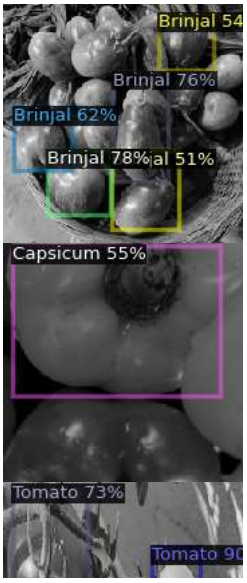
```
# Look at training curves in tensorboard:
%load_ext tensorboard
%tensorboard --logdir output
```




```
cfg.MODEL.WEIGHTS = os.path.join(cfg.OUTPUT_DIR, "model_final.pth")
cfg.MODEL.ROI_HEADS.SCORE_THRESH_TEST = 0.5   # set the testing threshold for this model
cfg.DATASETS.TEST = ("sample",)
predictor = DefaultPredictor(cfg)


from detectron2.utils.visualizer import ColorMode

for d in random.sample(dataset_dicts, 4):
    im = cv2.imread(d["file_name"])
    outputs = predictor(im)
    v = Visualizer(im[:, :, ::-1],
                   metadata=sample_metadata,
                   scale=0.8,
                   instance_mode=ColorMode.IMAGE_BW   # remove the colors of unsegmented pixels
    )
    v = v.draw_instance_predictions(outputs["instances"].to("cpu"))
    cv2_imshow(v.get_image()[:, :, ::-1])
```




```
# Download Config File
f= open("config.yaml","w")
f.write(cfg.dump())
f.close()
```