

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

Mounted at /content/drive

```
!pip install pyyaml==5.1
!pip install torch==1.8.0+cu101 torchvision==0.9.0+cu101 -f https://download.pytorch.org/whl/

Collecting pyyaml==5.1
  Downloading PyYAML-5.1.tar.gz (274 kB)
    |████████████████████████████████████████| 274 kB 5.3 MB/s
Building wheels for collected packages: pyyaml
  Building wheel for pyyaml (setup.py) ... done
  Created wheel for pyyaml: filename=PyYAML-5.1-cp37-cp37m-linux_x86_64.whl size=44092 sha256=
  Stored in directory: /root/.cache/pip/wheels/77/f5/10/d00a2bd30928b972790053b5de0c703c
Successfully built pyyaml
Installing collected packages: pyyaml
  Attempting uninstall: pyyaml
    Found existing installation: PyYAML 3.13
    Uninstalling PyYAML-3.13:
      Successfully uninstalled PyYAML-3.13
Successfully installed pyyaml-5.1
Looking in links: https://download.pytorch.org/whl/torch_stable.html
Collecting torch==1.8.0+cu101
  Downloading https://download.pytorch.org/whl/cu101/torch-1.8.0%2Bcu101-cp37-cp37m-linux_x86_64.whl
    |████████████████████████████████████████| 763.5 MB 16 kB/s
Collecting torchvision==0.9.0+cu101
  Downloading https://download.pytorch.org/whl/cu101/torchvision-0.9.0%2Bcu101-cp37-cp37m-linux_x86_64.whl
    |████████████████████████████████████████| 17.3 MB 183 kB/s
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist-packages (from torch)
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (from torchvision)
Requirement already satisfied: pillow>=4.1.1 in /usr/local/lib/python3.7/dist-packages (from torchvision)
Installing collected packages: torch, torchvision
  Attempting uninstall: torch
    Found existing installation: torch 1.10.0+cu111
    Uninstalling torch-1.10.0+cu111:
      Successfully uninstalled torch-1.10.0+cu111
  Attempting uninstall: torchvision
    Found existing installation: torchvision 0.11.1+cu111
    Uninstalling torchvision-0.11.1+cu111:
      Successfully uninstalled torchvision-0.11.1+cu111
ERROR: pip's dependency resolver does not currently take into account all the packages that are
already installed. For example, torchtext 0.11.0 requires torch==1.10.0, but you have torch 1.8.0+cu101 which is incompatible.
torchtext 0.11.0 requires torch==1.10.0, but you have torch 1.8.0+cu101 which is incompatible.
torchtext 0.11.0 requires torch==1.10.0, but you have torch 1.8.0+cu101 which is incompatible.
Successfully installed torch-1.8.0+cu101 torchvision-0.9.0+cu101
```

```
!pip install detectron2 -f https://dl.fbaipublicfiles.com/detectron2/wheels/cu101/torch1.8/in
```

```

Looking in links: https://dl.fbaipublicfiles.com/detectron2/wheels/cu101/torch1.8/
Collecting detectron2
  Downloading https://dl.fbaipublicfiles.com/detectron2/wheels/cu101/torch1.8/dete
    |████████████████████████████████████████| 6.3 MB 791 kB/s
Requirement already satisfied: tabulate in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: pydot in /usr/local/lib/python3.7/dist-packages (fr
Requirement already satisfied: cloudpickle in /usr/local/lib/python3.7/dist-packag
Collecting omegaconf>=2.1
  Downloading omegaconf-2.1.1-py3-none-any.whl (74 kB)
    |████████████████████████████████████████| 74 kB 2.2 MB/s
Collecting black==21.4b2
  Downloading black-21.4b2-py3-none-any.whl (130 kB)
    |████████████████████████████████████████| 130 kB 11.3 MB/s
Requirement already satisfied: tqdm>4.29.0 in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/dist-package
Requirement already satisfied: termcolor>=1.1 in /usr/local/lib/python3.7/dist-pac
Requirement already satisfied: future in /usr/local/lib/python3.7/dist-packages (f
Collecting hydra-core>=1.1
  Downloading hydra_core-1.1.1-py3-none-any.whl (145 kB)
    |████████████████████████████████████████| 145 kB 39.7 MB/s
Requirement already satisfied: pycocotools>=2.0.2 in /usr/local/lib/python3.7/dist
Requirement already satisfied: tensorboard in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: Pillow>=7.1 in /usr/local/lib/python3.7/dist-packag
Collecting fvcore<0.1.6,>=0.1.5
  Downloading fvcore-0.1.5.post20211023.tar.gz (49 kB)
    |████████████████████████████████████████| 49 kB 5.3 MB/s
Collecting yacs>=0.1.8
  Downloading yacs-0.1.8-py3-none-any.whl (14 kB)
Collecting iopath<0.1.10,>=0.1.7
  Downloading iopath-0.1.9-py3-none-any.whl (27 kB)
Requirement already satisfied: typing-extensions>=3.7.4 in /usr/local/lib/python3.
Requirement already satisfied: appdirs in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: toml>=0.10.1 in /usr/local/lib/python3.7/dist-packa
Collecting pathspec<1,>=0.8.1
  Downloading pathspec-0.9.0-py2.py3-none-any.whl (31 kB)
Collecting regex>=2020.1.8
  Downloading regex-2021.11.10-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_
    |████████████████████████████████████████| 749 kB 39.0 MB/s
Collecting mypy-extensions>=0.4.3
  Downloading mypy_extensions-0.4.3-py2.py3-none-any.whl (4.5 kB)
Requirement already satisfied: click>=7.1.2 in /usr/local/lib/python3.7/dist-packa
Collecting typed-ast>=1.4.2
  Downloading typed_ast-1.5.0-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.ma
    |████████████████████████████████████████| 843 kB 34.3 MB/s
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (fr
Requirement already satisfied: pyyaml>=5.1 in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: importlib-resources in /usr/local/lib/python3.7/dis
Collecting antlr4-python3-runtime==4.8
  Downloading antlr4-python3-runtime-4.8.tar.gz (112 kB)
    |████████████████████████████████████████| 112 kB 47.8 MB/s
Collecting portalocker
  Downloading portalocker-2.3.2-py2.py3-none-any.whl (15 kB)
Requirement already satisfied: cython>=0.27.3 in /usr/local/lib/python3.7/dist-pac
Requirement already satisfied: setuptools>=18.0 in /usr/local/lib/python3.7/dist-p
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-packa
Requirement already satisfied: pyparsing!=2.0.4,!2.1.2,!2.1.6,>=2.0.1 in /usr/lo

