```
import os
HOME = os.getcwd()
print(HOME)
```

```
/content
```

```
# Pip install method (recommended)

!pip install ultralytics==8.0.20

from IPython import display
display.clear_output()

import ultralytics
ultralytics.checks()
```

```
Ultralytics YOLOv8.0.20 🚀 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4, 15102MiB)
Setup complete ✅ (2 CPUs, 12.7 GB RAM, 27.1/78.2 GB disk)
```

```
from ultralytics import YOLO

from IPython.display import display, Image
```

```
!mkdir {HOME}/datasets
%cd {HOME}/datasets

!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="sHOrdGRjL6bmF29PNnNH")
project = rf.workspace("vit-university-fdu8k").project("nestle-product-finder")
dataset = project.version(2).download("yolov8")


```

```
mkdir: cannot create directory ‘/content/datasets’: File exists
/content/datasets
Requirement already satisfied: roboflow in /usr/local/lib/python3.10/dist-packages (1.1.7)
Requirement already satisfied: certifi==2022.12.7 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2022.12.7)
Requirement already satisfied: chardet==4.0.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.0.0)
Requirement already satisfied: cycler==0.10.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (0.10.0)
Requirement already satisfied: idna==2.10 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.10)
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.4.5)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-packages (from roboflow) (3.7.1)
Requirement already satisfied: numpy>=1.18.5 in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.23.5)
Requirement already satisfied: opencv-python-headless==4.8.0.74 in /usr/local/lib/python3.10/dist-packages (from roboflo
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.10/dist-packages (from roboflow) (9.4.0)
Requirement already satisfied: pyparsing==2.4.7 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.4.7)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.8.2)
Requirement already satisfied: python-dotenv in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.0.0)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.31.0)
Requirement already satisfied: six in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.16.0)
Requirement already satisfied: supervision in /usr/local/lib/python3.10/dist-packages (from roboflow) (0.16.0)
Requirement already satisfied: urllib3>=1.26.6 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.0.7)
Requirement already satisfied: tqdm>=4.41.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.66.1)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from roboflow) (6.0.1)
Requirement already satisfied: requests-toolbelt in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.0.0)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (2
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests->robof
Requirement already satisfied: scipy<2.0.0,>=1.9.0 in /usr/local/lib/python3.10/dist-packages (from supervision->roboflo
loading Roboflow workspace...
loading Roboflow project...
Dependency ultralytics==8.0.134 is required but found version=8.0.20, to fix: `pip install ultralytics==8.0.134`
Downloading Dataset Version Zip in nestle-product-finder--2 to yolov8:: 100%|██████████| 13864/13864 [00:00<00:00, 58388

Extracting Dataset Version Zip to nestle-product-finder--2 in yolov8:: 100%|██████████| 304/304 [00:00<00:00, 5521.52it/
```

