



```
!nvidia-smi
```


 Tue Sep 17 09:01:12 2024

NVIDIA-SMI 535.104.05				Driver Version: 535.104.05		CUDA Version: 12.2	
GPU	Name	Perf	Persistence-M	Bus-Id	Disp.A	Volatile	Uncorr. ECC
Fan	Temp		Pwr:Usage/Cap		Memory-Usage	GPU-Util	Compute M.
							MIG M.
0	Tesla T4		Off	00000000:00:04.0	Off		0
N/A	61C	P8	11W / 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
HOME = os.getcwd()
print(HOME)




 /content

# Pip install method (recommended)

!pip install ultralytics==8.0.196

from IPython import display
display.clear_output()

import ultralytics
ultralytics.checks()

 Ultralytics YOLOv8.0.196  Python-3.10.12 torch-2.4.0+cu121 CUDA:0 (Tesla T4, 15102MiB)
Setup complete  (2 CPUs, 12.7 GB RAM, 32.6/112.6 GB disk)

# Git clone method (for development)

# %cd {HOME}
# !git clone github.com/ultralytics/ultralytics
# %cd {HOME}/ultralytics
# !pip install -e .

# from IPython import display
# display.clear_output()


# import ultralytics
# ultralytics.checks()

from ultralytics import YOLO

from IPython.display import display, Image

!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="5keK78Jd2vJ9EB7lacGU")
project = rf.workspace("ganesh-lbmbj").project("indian-emergency-vehicles-dataset")
version = project.version(2)
dataset = version.download("yolov8")
```

 Collecting roboflow

Downloading roboflow-1.1.45-py3-none-any.whl.metadata (9.7 kB)
Requirement already satisfied: certifi in /usr/local/lib/python3.10/dist-packages (from roboflow) (2024.8.30)
Collecting idna==3.7 (from roboflow)
Downloading idna-3.7-py3-none-any.whl.metadata (9.9 kB)
Requirement already satisfied: cyler 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) (1.4.7)

```
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) (1.26.4)
Requirement already satisfied: opencv-python-headless==4.10.0.84 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.10.0)
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.metadata (23 kB)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.32.3)
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) (4.66.5)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from roboflow) (6.0.2)
Collecting requests-toolbelt (from roboflow)
  Downloading requests_toolbelt-1.0.0-py2.py3-none-any.whl.metadata (14 kB)
Collecting filetype (from roboflow)
  Downloading filetype-1.2.0-py2.py3-none-any.whl.metadata (6.5 kB)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (1.3.0)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (4.53.1)
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) (3.1.4)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests->roboflow) (3.3.2)
Downloading roboflow-1.1.45-py3-none-any.whl (80 kB)
80.3/80.3 kB 6.5 MB/s eta 0:00:00
Downloading idna-3.7-py3-none-any.whl (66 kB)
66.8/66.8 kB 6.0 MB/s eta 0:00:00
Downloading filetype-1.2.0-py2.py3-none-any.whl (19 kB)
Downloading python_dotenv-1.0.1-py3-none-any.whl (19 kB)
Downloading requests_toolbelt-1.0.0-py2.py3-none-any.whl (54 kB)
54.5/54.5 kB 5.0 MB/s eta 0:00:00
Installing collected packages: filetype, python-dotenv, idna, requests-toolbelt, roboflow
  Attempting uninstall: idna
    Found existing installation: idna 3.8
    Uninstalling idna-3.8:
      Successfully uninstalled idna-3.8
Successfully installed filetype-1.2.0 idna-3.7 python-dotenv-1.0.1 requests-toolbelt-1.0.0 roboflow-1.1.45
loading Roboflow workspace...
loading Roboflow project...
Downloading Dataset Version Zip in Indian-Vehicle-Dataset-Duplicate-2 to yolov8:: 100%|██████████| 205481/205481 [00:03<00:00, 595:
Extracting Dataset Version Zip to Indian-Vehicle-Dataset-Duplicate-2 in yolov8:: 100%|██████████| 18765/18765 [00:02<00:00, 8081.4:
```

Custom Training

