Image Classification with YOLO (You Only Look Once)

Setup the Environment

```
1 # install the ultralytics package, which will handle the machine learning using YOLO
2 !pip install ultralytics
```

```
Collecting ultralytics
  Downloading ultralytics-8.3.23-py3-none-any.whl.metadata (35 kB)
Requirement already satisfied: numpy>=1.23.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (1.26.4)
Requirement already satisfied: matplotlib>=3.3.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (3.7.1)
Requirement already satisfied: opencv-python>=4.6.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (4.10.0.84)
Requirement already satisfied: pillow>=7.1.2 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (10.4.0)
Requirement already satisfied: pyyaml>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (6.0.2)
Requirement already satisfied: requests>=2.23.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (2.32.3)
Requirement already satisfied: scipy>=1.4.1 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (1.13.1)
Requirement already satisfied: torch>=1.8.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (2.5.0+cu121)
Requirement already satisfied: torchvision>=0.9.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (0.20.0+cu121)
Requirement already satisfied: tqdm>=4.64.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (4.66.5)
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) (2.2.2)
Requirement already satisfied: seaborn>=0.11.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (0.13.2)
Collecting ultralytics-thop>=2.0.0 (from ultralytics)
  Downloading ultralytics_thop-2.0.9-py3-none-any.whl.metadata (9.3 kB)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (1.3.0)
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) (4.54.
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (1.4.7
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) (3.2.0)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (2.
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.1.4->ultralytics) (2024.2)
Requirement already satisfied: tzdata>=2022.7 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.1.4->ultralytics) (2024.2)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (3.10)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (2.2.3
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (2024.
Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (3.16.1)
Requirement already satisfied: typing-extensions>=4.8.0 in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (4.1
Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (3.4.2)
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) (2024.6.1)
Requirement already satisfied: sympy==1.13.1 in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (1.13.1)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in /usr/local/lib/python3.10/dist-packages (from sympy==1.13.1->torch>=1.8.0->ultralyt
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.7->matplotlib>=3.3.0->ultral
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.10/dist-packages (from jinja2->torch>=1.8.0->ultralytics) (3.0.
Downloading ultralytics-8.3.23-py3-none-any.whl (877 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 877.6/877.6 kB 13.3 MB/s eta 0:00:00
Downloading ultralytics_thop-2.0.9-py3-none-any.whl (26 kB)
Installing collected packages: ultralytics-thop, ultralytics
Successfully installed ultralytics-8.3.23 ultralytics-thop-2.0.9
```

```
1 # import the needed packages
2 from ultralytics import YOLO # machine learning package
3 from google.colab import drive # your google drive
4 import os
```

```
Creating new Ultralytics Settings v0.0.6 file ✅
View Ultralytics Settings with 'yolo settings' or at '/root/.config/Ultralytics/settings.json'
Update Settings with 'yolo settings key=value', i.e. 'yolo settings runs_dir=path/to/dir'. For help see https://docs.ultralytics.com/qui
```

+ Code   + Text

```
1 # mount your google drive
2 drive.mount("/content/gdrive")
```

```
Mounted at /content/gdrive
```

Train the Model

```
1 # point to the location of your image data
2 ROOT_DIR = "/content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files"
```

```
1 # load the model
2 model = YOLO("yolov8n.yaml")
```

```
1 # train the model on the image data
2 output = model.train(data=os.path.join(ROOT_DIR, "data.yaml"), epochs=75)
```

		_	_	_	_			
12/75	2.29G	1.397	1.897	1.853	10	640: 100%	██████████	404/404 [00:40<00:00, 9.99it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.52i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
13/75	2.29G	1.376	1.828	1.835	7	640: 100%	██████████	404/404 [00:40<00:00, 10.01it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.02i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
14/75	2.29G	1.346	1.739	1.802	7	640: 100%	██████████	404/404 [00:40<00:00, 9.99it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.68i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
15/75	2.29G	1.347	1.722	1.798	10	640: 100%	██████████	404/404 [00:40<00:00, 9.98it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 7.82i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
16/75	2.29G	1.299	1.647	1.759	8	640: 100%	██████████	404/404 [00:40<00:00, 9.97it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.46i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
17/75	2.29G	1.285	1.614	1.737	11	640: 100%	██████████	404/404 [00:40<00:00, 10.01it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.21i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
18/75	2.29G	1.27	1.539	1.722	9	640: 100%	██████████	404/404 [00:40<00:00, 9.95it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.75i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
19/75	2.29G	1.241	1.501	1.695	3	640: 100%	██████████	404/404 [00:40<00:00, 9.96it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.23i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
20/75	2.29G	1.234	1.494	1.695	6	640: 100%	██████████	404/404 [00:40<00:00, 9.97it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.25i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
21/75	2.29G	1.219	1.462	1.676	14	640: 100%	██████████	404/404 [00:40<00:00, 9.96it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.72i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
22/75	2.29G	1.212	1.428	1.665	9	640: 100%	██████████	404/404 [00:40<00:00, 9.93it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:02<00:00, 8.15i

