```
!pip install ultralytics
```

```
Requirement already satisfied: tqdm>=4.64.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (4.66.4)
Requirement already satisfied: psutil in /usr/local/lib/python3.10/dist-packages (from ultralytics) (5.9.5)
Requirement already satisfied: py-cpuinfo in /usr/local/lib/python3.10/dist-packages (from ultralytics) (9.0.0)
Requirement already satisfied: pandas>=1.1.4 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (2.0.3)
Requirement already satisfied: seaborn>=0.11.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (0.13.1)
Collecting ultralytics-thop>=2.0.0 (from ultralytics)
  Downloading ultralytics_thop-2.0.0-py3-none-any.whl (25 kB)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (1.2.1)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (4.53.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (1.4.5)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (24.1)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (3.1.2)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.1.4->ultralytics) (2023.4)
Requirement already satisfied: tzdata>=2022.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.1.4->ultralytics) (2024.1)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (3.7)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (2.0.7)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (2024.6.2)
Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (3.15.3)
Requirement already satisfied: typing-extensions>=4.8.0 in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (4.12.2)
Requirement already satisfied: sympy in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (1.12.1)
Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (3.3)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (3.1.4)
Requirement already satisfied: fsspec in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (2023.6.0)
Collecting nvidia-cuda-nvrtc-cu12==12.1.105 (from torch>=1.8.0->ultralytics)
  Using cached nvidia_cuda_nvrtc_cu12-12.1.105-py3-none-manylinux1_x86_64.whl (23.7 MB)
Collecting nvidia-cuda-runtime-cu12==12.1.105 (from torch>=1.8.0->ultralytics)
  Using cached nvidia_cuda_runtime_cu12-12.1.105-py3-none-manylinux1_x86_64.whl (823 kB)
Collecting nvidia-cuda-cupti-cu12==12.1.105 (from torch>=1.8.0->ultralytics)
```

```
  Using cached nvidia_cusparse_cu12-12.1.0.106-py3-none-manylinux1_x86_64.whl (196.0 MB)
Collecting nvidia-nccl-cu12==2.20.5 (from torch>=1.8.0->ultralytics)
  Using cached nvidia_nccl_cu12-2.20.5-py3-none-manylinux2014_x86_64.whl (176.2 MB)
Collecting nvidia-nvtx-cu12==12.1.105 (from torch>=1.8.0->ultralytics)
  Using cached nvidia_nvtx_cu12-12.1.105-py3-none-manylinux1_x86_64.whl (99 kB)
Requirement already satisfied: triton==2.3.0 in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (2.3.0)
Collecting nvidia-nvjitlink-cu12 (from nvidia-cusolver-cu12==11.4.5.107->torch>=1.8.0->ultralytics)
  Downloading nvidia_nvjitlink_cu12-12.5.40-py3-none-manylinux2014_x86_64.whl (21.3 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 21.3/21.3 MB 32.9 MB/s eta 0:00:00
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.7->matplotlib>=3.3.0->ultralytics) (1.16.0)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.10/dist-packages (from jinja2->torch>=1.8.0->ultralytics) (2.1.5)
Requirement already satisfied: mpmath<1.4.0,>=1.1.0 in /usr/local/lib/python3.10/dist-packages (from sympy->torch>=1.8.0->ultralytics) (1.3.0)
Installing collected packages: nvidia-nvtx-cu12, nvidia-nvjitlink-cu12, nvidia-nccl-cu12, nvidia-curand-cu12, nvidia-cufft-cu12, nvidia-cuda-runtime-cu12, nvidia-cu
Successfully installed nvidia-cublas-cu12-12.1.3.1 nvidia-cuda-cupti-cu12-12.1.105 nvidia-cuda-nvrtc-cu12-12.1.105 nvidia-cuda-runtime-cu12-12.1.105 nvidia-cudnn-cu
```

```
!pip install roboflow
```

```
Collecting roboflow
  Downloading roboflow-1.1.33-py3-none-any.whl (75 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 75.6/75.6 kB 3.0 MB/s eta 0:00:00
Requirement already satisfied: certifi in /usr/local/lib/python3.10/dist-packages (from roboflow) (2024.6.2)
Collecting chardet==4.0.0 (from roboflow)
  Downloading chardet-4.0.0-py2.py3-none-any.whl (178 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 178.7/178.7 kB 6.5 MB/s eta 0:00:00
Requirement already satisfied: idna==3.7 in /usr/local/lib/python3.10/dist-packages (from roboflow) (3.7)
Requirement already satisfied: cycler in /usr/local/lib/python3.10/dist-packages (from roboflow) (0.12.1)
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) (1.25.2)
Requirement already satisfied: opencv-python-headless==4.10.0.84 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.10.0.84)
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.10/dist-packages (from roboflow) (9.4.0)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.8.2)
Collecting python-dotenv (from roboflow)
  Downloading python_dotenv-1.0.1-py3-none-any.whl (19 kB)
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: 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) (4.66.4)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from roboflow) (6.0.1)
Collecting requests-toolbelt (from roboflow)
  Downloading requests_toolbelt-1.0.0-py2.py3-none-any.whl (54 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 54.5/54.5 kB 6.4 MB/s eta 0:00:00
Collecting python-magic (from roboflow)
  Downloading python_magic-0.4.27-py2.py3-none-any.whl (13 kB)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (1.2.1)
```

```
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (4.53.0)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (24.1)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (3.1.2)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests->roboflow) (3.3.2)
Installing collected packages: python-magic, python-dotenv, chardet, requests-toolbelt, roboflow
  Attempting uninstall: chardet
    Found existing installation: chardet 5.2.0
    Uninstalling chardet-5.2.0:
      Successfully uninstalled chardet-5.2.0
Successfully installed chardet-4.0.0 python-dotenv-1.0.1 python-magic-0.4.27 requests-toolbelt-1.0.0 roboflow-1.1.33
```

```
from roboflow import Roboflow
rf = Roboflow(api_key="3KqG1UPZmi8eBhoVjB7Q")
project = rf.workspace("kewlabd").project("currency-identification-smart-glasses")
version = project.version(3)
dataset = version.download("yolov9")
```

```
loading Roboflow workspace...