```

```

Requirement already satisfied: python-dateutil>=2.1 in /usr/local/lib/python3.7/di
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: zipp>=3.1.0 in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.7/dis
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.7/dist-pa
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /usr/local/lib/
Requirement already satisfied: protobuf>=3.6.0 in /usr/local/lib/python3.7/dist-pa
Requirement already satisfied: wheel>=0.26 in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: werkzeug>=0.11.15 in /usr/local/lib/python3.7/dist-
Requirement already satisfied: grpcio>=1.24.3 in /usr/local/lib/python3.7/dist-pac
Requirement already satisfied: google-auth<3,>=1.6.3 in /usr/local/lib/python3.7/d
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in /usr/local
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /usr/local/lib/pyt
Requirement already satisfied: absl-py>=0.4 in /usr/local/lib/python3.7/dist-packa
Requirement already satisfied: pyasn1-modules>=0.2.1 in /usr/local/lib/python3.7/d
Requirement already satisfied: cachetools<5.0,>=2.0.0 in /usr/local/lib/python3.7/
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.
Requirement already satisfied: importlib-metadata>=4.4 in /usr/local/lib/python3.7
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /usr/local/lib/python3.7/di
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist
Requirement already satisfied: urllib3!=1.25.0,!1.25.1,<1.26,>=1.21.1 in /usr/loc
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packa
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-pa
Building wheels for collected packages: fvcare, antlr4-python3-runtime
  Building wheel for fvcare (setup.py) ... done
  Created wheel for fvcare: filename=fvcare-0.1.5.post20211023-py3-none-any.whl si
  Stored in directory: /root/.cache/pip/wheels/16/98/fc/252d62cab6263c719120e06b28
  Building wheel for antlr4-python3-runtime (setup.py) ... done
  Created wheel for antlr4-python3-runtime: filename=antlr4_python3_runtime-4.8-py
  Stored in directory: /root/.cache/pip/wheels/ca/33/b7/336836125fc9bb4ceaa4376d8a
Successfully built fvcare antlr4-python3-runtime
Installing collected packages: portalocker, antlr4-python3-runtime, yacs, typed-as
  Attempting uninstall: regex
    Found existing installation: regex 2019.12.20
    Uninstalling regex-2019.12.20:
      Successfully uninstalled regex-2019.12.20
Successfully installed antlr4-python3-runtime-4.8 black-21.4b2 detectron2-0.6+cu10

