```
import shutil
dir_path = '/content/data.zip'
shutil.rmtree(dir_path)
```

```
!nvidia-smi
```

```
Thu Jan 30 10:02:48 2025
+-----------------------------------------------------------------------------------------+
| NVIDIA-SMI 550.54.15              Driver Version: 550.54.15      CUDA Version: 12.4      |
|-----------------------------------------+------------------------+----------------------+
| GPU  Name                 Persistence-M | Bus-Id          Disp.A | Volatile Uncorr. ECC |
| Fan  Temp    Perf          Pwr:Usage/Cap |           Memory-Usage | GPU-Util  Compute M. |
|                                          |                        |               MIG M. |
|=========================================+========================+======================|
|   0  Tesla T4                       Off | 00000000:00:04.0 Off |                    0 |
| N/A   41C    P8            9W /   70W |     0MiB /  15360MiB |     0%      Default |
|                                          |                        |                  N/A |
+-----------------------------------------+------------------------+----------------------+

+-----------------------------------------------------------------------------------------+
| Processes:                                                                              |
|  GPU   GI   CI        PID   Type   Process name                             GPU Memory |
|        ID   ID                                                              Usage      |
|=========================================================================================|
|  No running processes found                                                            |
+-----------------------------------------------------------------------------------------+
```

```
!unzip -q /content/data.zip -d /content/custom_data
```

```
!python train_val_split.py --datapath="/content/custom_data" --train_pct=0.9
```

```
Created folder at /content/data/train/images.
Created folder at /content/data/train/labels.
Created folder at /content/data/validation/images.
Created folder at /content/data/validation/labels.
Number of image files: 500
Number of annotation files: 500
Images moving to train: 450
Images moving to validation: 50
```

```
!pip install ultralytics
```

```
        Uninstalling nvidia-cuda-cupti-cu12-12.5.82:
          Successfully uninstalled nvidia-cuda-cupti-cu12-12.5.82
      Attempting uninstall: nvidia-cublas-cu12
        Found existing installation: nvidia-cublas-cu12 12.5.3.2
        Uninstalling nvidia-cublas-cu12-12.5.3.2:
          Successfully uninstalled nvidia-cublas-cu12-12.5.3.2
      Attempting uninstall: nvidia-cusparse-cu12
        Found existing installation: nvidia-cusparse-cu12 12.5.1.3
        Uninstalling nvidia-cusparse-cu12-12.5.1.3:
          Successfully uninstalled nvidia-cusparse-cu12-12.5.1.3
      Attempting uninstall: nvidia-cudnn-cu12
        Found existing installation: nvidia-cudnn-cu12 9.3.0.75
        Uninstalling nvidia-cudnn-cu12-9.3.0.75:
          Successfully uninstalled nvidia-cudnn-cu12-9.3.0.75
      Attempting uninstall: nvidia-cusolver-cu12
        Found existing installation: nvidia-cusolver-cu12 11.6.3.83
        Uninstalling nvidia-cusolver-cu12-11.6.3.83:
          Successfully uninstalled nvidia-cusolver-cu12-11.6.3.83
    Successfully installed nvidia-cublas-cu12-12.4.5.8 nvidia-cuda-cupti-cu12-12.4.127 nvidia-cuda-nvrtc-cu12-12.4.127 nvidia-cuda-runtim
```

```python
import yaml
import os

def create_data_yaml(path_to_classes_txt, path_to_data_yaml):

  # Read class.txt to get class names
  if not os.path.exists(path_to_classes_txt):
    print(f'classes.txt file not found! Please create a classes.txt labelmap and move it to {path_to_classes_txt}')
    return
  with open(path_to_classes_txt, 'r') as f:
    classes = []
    for line in f.readlines():
      if len(line.strip()) == 0: continue
      classes.append(line.strip())
  number_of_classes = len(classes)

  # Create data dictionary
  data = {
      'path': '/content/data',
      'train': 'train/images',
      'val': 'validation/images',
      'nc': number_of_classes,
      'names': classes
  }

  # Write data to YAML file
  with open(path_to_data_yaml, 'w') as f:
    yaml.dump(data, f, sort_keys=False)
  print(f'Created config file at {path_to_data_yaml}')

  return

# Define path to classes.txt and run function
path_to_classes_txt = '/content/custom_data/classes.txt'
path_to_data_yaml = '/content/data.yaml'

create_data_yaml(path_to_classes_txt, path_to_data_yaml)

print('\nFile contents:\n')
!cat /content/data.yaml
```

```
Created config file at /content/data.yaml

File contents:

path: /content/data