loading Roboflow project...
Downloading Dataset Version Zip in Currency-Identification-Smart-Glasses-3 to yolov9:: 100%|██████████| 141331/141331 [00:02<00:00, 61772.08it/s]

Extracting Dataset Version Zip to Currency-Identification-Smart-Glasses-3 in yolov9:: 100%|██████████| 7234/7234 [00:01<00:00, 6311.66it/s]
```

```
from ultralytics import YOLO

# Load a model
model = YOLO("yolov9c.yaml")  # build a new model from YAML
model = YOLO("yolov9c.pt")  # load a pretrained model (recommended for training)
```

```
Downloading https://github.com/ultralytics/assets/releases/download/v8.2.0/yolov8n.pt to 'yolov8n.pt'...
100%|██████████| 6.23M/6.23M [00:00<00:00, 139MB/s]
```

```
Start coding or generate with AI.
```

```
results = model.train(data="/content/DataSet/data.yaml", epochs=20, imgsz=640)
```

```
Ultralytics YOLOv8.2.45 🚀 Python-3.10.12 torch-2.3.0+cu121 CUDA:0 (Tesla T4, 15102MiB)
engine/trainer: task=detect, mode=train, model=yolov8n.pt, data=/content/DataSet/data.yaml, epochs=20, time=None, patience=100, batch=16, imgsz=640, save=True, save
Downloading https://ultralytics.com/assets/Arial.ttf to '/root/.config/Ultralytics/Arial.ttf'...
100%|██████████| 755k/755k [00:00<00:00, 19.2MB/s]
Overriding model.yaml nc=80 with nc=7
```

```
                   from  n    params  module                                       arguments
  0                  -1  1       464  ultralytics.nn.modules.conv.Conv             [3, 16, 3, 2]
  1                  -1  1      4672  ultralytics.nn.modules.conv.Conv             [16, 32, 3, 2]
  2                  -1  1      7360  ultralytics.nn.modules.block.C2f             [32, 32, 1, True]
  3                  -1  1     18560  ultralytics.nn.modules.conv.Conv             [32, 64, 3, 2]
  4                  -1  2     49664  ultralytics.nn.modules.block.C2f             [64, 64, 2, True]
  5                  -1  1     73984  ultralytics.nn.modules.conv.Conv             [64, 128, 3, 2]
  6                  -1  2    197632  ultralytics.nn.modules.block.C2f             [128, 128, 2, True]
  7                  -1  1    295424  ultralytics.nn.modules.conv.Conv             [128, 256, 3, 2]
  8                  -1  1    460288  ultralytics.nn.modules.block.C2f             [256, 256, 1, True]
  9                  -1  1    164608  ultralytics.nn.modules.block.SPPF            [256, 256, 5]
 10                  -1  1         0  torch.nn.modules.upsampling.Upsample         [None, 2, 'nearest']
 11             [-1, 6]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 12                  -1  1    148224  ultralytics.nn.modules.block.C2f             [384, 128, 1]
 13                  -1  1         0  torch.nn.modules.upsampling.Upsample         [None, 2, 'nearest']
 14             [-1, 4]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 15                  -1  1     37248  ultralytics.nn.modules.block.C2f             [192, 64, 1]
 16                  -1  1     36992  ultralytics.nn.modules.conv.Conv             [64, 64, 3, 2]
 17            [-1, 12]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 18                  -1  1    123648  ultralytics.nn.modules.block.C2f             [192, 128, 1]
 19                  -1  1    147712  ultralytics.nn.modules.conv.Conv             [128, 128, 3, 2]
 20             [-1, 9]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 21                  -1  1    493056  ultralytics.nn.modules.block.C2f             [384, 256, 1]
 22        [15, 18, 21]  1    752677  ultralytics.nn.modules.head.Detect           [7, [64, 128, 256]]
Model summary: 225 layers, 3012213 parameters, 3012197 gradients, 8.2 GFLOPs

Transferred 319/355 items from pretrained weights
TensorBoard: Start with 'tensorboard --logdir runs/detect/train3', view at http://localhost:6006/
Freezing layer 'model.22.dfl.conv.weight'
AMP: running Automatic Mixed Precision (AMP) checks with YOLOv8n...