```

```

import torch
assert torch.__version__.startswith("1.8")
import torchvision
import cv2

```

```

import os
import numpy as np
import json
import random
import matplotlib.pyplot as plt
%matplotlib inline

```

```

from detectron2.structures import BoxMode
from detectron2.data import DatasetCatalog, MetadataCatalog

```

```

def get_data_dicts(directory, classes):
    dataset_dicts = []
    for filename in [file for file in os.listdir(directory) if file.endswith('.json')]:
        json_file = os.path.join(directory, filename)
        with open(json_file) as f:
            img_anns = json.load(f)

        record = {}

        filename = os.path.join(directory, img_anns["imagePath"])

        record["file_name"] = filename
        record["height"] = 224
        record["width"] = 224

        annos = img_anns["shapes"]
        objs = []
        for anno in annos:
            px = [a[0] for a in anno['points']] # x coord
            py = [a[1] for a in anno['points']] # y-coord
            poly = [(x, y) for x, y in zip(px, py)] # poly for segmentation
            poly = [p for x in poly for p in x]

            obj = {
                "bbox": [np.min(px), np.min(py), np.max(px), np.max(py)],
                "bbox_mode": BoxMode.XYXY_ABS,
                "segmentation": [poly],
                "category_id": classes.index(anno['label']),
                "iscrowd": 0
            }
            objs.append(obj)
        record["annotations"] = objs
        dataset_dicts.append(record)
    return dataset_dicts

classes = ['benign', 'malignant']

data_path = '/content/drive/MyDrive/data/'

for d in ["train", "test"]:
    DatasetCatalog.register(
        "category_" + d,
        lambda d=d: get_data_dicts(data_path+d, classes)
    )
    MetadataCatalog.get("category_" + d).set(thing_classes=classes)

microcontroller_metadata = MetadataCatalog.get("category_train")

```

```

-----
AssertionError                                Traceback (most recent call last)
<ipython-input-13-e1dc1e9d4441> in <module>()
      6     DatasetCatalog.register(
      7         "category_" + d,
----> 8         lambda d=d: get_data_dicts(data_path+d, classes)
      9     )
     10     MetadataCatalog.get("category_" + d).set(thing_classes=classes)

/usr/local/lib/python3.7/dist-packages/detectron2/data/catalog.py in register(self,
name, func)
     35     """
     36     assert callable(func), "You must register a function with
`DatasetCatalog.register`!"
--> 37     assert name not in self, "Dataset '{}' is already
registered!".format(name)
     38     self[name] = func
     39

```

```

from detectron2 import model_zoo
from detectron2.engine import DefaultTrainer, DefaultPredictor
from detectron2.config import get_cfg
from detectron2.utils.visualizer import ColorMode, Visualizer