Custom Training

```
%cd {HOME}

!yolo task=detect mode=train model=yolov8s.pt data={dataset.location}/data.yaml epochs=25 imgsz=800 plots=True
```

```
/content
Ultralytics YOLOv8.0.20 🚀 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4, 15102MiB)
yolo/engine/trainer: task=detect, mode=train, model=yolov8s.yaml, data=/content/datasets/nestle-product-finder--2/data
2023-10-21 09:42:54.934476: W tensorflow/compiler/tf2tensorrt/utils/py_utils.cc:38] TF-TRT Warning: Could not find Ten
```

```
Overriding model.yaml nc=80 with nc=1

                   from  n    params  module                                       arguments
  0                  -1  1       928  ultralytics.nn.modules.Conv                  [3, 32, 3, 2]
  1                  -1  1     18560  ultralytics.nn.modules.Conv                  [32, 64, 3, 2]
  2                  -1  1     29056  ultralytics.nn.modules.C2f                   [64, 64, 1, True]
  3                  -1  1     73984  ultralytics.nn.modules.Conv                  [64, 128, 3, 2]
  4                  -1  2    197632  ultralytics.nn.modules.C2f                   [128, 128, 2, True]
  5                  -1  1    295424  ultralytics.nn.modules.Conv                  [128, 256, 3, 2]
  6                  -1  2    788480  ultralytics.nn.modules.C2f                   [256, 256, 2, True]
  7                  -1  1   1180672  ultralytics.nn.modules.Conv                  [256, 512, 3, 2]
  8                  -1  1   1838080  ultralytics.nn.modules.C2f                   [512, 512, 1, True]
  9                  -1  1    656896  ultralytics.nn.modules.SPPF                  [512, 512, 5]
 10                  -1  1         0  torch.nn.modules.upsampling.Upsample         [None, 2, 'nearest']
 11             [-1, 6]  1         0  ultralytics.nn.modules.Concat                [1]
 12                  -1  1    591360  ultralytics.nn.modules.C2f                   [768, 256, 1]
 13                  -1  1         0  torch.nn.modules.upsampling.Upsample         [None, 2, 'nearest']
 14             [-1, 4]  1         0  ultralytics.nn.modules.Concat                [1]
 15                  -1  1    148224  ultralytics.nn.modules.C2f                   [384, 128, 1]
 16                  -1  1    147712  ultralytics.nn.modules.Conv                  [128, 128, 3, 2]
 17            [-1, 12]  1         0  ultralytics.nn.modules.Concat                [1]
 18                  -1  1    493056  ultralytics.nn.modules.C2f                   [384, 256, 1]
 19                  -1  1    590336  ultralytics.nn.modules.Conv                  [256, 256, 3, 2]
 20             [-1, 9]  1         0  ultralytics.nn.modules.Concat                [1]
 21                  -1  1   1969152  ultralytics.nn.modules.C2f                   [768, 512, 1]
 22        [15, 18, 21]  1   2116435  ultralytics.nn.modules.Detect                [1, [128, 256, 512]]
Model summary: 225 layers, 11135987 parameters, 11135971 gradients, 28.6 GFLOPs

Transferred 349/355 items from pretrained weights
optimizer: SGD(lr=0.01) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.001), 63 bias
train: Scanning /content/datasets/nestle-product-finder--2/train/labels.cache... 128 images, 0 backgrounds, 0 corrupt:
albumentations: Blur(p=0.01, blur_limit=(3, 7)), MedianBlur(p=0.01, blur_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01,
val: Scanning /content/datasets/nestle-product-finder--2/valid/labels.cache... 4 images, 0 backgrounds, 0 corrupt: 100
Image sizes 800 train, 800 val
Using 2 dataloader workers
Logging results to runs/detect/train4
Starting training for 25 epochs...

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       1/25      5.75G      1.187      3.409      1.581         89        800: 100% 8/8 [00:11<00:00,  1.46s/it]
/usr/local/lib/python3.10/dist-packages/torch/optim/lr_scheduler.py:136: UserWarning: Detected call of `lr_scheduler.s
  warnings.warn("Detected call of `lr_scheduler.step()` before `optimizer.step()`. "
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  2.35
                   all          4          4     0.0367       0.75     0.0412       0.01

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       2/25      5.78G      1.074      2.654      1.499         81        800: 100% 8/8 [00:09<00:00,  1.18s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  4.49
                   all          4          4      0.332       0.25      0.383      0.127

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       3/25      5.79G     0.8331      1.487      1.388         68        800: 100% 8/8 [00:08<00:00,  1.05s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  4.65
```

```
1 !ls {HOME}/runs/detect/train4/
```