```
%cd {HOME}
```

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

```
→ /content
Downloading https://github.com/ultralytics/assets/releases/download/v0.0.0/yolov8s.pt to 'yolov8s.pt'...
100% 21.5M/21.5M [00:00<00:00, 264MB/s]
/usr/local/lib/python3.10/dist-packages/ultralytics/nn/tasks.py:567: FutureWarning: You are using `torch.load` with `weights_only=f
  return torch.load(file, map_location='cpu'), file # load
New https://pypi.org/project/ultralytics/8.2.95 available 🤖 Update with 'pip install -U ultralytics'
Ultralytics YOLOv8.0.196 Python-3.10.12 torch-2.4.0+cu121 CUDA:0 (Tesla T4, 15102MiB)
engine/trainer: task=detect, mode=train, model=yolov8s.pt, data=/content/Indian-Vehicle-Dataset-Duplicate-2/data.yaml, epochs=25, p
Downloading https://ultralytics.com/assets/Arial.ttf to '/root/.config/Ultralytics/Arial.ttf'...
100% 755k/755k [00:00<00:00, 24.2MB/s]
2024-09-17 09:03:36.242909: E external/local_xla/xla/stream_executor/cuda/cuda_fft.cc:485] Unable to register cuFFT factory: Attem
2024-09-17 09:03:36.260588: E external/local_xla/xla/stream_executor/cuda/cuda_dnn.cc:8454] Unable to register cuDNN factory: Atter
2024-09-17 09:03:36.266365: E external/local_xla/xla/stream_executor/cuda/cuda_blas.cc:1452] Unable to register cuBLAS factory: At
Overriding model.yaml nc=80 with nc=7
```

	from	n	params	module	arguments
0	-1	1	928	ultralytics.nn.modules.conv.Conv	[3, 32, 3, 2]
1	-1	1	18560	ultralytics.nn.modules.conv.Conv	[32, 64, 3, 2]
2	-1	1	29056	ultralytics.nn.modules.block.C2f	[64, 64, 1, True]
3	-1	1	73984	ultralytics.nn.modules.conv.Conv	[64, 128, 3, 2]
4	-1	2	197632	ultralytics.nn.modules.block.C2f	[128, 128, 2, True]
5	-1	1	295424	ultralytics.nn.modules.conv.Conv	[128, 256, 3, 2]
6	-1	2	788480	ultralytics.nn.modules.block.C2f	[256, 256, 2, True]
7	-1	1	1180672	ultralytics.nn.modules.conv.Conv	[256, 512, 3, 2]
8	-1	1	1838080	ultralytics.nn.modules.block.C2f	[512, 512, 1, True]
9	-1	1	656896	ultralytics.nn.modules.block.SPPF	[512, 512, 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	591360	ultralytics.nn.modules.block.C2f	[768, 256, 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	148224	ultralytics.nn.modules.block.C2f	[384, 128, 1]
16	-1	1	147712	ultralytics.nn.modules.conv.Conv	[128, 128, 3, 2]
17	[-1, 12]	1	0	ultralytics.nn.modules.conv.Concat	[1]