train: train/images
val: validation/images
nc: 3
names:
- High
- Low
- Medium
```

```
!yolo detect train data=/content/data.yaml model=yolo11s.pt epochs=60 imgsz=640
```

```
                                     all          50          226         0.291        0.448         0.301       0.123

        Epoch    GPU_mem    box_loss    cls_loss    dfl_loss  Instances       Size
        53/60     4.32G       1.362       1.002       1.337         75        640: 100% 28/28 [00:11<00:00,  2.51it/s]
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:00<00:00,  3.17it/s]
                   all          50          226         0.286        0.462         0.303       0.124

        Epoch    GPU_mem    box_loss    cls_loss    dfl_loss  Instances       Size
        54/60     4.32G       1.336      0.9854       1.327         51        640: 100% 28/28 [00:12<00:00,  2.17it/s]
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:00<00:00,  2.98it/s]
                   all          50          226         0.324        0.403         0.3       0.121

        Epoch    GPU_mem    box_loss    cls_loss    dfl_loss  Instances       Size
        55/60     4.35G       1.348      0.9785       1.333         81        640: 100% 28/28 [00:10<00:00,  2.56it/s]
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:01<00:00,  1.58it/s]
                   all          50          226         0.363        0.359         0.298       0.12

        Epoch    GPU_mem    box_loss    cls_loss    dfl_loss  Instances       Size
        56/60     4.36G       1.303      0.9368       1.305         95        640: 100% 28/28 [00:09<00:00,  3.04it/s]
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:00<00:00,  2.93it/s]
                   all          50          226         0.283        0.446         0.288       0.119

        Epoch    GPU_mem    box_loss    cls_loss    dfl_loss  Instances       Size
        57/60     4.37G       1.31       0.9247       1.306         73        640: 100% 28/28 [00:11<00:00,  2.39it/s]
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:00<00:00,  2.79it/s]
                   all          50          226         0.285        0.413         0.288       0.119

        Epoch    GPU_mem    box_loss    cls_loss    dfl_loss  Instances       Size
        58/60     4.35G       1.286       0.914       1.306         59        640: 100% 28/28 [00:12<00:00,  2.25it/s]
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:00<00:00,  2.78it/s]
                   all          50          226         0.404        0.331         0.298       0.121

        Epoch    GPU_mem    box_loss    cls_loss    dfl_loss  Instances       Size
        59/60     4.34G       1.28       0.8898       1.297         47        640: 100% 28/28 [00:10<00:00,  2.74it/s]
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:01<00:00,  1.53it/s]
                   all          50          226         0.301        0.429         0.291       0.123

        Epoch    GPU_mem    box_loss    cls_loss    dfl_loss  Instances       Size
        60/60     4.34G       1.249      0.8705       1.28          54        640: 100% 28/28 [00:09<00:00,  2.90it/s]
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:00<00:00,  2.87it/s]
                   all          50          226         0.351        0.344         0.29       0.123

    60 epochs completed in 0.232 hours.
    Optimizer stripped from runs/detect/train/weights/last.pt, 19.2MB
    Optimizer stripped from runs/detect/train/weights/best.pt, 19.2MB

    Validating runs/detect/train/weights/best.pt...
    Ultralytics 8.3.69 🚀 Python-3.11.11 torch-2.5.1+cu124 CUDA:0 (Tesla T4, 15095MiB)
    YOLO11s summary (fused): 238 layers, 9,413,961 parameters, 0 gradients, 21.3 GFLOPs
                 Class      Images   Instances      Box(P          R       mAP50  mAP50-95): 100% 2/2 [00:01<00:00,  1.81it/s]
                   all          50          226         0.378        0.379         0.348       0.15
                  High          22           60         0.406        0.445         0.419       0.19
                   Low          20           43         0.271        0.138         0.128       0.0633
                Medium          35          123         0.456        0.553         0.496       0.198
    Speed: 0.4ms preprocess, 4.8ms inference, 0.0ms loss, 3.3ms postprocess per image
    Results saved to runs/detect/train
    💡 Learn more at https://docs.ultralytics.com/modes/train
```

```python
!zip -r "runs.zip" "/content/runs"
```

```
    adding: content/runs/ (stored 0%)
    adding: content/runs/detect/ (stored 0%)
    adding: content/runs/detect/train/ (stored 0%)
    adding: content/runs/detect/train/train_batch3081.jpg (deflated 10%)