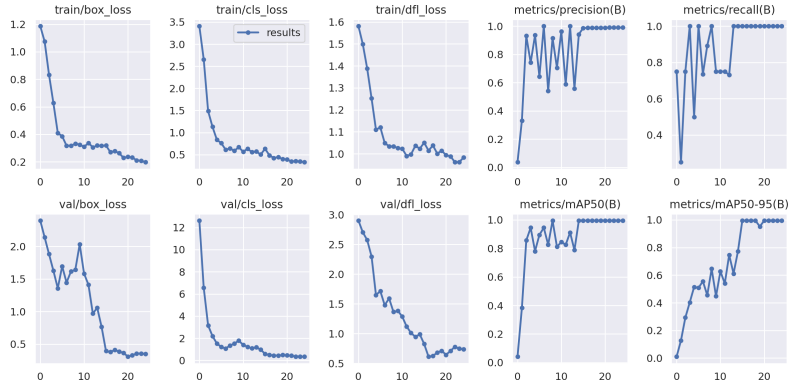
```
args.yaml                                       R_curve.png         train_batch122.jpg
confusion_matrix.png                            results.csv         train_batch1.jpg
events.out.tfevents.1697881376.cfb2bbac4a5a.4109.0  results.png         train_batch2.jpg
F1_curve.png                                    train_batch0.jpg    val_batch0_labels.jpg
P_curve.png                                     train_batch120.jpg  val_batch0_pred.jpg
PR_curve.png                                    train_batch121.jpg  weights
```

```
1 %cd {HOME}
2 Image(filename=f'{HOME}/runs/detect/train4/confusion_matrix.png', width=600)
```

```
/content
```


```
1 %cd {HOME}
2 Image(filename=f'{HOME}/runs/detect/train4/results.png', width=600)
```

```
/content
```




```
1 %cd {HOME}
2 Image(filename=f'{HOME}/runs/detect/train4/val_batch0_pred.jpg', width=600)
```

```
/content
```

Validate Custom Model

```
1 %cd {HOME}
2
3 !yolo task=detect mode=val model={HOME}/runs/detect/train4/weights/best.pt data={dataset.location}/data.yaml
```

```
/content
2023-10-21 09:51:33.020627: W tensorflow/compiler/tf2tensorrt/utils/py_utils.cc:38] TF-TRT Warning: Could not find Tenso
Ultralytics YOLOv8.0.20 🚀 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4, 15102MiB)
Model summary (fused): 168 layers, 11125971 parameters, 0 gradients, 28.4 GFLOPs
val: Scanning /content/datasets/nestle-product-finder--2/valid/labels.cache... 4 images, 0 backgrounds, 0 corrupt: 100%
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  1.67it
                   all          4          4      0.989          1      0.995      0.995
Speed: 0.4ms pre-process, 28.9ms inference, 0.0ms loss, 25.1ms post-process per image
```