Plan failed with a cudnnException: CUDNN_BACKEND_EXECUTION_PLAN_DESCRIPTOR: cudnnFinalize Descriptor Failed cudnn_status: CUDNN_STATUS_NOT_SUPPORTED (Triggered inte
AMP: checks passed ✅
train: Scanning /content/DataSet/train/labels... 2527 images, 0 backgrounds, 0 corrupt: 100%|██████████| 2527/2527 [00:01<00:00, 1387.76it/s]
train: New cache created: /content/DataSet/train/labels.cache
WARNING ⚠️ Box and segment counts should be equal, but got len(segments) = 2503, len(boxes) = 2531. To resolve this only boxes will be used and all segments will b
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, clip_limit=(1, 4.0), tile_grid_size=(8, 8))
os.fork() was called. os.fork() is incompatible with multithreaded code, and JAX is multithreaded, so this will likely lead to a deadlock.
val: Scanning /content/DataSet/valid/labels... 722 images, 0 backgrounds, 0 corrupt: 100%|██████████| 722/722 [00:00<00:00, 759.44it/s]val: New cache created: /cont
WARNING ⚠️ Box and segment counts should be equal, but got len(segments) = 716, len(boxes) = 724. To resolve this only boxes will be used and all segments will be

Plotting labels to runs/detect/train3/labels.jpg...
optimizer: 'optimizer=auto' found, ignoring 'lr0=0.01' and 'momentum=0.937' and determining best 'optimizer', 'lr0' and 'momentum' automatically...
optimizer: AdamW(lr=0.000909, momentum=0.9) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)
TensorBoard: model graph visualization added ✅
Image sizes 640 train, 640 val
Using 2 dataloader workers
```

```
Logging results to runs/detect/train3
Starting training for 20 epochs...

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       1/20      2.44G     0.7339      2.745      1.189         29        640: 100%|██████████| 158/158 [01:04<00:00,  2.45it/s]
```

```
# Load a model
model = YOLO("/content/runs/detect/train3/weights/best.pt")  # pretrained YOLOv8n model

# Run batched inference on a list of images
results = model(["/content/DataSet/valid/images/IMG20211228002316_jpg.rf.ef21b7b00e7ab80717528e50a1c2f5cc.jpg", "/content/DataSet/valid/images/IMG20211228012555_jpg.rf.d3

# Process results list
for result in results:
    boxes = result.boxes  # Boxes object for bounding box output
    masks = result.masks  # Masks object for segmentation masks outputs
    keypoints = result.keypoints  # Keypoints object for pose outputs
    probs = result.probs  # Probs object for classification outputs
    obb = result.obb  # Oriented boxes object for OBB outputs
    result.show()  # display to screen
    result.save(filename="result.jpg")  # save to disk
```

```
0: 640x640 1 50, 6.5ms
1: 640x640 1 5000, 6.5ms
Speed: 1.9ms preprocess, 6.5ms inference, 1.1ms postprocess per image at shape (1, 3, 640, 640)
```

```
model = YOLO("yolov9c.yaml")  # build a new model from YAML
model = YOLO("yolov9c.pt")  # load a pretrained model (recommended for training)
```

```
Downloading https://github.com/ultralytics/assets/releases/download/v8.2.0/yolov9c.pt to 'yolov9c.pt'...
100%|██████████| 49.4M/49.4M [00:00<00:00, 241MB/s]
```

```
results = model.train(data="/content/DataSet/data.yaml", epochs=30, imgsz=640)
```

```
      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
      27/30        11G      0.467      0.289      1.028         15        640: 100%|██████████| 158/158 [02:04<00:00,  1.27it/s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 23/23 [00:16<00:00,  1.38it/s]                   all
```

```
# Load a model
model = YOLO("/content/runs/detect/train4/weights/best.pt")  # pretrained YOLOv8n model

# Run batched inference on a list of images
results = model(["/content/DataSet/valid/images/IMG20211228002316_jpg.rf.ef21b7b00e7ab80717528e50a1c2f5cc.jpg", "/content/DataSet/valid/images/IMG20211228012555_jpg.rf.d3

# Process results list
for result in results:
    boxes = result.boxes  # Boxes object for bounding box output
    masks = result.masks  # Masks object for segmentation masks outputs
    keypoints = result.keypoints  # Keypoints object for pose outputs
    probs = result.probs  # Probs object for classification outputs
    obb = result.obb  # Oriented boxes object for OBB outputs
    result.show()  # display to screen
    result.save(filename="result2.jpg")  # save to disk
```

```
0: 640x640 1 50, 47.8ms
1: 640x640 1 5000, 47.8ms
Speed: 1.5ms preprocess, 47.8ms inference, 1.3ms postprocess per image at shape (1, 3, 640, 640)
```

Start coding or generate with AI.