```

18          -1 1      493056  ultralytics.nn.modules.block.C2f      [384, 256, 1]
19          -1 1      590336  ultralytics.nn.modules.conv.Conv      [256, 256, 3, 2]
20          [-1, 9] 1          0  ultralytics.nn.modules.conv.Concat      [1]
21          -1 1      1969152  ultralytics.nn.modules.block.C2f      [768, 512, 1]
22          [15, 18, 21] 1      2118757  ultralytics.nn.modules.head.Detect      [7, [128, 256, 512]]
Model summary: 225 layers, 11138309 parameters, 11138293 gradients, 28.7 GFLOPs

```

Transferred 349/355 items from pretrained weights

TensorBoard: Start with 'tensorboard --logdir runs/detect/train', view at <http://localhost:6006/>

Freezing layer 'model.22.dfl.conv.weight'

AMP: running Automatic Mixed Precision (AMP) checks with YOLOv8n...

Downloading <https://github.com/ultralytics/assets/releases/download/v0.0.0/yolov8n.pt> to 'yolov8n.pt'...

100% 6.23M/6.23M [00:00<00:00, 113MB/s]

/usr/local/lib/python3.10/dist-packages/ultralytics/nn/tasks.py:567: FutureWarning: You are using `torch.load` with `weights_only=False` which will be deprecated in a future release. Please use `torch.load` with `weights_only=True` to silence this warning and use `torch.serialization.load` to load the full file. (Triggered by 'return torch.load(file, map_location='cpu')', file # load

WARNING ⚠️ NMS time limit 0.550s exceeded

/usr/local/lib/python3.10/dist-packages/ultralytics/utils/checks.py:558: FutureWarning: `torch.cuda.amp.autocast(args...)` is deprecated in favor of `torch.cuda.amp.autocast(dtype=torch.float16, device_type='cuda', device_index=-1, min_cuda_major_version=11.0)`

AMP: checks passed ✓

/usr/local/lib/python3.10/dist-packages/ultralytics/engine/trainer.py:238: FutureWarning: `torch.cuda.amp.GradScaler(args...)` is deprecated in favor of `torch.cuda.amp.grad_scaler.GradScaler`

train: Scanning /content/Indian-Vehicle-Dataset-Duplicate-2/train/labels... 8277 images, 2765 backgrounds, 0 corrupt: 100% 8277/8277

train: New cache created: /content/Indian-Vehicle-Dataset-Duplicate-2/train/labels.cache

WARNING ⚠️ Box and segment counts should be equal, but got len(segments) = 201, len(boxes) = 6998. To resolve this only boxes will be used for training.

Save the model on local

!zip -r /content/best_model.zip /content/runs/detect/train/weights/best.pt



```

-----
NameError                                Traceback (most recent call last)
<ipython-input-2-25b0b6735776> in <cell line: 2>()
      1 # Save the model on local
----> 2 zip -r /content/best_model.zip /content/runs/detect/train/weights/best.pt

NameError: name 'r' is not defined

```

```

from google.colab import files
files.download('/content/best_model.zip')

```

```

from google.colab import files
files.download('/content/runs/detect/predict4/TrimmedVideo.avi')

```

run cthis command on locally

yolo task=detect mode=predict model=path/to/best.pt conf=0.25 source=path/to/video.mp4 save=True

!ls {HOME}/runs/detect/train/




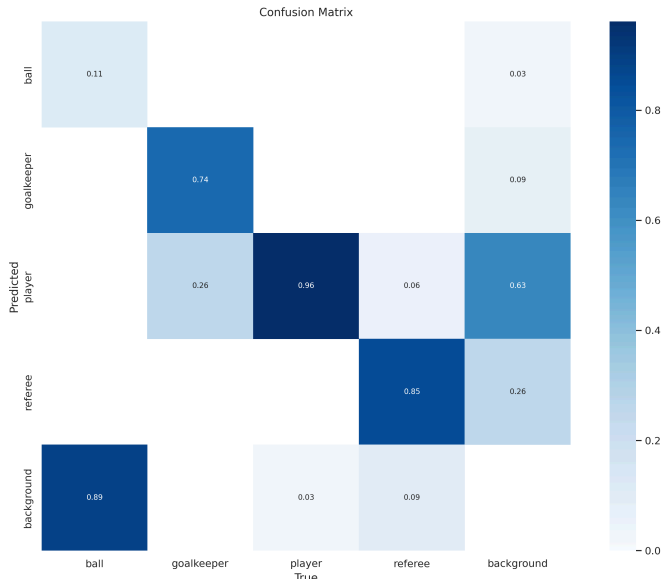
```
ls: cannot access '{HOME}/runs/detect/train/': No such file or directory
```