```

```

cfg = get_cfg()
cfg.merge_from_file(model_zoo.get_config_file("COCO-InstanceSegmentation/mask_rcnn_R_50_FPN_3
cfg.DATASETS.TRAIN = ("category_train",)
cfg.DATASETS.TEST = ()
cfg.DATALOADER.NUM_WORKERS = 2
cfg.MODEL.WEIGHTS = model_zoo.get_checkpoint_url("COCO-InstanceSegmentation/mask_rcnn_R_50_FP
cfg.SOLVER.IMS_PER_BATCH = 2
cfg.SOLVER.BASE_LR = 0.00025
cfg.SOLVER.MAX_ITER = 1000
cfg.MODEL.ROI_HEADS.NUM_CLASSES = 2

```

```

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

```

[11/22 18:57:00 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(

```



```

[11/22 19:01:13 d2.utils.events]: eta: 0:15:17 iter: 159 total_loss: 0.8841 loss_cls
[11/22 19:01:34 d2.utils.events]: eta: 0:14:54 iter: 179 total_loss: 0.8647 loss_cls
[11/22 19:01:55 d2.utils.events]: eta: 0:14:34 iter: 199 total_loss: 0.7873 loss_cls
[11/22 19:02:17 d2.utils.events]: eta: 0:14:11 iter: 219 total_loss: 0.7464 loss_cls
[11/22 19:02:39 d2.utils.events]: eta: 0:13:50 iter: 239 total_loss: 0.6954 loss_cls
[11/22 19:03:01 d2.utils.events]: eta: 0:13:32 iter: 259 total_loss: 0.7175 loss_cls
[11/22 19:03:23 d2.utils.events]: eta: 0:13:10 iter: 279 total_loss: 0.7074 loss_cls
[11/22 19:03:45 d2.utils.events]: eta: 0:12:48 iter: 299 total_loss: 0.6278 loss_cls
[11/22 19:04:06 d2.utils.events]: eta: 0:12:25 iter: 319 total_loss: 0.5895 loss_cls
[11/22 19:04:28 d2.utils.events]: eta: 0:12:03 iter: 339 total_loss: 0.5417 loss_cls
[11/22 19:04:50 d2.utils.events]: eta: 0:11:40 iter: 359 total_loss: 0.4993 loss_cls
[11/22 19:05:12 d2.utils.events]: eta: 0:11:18 iter: 379 total_loss: 0.5248 loss_cls
[11/22 19:05:34 d2.utils.events]: eta: 0:10:56 iter: 399 total_loss: 0.5159 loss_cls
[11/22 19:05:55 d2.utils.events]: eta: 0:10:35 iter: 419 total_loss: 0.4944 loss_cls
[11/22 19:06:18 d2.utils.events]: eta: 0:10:13 iter: 439 total_loss: 0.4788 loss_cls
[11/22 19:06:39 d2.utils.events]: eta: 0:09:50 iter: 459 total_loss: 0.4663 loss_cls
[11/22 19:07:00 d2.utils.events]: eta: 0:09:28 iter: 479 total_loss: 0.415 loss_cls
[11/22 19:07:21 d2.utils.events]: eta: 0:09:06 iter: 499 total_loss: 0.4646 loss_cls
[11/22 19:07:43 d2.utils.events]: eta: 0:08:44 iter: 519 total_loss: 0.4378 loss_cls
[11/22 19:08:05 d2.utils.events]: eta: 0:08:22 iter: 539 total_loss: 0.4217 loss_cls
[11/22 19:08:27 d2.utils.events]: eta: 0:08:00 iter: 559 total_loss: 0.417 loss_cls
[11/22 19:08:49 d2.utils.events]: eta: 0:07:38 iter: 579 total_loss: 0.3549 loss_cls
[11/22 19:09:12 d2.utils.events]: eta: 0:07:17 iter: 599 total_loss: 0.3785 loss_cls
[11/22 19:09:33 d2.utils.events]: eta: 0:06:55 iter: 619 total_loss: 0.3715 loss_cls