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
23/75	2.29G	1.202	1.389	1.647	9	640: 100%	██████████	404/404 [00:40<00:00, 10.03it/s]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100%	██████████	18/18 [00:01<00:00, 9.10i

∨ Access Model Output

```
1 results = model.predict(source=os.path.join(ROOT_DIR, "test/images"), save=True)
```

```
image 257/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-29_jpg.rf.121bb198794079498a7e9e2ede99dce1
image 258/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-29_jpg.rf.dc2dcea463314f8b47667142adb650fb
image 259/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-34_jpg.rf.348de6113db6e57567e97707f44d67c3
image 260/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-37_jpg.rf.c37e20e61025e5b29cf34add1e2ee3bc
image 261/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-39_jpg.rf.b9e13672096b17ca25211a4166114c8c
image 262/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-3_jpg.rf.efdfbd6b9dd687268ca188c0ae3f54da.
image 263/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-40_jpg.rf.a39bd6b610c103709408b34c32d3b97f
image 264/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-46_jpg.rf.a445d2725c0fa51ab9c496a7be94c522
image 265/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-50_jpg.rf.8feac9da5300444c7e16fa9ba30ce2f2
image 266/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-51_jpg.rf.592602e13fd91f20c176e68d59a21d1e
image 267/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-56_jpg.rf.7676322ce508982f24ee8eb4f6266ab9
image 268/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-58_jpg.rf.38a083eefa3d90155ecfae628b3df0de
image 269/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-59_jpg.rf.60f4826abbf282fb647605441bfb1024
image 270/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-63_jpg.rf.ca761368d61451ada0968062870a7026
image 271/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-70_jpg.rf.73d1fdcd2f9c5a15646637453c1450c1
image 272/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-84_jpg.rf.a53d50d8ad44fcf9ea8d0d88777572c8
image 273/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/youtube-93_jpg.rf.b6c1dc39154e28cce2bd5ea57387ab48
image 274/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-104_jpg.r
image 275/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-107_jpg.r
image 276/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-108_jpg.r
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image 278/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-114_jpg.r
image 279/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-12_jpg.rf
image 280/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-137_jpg.r
image 281/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-143_jpg.r
image 282/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-147_jpg.r
image 283/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-157_jpg.r
image 284/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-164_jpg.r
image 285/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-178_jpg.r
image 286/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-187_jpg.r
image 287/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-199_jpg.r
image 288/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-209_jpg.r
image 289/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-216_jpg.r
image 290/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-238_jpg.r
image 291/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-243_jpg.r
image 292/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-256_jpg.r
image 293/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-27_jpg.rf
image 294/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-285_jpg.r
image 295/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-291_jpg.r
image 296/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-37_jpg.rf
image 297/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-3_jpg.rf.
image 298/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-42_jpg.rf
image 299/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-58_jpg.rf
image 300/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-72_jpg.rf
image 301/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-74_jpg.rf
image 302/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-79_jpg.rf
image 303/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-87_jpg.rf
image 304/304 /content/gdrive/My Drive/Rock_Paper_Scissors/Model_Files/test/images/zoom_tests_RockPaperScissors-mohamed_mp4-99_jpg.rf
Speed: 2.1ms preprocess, 7.7ms inference, 1.1ms postprocess per image at shape (1, 3, 640, 640)
Results saved to runs/detect/train2
```

```python
1 import locale
2 import os
3
4 try:
5     locale.setlocale(locale.LC_ALL, 'en_US.UTF-8')
6 except locale.Error as e:
7     print("Error setting locale:", e)
8
9 os.environ['LC_ALL'] = 'en_US.UTF-8'
10 os.environ['LANG'] = 'en_US.UTF-8'
11
12 locale.getpreferredencoding = lambda: "UTF-8"
```

```python
1 # Copy the results folder to Google Drive
2 !cp -r /content/runs "/content/gdrive/My Drive/Rock_Paper_Scissors/Model_Output"
```

```python
1 # Get the model metrics
2 metrics = model.val()
```