```

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


```

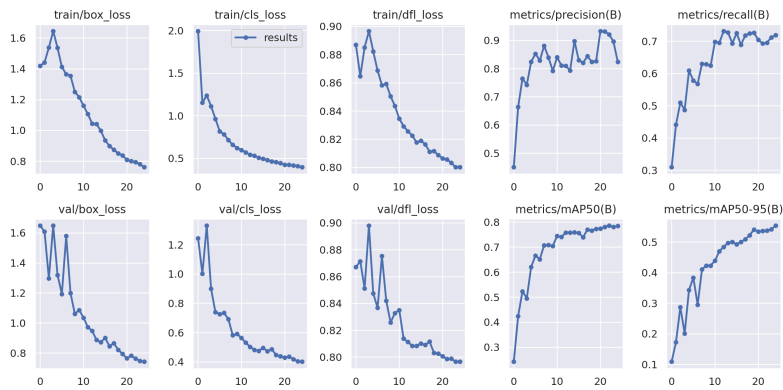
 /content



```
%cd {HOME}
```

```
Image(filename=f'{HOME}/runs/detect/train/results.png', width=600)
```

 /content



```
%cd {HOME}
```

```
Image(filename=f'{HOME}/runs/detect/train/val_batch0_pred.jpg', width=600)
```

 /content



✓ Validate Custom Model

```
%cd {HOME}
```

```
!yolo task=detect mode=val model={HOME}/runs/detect/train/weights/best.pt data={dataset.location}/data.yaml
```

```

/content
Ultralytics YOLOv8.0.9 Python-3.8.10 torch-1.13.1+cu116 CUDA:0 (Tesla T4, 15110MiB)
Fusing layers...
Model summary: 168 layers, 11127132 parameters, 0 gradients, 28.4 GFLOPs
val: Scanning /content/datasets/football-players-detection-1/valid/labels.cache... 38 images, 0 backgrounds, 0 corrupt: 100% 38/38

```

Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 3/3 [00:03<00:00, 1.25s/it]
all	38	905	0.81	0.726	0.762	0.493
ball	38	35	0.788	0.229	0.293	0.0589
goalkeeper	38	27	0.799	0.963	0.953	0.66
player	38	754	0.937	0.938	0.973	0.737
referee	38	89	0.716	0.775	0.828	0.515

```

Speed: 2.1ms pre-process, 7.0ms inference, 0.0ms loss, 1.6ms post-process per image

```

✓ Inference with Custom Model

```
%cd {HOME}
```

```
!yolo task=detect mode=predict model={HOME}/runs/detect/train/weights/best.pt conf=0.25 source={dataset.location}/test/images save=True
```