[11/22 19:09:55 d2.utils.events]: eta: 0:06:34 iter: 639 total_loss: 0.3745 loss_cls
[11/22 19:10:17 d2.utils.events]: eta: 0:06:12 iter: 659 total_loss: 0.3335 loss_cls
[11/22 19:10:39 d2.utils.events]: eta: 0:05:50 iter: 679 total_loss: 0.3475 loss_cls
[11/22 19:11:00 d2.utils.events]: eta: 0:05:29 iter: 699 total_loss: 0.3169 loss_cls
[11/22 19:11:22 d2.utils.events]: eta: 0:05:06 iter: 719 total_loss: 0.3346 loss_cls
[11/22 19:11:44 d2.utils.events]: eta: 0:04:45 iter: 739 total_loss: 0.2892 loss_cls
[11/22 19:12:06 d2.utils.events]: eta: 0:04:23 iter: 759 total_loss: 0.3242 loss_cls
[11/22 19:12:27 d2.utils.events]: eta: 0:04:01 iter: 779 total_loss: 0.2993 loss_cls
[11/22 19:12:49 d2.utils.events]: eta: 0:03:39 iter: 799 total_loss: 0.2964 loss_cls
[11/22 19:13:11 d2.utils.events]: eta: 0:03:17 iter: 819 total_loss: 0.3024 loss_cls
[11/22 19:13:33 d2.utils.events]: eta: 0:02:55 iter: 839 total_loss: 0.3201 loss_cls
[11/22 19:13:56 d2.utils.events]: eta: 0:02:33 iter: 859 total_loss: 0.3388 loss_cls
[11/22 19:14:17 d2.utils.events]: eta: 0:02:11 iter: 879 total_loss: 0.2536 loss_cls
[11/22 19:14:39 d2.utils.events]: eta: 0:01:49 iter: 899 total_loss: 0.2587 loss_cls
[11/22 19:15:00 d2.utils.events]: eta: 0:01:27 iter: 919 total_loss: 0.2595 loss_cls
[11/22 19:15:21 d2.utils.events]: eta: 0:01:05 iter: 939 total_loss: 0.3005 loss_cls
[11/22 19:15:42 d2.utils.events]: eta: 0:00:43 iter: 959 total_loss: 0.2612 loss_cls
[11/22 19:16:03 d2.utils.events]: eta: 0:00:21 iter: 979 total_loss: 0.271 loss_cls
[11/22 19:16:25 d2.utils.events]: eta: 0:00:00 iter: 999 total_loss: 0.2468 loss_cls
[11/22 19:16:26 d2.engine.hooks]: Overall training speed: 998 iterations in 0:18:00 (1.6
[11/22 19:16:26 d2.engine.hooks]: Total training time: 0:18:02 (0:00:02 on hooks)

```

```

cfg.MODEL.WEIGHTS = os.path.join(cfg.OUTPUT_DIR, "model_final.pth")
cfg.MODEL.ROI_HEADS.SCORE_THRESH_TEST = 0.5
cfg.DATASETS.TEST = ("skin_test", )
predictor = DefaultPredictor(cfg)

```

```
test_dataset_dicts = get_data_dicts(data_path+'test', classes)
```

```
for d in random.sample(test_dataset_dicts, 3):
    img = cv2.imread(d["file_name"])
    outputs = predictor(img)
    v = Visualizer(img[:, :, ::-1],
                   metadata=microcontroller_metadata,
                   scale=0.8,
                   instance_mode=ColorMode.IMAGE_BW # removes the colors of unsegmented pixel
    )
    v = v.draw_instance_predictions(outputs["instances"].to("cpu"))
    plt.figure(figsize = (14, 10))
    plt.imshow(cv2.cvtColor(v.get_image()[:, :, ::-1], cv2.COLOR_BGR2RGB))
    plt.show()
```