Inference with Custom Model

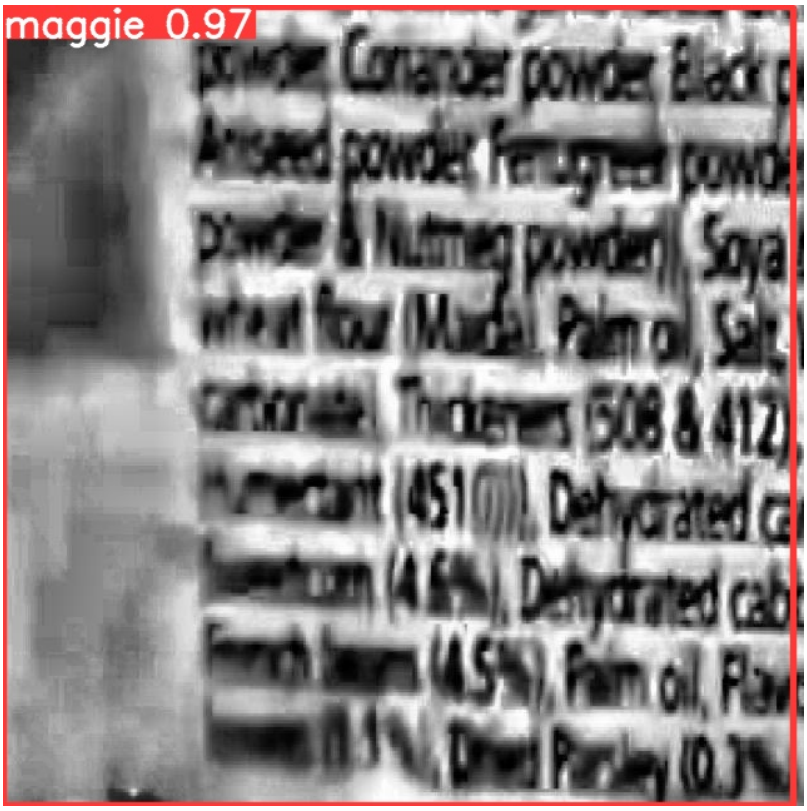
```
%cd {HOME}
!yolo task=detect mode=predict model={HOME}/runs/detect/train4/weights/best.pt conf=0.25 source={dataset.location}/test/im
```

```
/content
2023-10-21 09:52:07.391725: W tensorflow/compiler/tf2tensorrt/utils/py_utils.cc:38] TF-TRT Warning: Could not find Tenso
Ultralytics YOLOv8.0.20 🚀 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4, 15102MiB)
Model summary (fused): 168 layers, 11125971 parameters, 0 gradients, 28.4 GFLOPs
image 1/14 /content/datasets/nestle-product-finder--2/test/images/youtube-16_jpg.rf.1ef556b3a0a1b0284c9aa0d328385154.jpg
image 2/14 /content/datasets/nestle-product-finder--2/test/images/youtube-16_jpg.rf.2ebb947b6ebe74d1e26facd0f1ddb768.jpg
image 3/14 /content/datasets/nestle-product-finder--2/test/images/youtube-17_jpg.rf.0a5f7276cc9b48654bc3bb09aa794aa4.jpg
image 4/14 /content/datasets/nestle-product-finder--2/test/images/youtube-17_jpg.rf.3e7bd50f6239756cd06eeb9dedcec4fb.jpg
image 5/14 /content/datasets/nestle-product-finder--2/test/images/youtube-17_jpg.rf.835b178579218271372d94a0efb8d01b.jpg
image 6/14 /content/datasets/nestle-product-finder--2/test/images/youtube-17_jpg.rf.acb18a8d48a9ea6973622a44dac842cc.jpg
image 7/14 /content/datasets/nestle-product-finder--2/test/images/youtube-35_jpg.rf.333acb209ca4c51e121c9a468727a78d.jpg
image 8/14 /content/datasets/nestle-product-finder--2/test/images/youtube-35_jpg.rf.9ec4aecd4184390d363cd5f6ed9da739.jpg
image 9/14 /content/datasets/nestle-product-finder--2/test/images/youtube-35_jpg.rf.c5161f05168331c0a3f9cd99f659c039.jpg
image 10/14 /content/datasets/nestle-product-finder--2/test/images/youtube-35_jpg.rf.e2a0c56c5c46c5b272efcddf706a0501.jp
image 11/14 /content/datasets/nestle-product-finder--2/test/images/youtube-37_jpg.rf.248daab76df112c4a0430616e681c13e.jp
image 12/14 /content/datasets/nestle-product-finder--2/test/images/youtube-37_jpg.rf.2a1611df27f52b45bfe145499992c355.jp
image 13/14 /content/datasets/nestle-product-finder--2/test/images/youtube-37_jpg.rf.94b2cf136bc17a359a31a15b29ba6787.jp
image 14/14 /content/datasets/nestle-product-finder--2/test/images/youtube-37_jpg.rf.a8b4c2c498e1b41b44e350b4f5dae458.jp
Speed: 0.7ms pre-process, 20.5ms inference, 6.8ms postprocess per image at shape (1, 3, 800, 800)
Results saved to runs/detect/predict2
```

NOTE: Let's take a look at few results.

```
import glob
from IPython.display import Image, display

for image_path in glob.glob(f'{HOME}/runs/detect/predict2/*.jpg')[:3]:
      display(Image(filename=image_path, width=600))
      print("\n")
```


maggie 0.97


maggie 0.96
Ginger pow
cardamom
(Maida), Pa
Thickeners
Thickener


maggie 0.97
d garlic (2.5%), Cumin po
er. Black pepper powder (0.4%), Clo