```

/content
Ultralytics YOLOv8.0.9 Python-3.8.10 torch-1.13.1+cu116 CUDA:0 (Tesla T4, 15110MiB)
Fusing layers...
Model summary: 168 layers, 11127132 parameters, 0 gradients, 28.4 GFLOPs
image 1/13 /content/datasets/football-players-detection-1/test/images/40cd38_7_6_png.rf.68ef7fcd663cdf0f5b96bacdbcd94e07.jpg: 384x
image 2/13 /content/datasets/football-players-detection-1/test/images/42ba34_1_5_png.rf.4337fde8fbc3640cf4351fb41ac9c3ca.jpg: 384x
image 3/13 /content/datasets/football-players-detection-1/test/images/42ba34_5_5_png.rf.ceb556bd4c92d41496ae1d8c56600c4a.jpg: 384x
image 4/13 /content/datasets/football-players-detection-1/test/images/4b770a_1_4_png.rf.5a45b3b841a06de414ceb802e34c136f.jpg: 384x
image 5/13 /content/datasets/football-players-detection-1/test/images/4b770a_3_6_png.rf.d0d9403f2f73ca0da7a6a1373c02b749.jpg: 384x
image 6/13 /content/datasets/football-players-detection-1/test/images/573e61_1_9_png.rf.e82af77d907cdc12dccbd6857f53b9b1.jpg: 384x
image 7/13 /content/datasets/football-players-detection-1/test/images/573e61_9_6_png.rf.fc52856b5974cb67862c25bae96f25ad.jpg: 384x
image 8/13 /content/datasets/football-players-detection-1/test/images/744b27_1_10_png.rf.e6f27d3b66a0c6720b9e9e50265251a6.jpg: 384x
image 9/13 /content/datasets/football-players-detection-1/test/images/744b27_7_4_png.rf.3431eaf3ff56847b5076376771bdf954.jpg: 384x
image 10/13 /content/datasets/football-players-detection-1/test/images/744b27_9_9_png.rf.b229c5eff4425a17d2f7e4b34cf7edd1.jpg: 384x
image 11/13 /content/datasets/football-players-detection-1/test/images/798b45_3_3_png.rf.f3a1db99742364b75a965df8ed33ba8f.jpg: 384x
image 12/13 /content/datasets/football-players-detection-1/test/images/a9f16c_2_10_png.rf.cf607320fc980b28b6e14b14fed46e91.jpg: 384x
image 13/13 /content/datasets/football-players-detection-1/test/images/a9f16c_2_9_png.rf.ee1080f3ec9bad6ba2b8ae4799f90b59.jpg: 384x
Speed: 0.4ms pre-process, 12.0ms inference, 1.7ms postprocess per image at shape (1, 3, 640, 640)
Results saved to runs/detect/predict3

```

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

```

import glob
from IPython.display import Image, display

# Define the base path where the folders are located
base_path = '/content/runs/detect/'

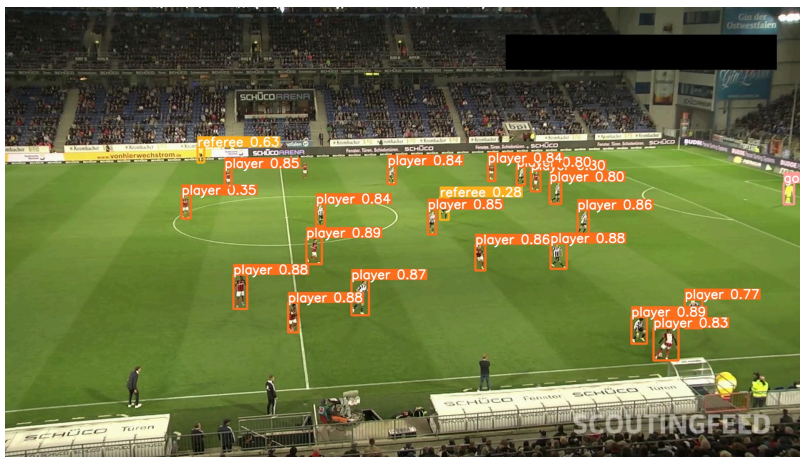
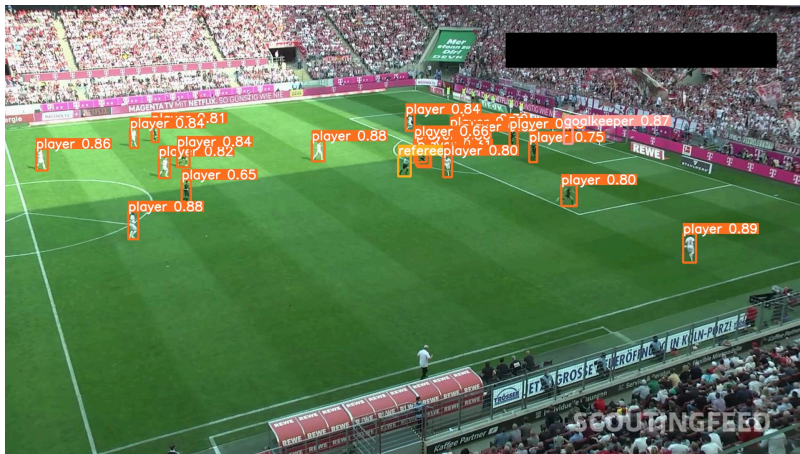
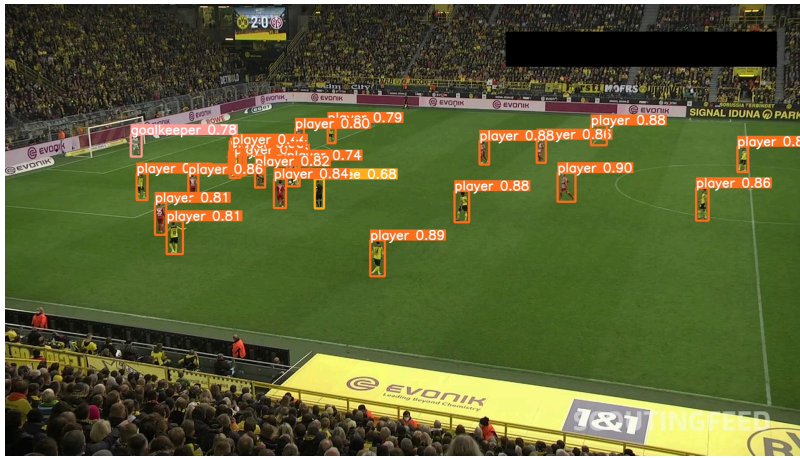
# List all directories that start with 'predict' in the base path
subfolders = [os.path.join(base_path, d) for d in os.listdir(base_path)
               if os.path.isdir(os.path.join(base_path, d)) and d.startswith('predict')]

# Find the latest folder by modification time
latest_folder = max(subfolders, key=os.path.getmtime)

image_paths = glob.glob(f'{latest_folder}/*.jpg')[:3]

# Display each image
for image_path in image_paths:
    display(Image(filename=image_path, width=600))
    print("\n")

```

> Deploy model on Roboflow

Once you have finished training your YOLOv8 model, you'll have a set of trained weights ready for use. These weights will be in the [/runs/detect/train/weights/best.pt](#) folder of your project. You can upload your model weights to Roboflow Deploy to use your trained weights on our infinitely scalable infrastructure.

The `.deploy()` function in the [Roboflow pip package](#) now supports uploading YOLOv8 weights.

To upload model weights, add the following code to the "Inference with Custom Model" section in the aforementioned notebook:

```
[ ] 3 cells hidden
```

> Deploy Your Model to the Edge

In addition to using the Roboflow hosted API for deployment, you can use [Roboflow Inference](#), an open source inference solution that has powered millions of API calls in production environments. Inference works with CPU and GPU, giving you immediate access to a range of devices, from the NVIDIA Jetson to TRT-compatible devices to ARM CPU devices.

With Roboflow Inference, you can self-host and deploy your model on-device. You can deploy applications using the [Inference Docker containers](#) or the pip package.

For example, to install Inference on a device with an NVIDIA GPU, we can use:

```
docker pull roboflow/roboflow-inference-server-gpu
```

Then we can run inference via HTTP:

```
import requests

workspace_id = ""
model_id = ""
image_url = ""
confidence = 0.75
api_key = ""

infer_payload = {
    "image": {
        "type": "url",
        "value": image_url,
    },
    "confidence": confidence,
    "iou_threshold": iou_thresh,
    "api_key": api_key,
}

res = requests.post(
    f"http://localhost:9001/{workspace_id}/{model_id}",
```