    adding: content/runs/detect/train/val_batch1_labels.jpg (deflated 6%)
    adding: content/runs/detect/train/train_batch0.jpg (deflated 3%)
    adding: content/runs/detect/train/val_batch1_pred.jpg (deflated 6%)
    adding: content/runs/detect/train/PR_curve.png (deflated 15%)
    adding: content/runs/detect/train/labels.jpg (deflated 24%)
    adding: content/runs/detect/train/train_batch3080.jpg (deflated 8%)
    adding: content/runs/detect/train/confusion_matrix_normalized.png (deflated 28%)
    adding: content/runs/detect/train/val_batch0_pred.jpg (deflated 6%)
    adding: content/runs/detect/train/weights/ (stored 0%)
    adding: content/runs/detect/train/weights/last.pt (deflated 9%)
    adding: content/runs/detect/train/weights/best.pt (deflated 9%)
    adding: content/runs/detect/train/labels_correlogram.jpg (deflated 37%)
    adding: content/runs/detect/train/args.yaml (deflated 53%)
    adding: content/runs/detect/train/R_curve.png (deflated 13%)
    adding: content/runs/detect/train/results.csv (deflated 61%)
    adding: content/runs/detect/train/train_batch3082.jpg (deflated 9%)
    adding: content/runs/detect/train/val_batch0_labels.jpg (deflated 6%)
    adding: content/runs/detect/train/confusion_matrix.png (deflated 33%)
```

```
    adding: content/runs/detect/train/P_curve.png (deflated 10%)
    adding: content/runs/detect/train/F1_curve.png (deflated 12%)
    adding: content/runs/detect/train/events.out.tfevents.1738217654.59ed2f24fd45.8265.0 (deflated 88%)
    adding: content/runs/detect/train/results.png (deflated 7%)
    adding: content/runs/detect/train/train_batch2.jpg (deflated 2%)
    adding: content/runs/detect/train/train_batch1.jpg (deflated 1%)
```

```
!yolo detect predict model=runs/detect/train/weights/best.pt source=data/validation/images save=True
```

```
Ultralytics 8.3.69 🚀 Python-3.11.11 torch-2.5.1+cu124 CUDA:0 (Tesla T4, 15095MiB)
YOLO11s summary (fused): 238 layers, 9,413,961 parameters, 0 gradients, 21.3 GFLOPs

image 1/50 /content/data/validation/images/073bb708-ph_289.jpg: 384x640 3 Highs, 49.7ms
image 2/50 /content/data/validation/images/0f520e75-ph_263.jpg: 480x640 1 Medium, 47.0ms
image 3/50 /content/data/validation/images/146d9e4a-ph_180.jpg: 480x640 1 High, 12.4ms
image 4/50 /content/data/validation/images/193a0e91-ph_474.jpg: 224x640 1 Medium, 45.1ms
image 5/50 /content/data/validation/images/1c9027af-ph_274.jpg: 640x448 1 High, 2 Lows, 3 Mediums, 48.8ms
image 6/50 /content/data/validation/images/1ec92261-ph_89.jpg: 480x640 1 High, 6 Mediums, 13.1ms
image 7/50 /content/data/validation/images/2cf4f542-ph_118.jpg: 448x640 5 Mediums, 43.9ms
image 8/50 /content/data/validation/images/33781026-ph_71.jpg: 448x640 4 Highs, 11 Mediums, 12.2ms
image 9/50 /content/data/validation/images/35d18f22-ph_98.jpg: 384x640 1 High, 1 Low, 1 Medium, 11.5ms
image 10/50 /content/data/validation/images/36ae9fea-ph_68.jpg: 384x640 7 Highs, 3 Lows, 9 Mediums, 10.8ms
image 11/50 /content/data/validation/images/37f820f4-ph_212.jpg: 384x640 1 Medium, 10.9ms
image 12/50 /content/data/validation/images/392645f7-ph_167.jpg: 448x640 8 Mediums, 12.8ms
image 13/50 /content/data/validation/images/418d9b3e-ph_57.jpg: 384x640 1 High, 1 Medium, 11.5ms
image 14/50 /content/data/validation/images/4bf698e1-ph_194.jpg: 448x640 2 Highs, 1 Medium, 12.8ms
image 15/50 /content/data/validation/images/4de53000-ph_450.jpg: 320x640 1 High, 45.3ms
image 16/50 /content/data/validation/images/503d638e-ph_337.jpg: 448x640 12 Mediums, 12.9ms
image 17/50 /content/data/validation/images/533d2e07-ph_384.jpg: 448x640 1 Medium, 12.1ms
image 18/50 /content/data/validation/images/6217e01c-ph_1.jpg: 448x640 1 High, 4 Mediums, 12.8ms
image 19/50 /content/data/validation/images/6cbf0587-ph_260.jpg: 384x640 1 High, 11.4ms
image 20/50 /content/data/validation/images/6e57ff26-ph_379.jpg: 448x640 (no detections), 12.7ms
image 21/50 /content/data/validation/images/7531081c-ph_388.jpg: 480x640 1 High, 13.3ms
image 22/50 /content/data/validation/images/760a64ff-ph_175.jpg: 384x640 2 Highs, 3 Lows, 10 Mediums, 11.6ms
image 23/50 /content/data/validation/images/86e6e3fa-ph_421.jpg: 448x640 1 High, 2 Mediums, 12.8ms
image 24/50 /content/data/validation/images/88bb72ba-ph_30.jpg: 640x544 6 Mediums, 46.6ms
image 25/50 /content/data/validation/images/9bf4589b-ph_377.jpg: 448x640 1 Low, 1 Medium, 10.8ms
image 26/50 /content/data/validation/images/9cc1a1f6-ph_9.jpg: 384x640 7 Mediums, 9.6ms
image 27/50 /content/data/validation/images/9dbf2205-ph_105.jpg: 640x640 1 Medium, 13.5ms
image 28/50 /content/data/validation/images/a2a78b71-ph_395.jpg: 352x640 2 Highs, 3 Mediums, 46.1ms
image 29/50 /content/data/validation/images/ad37e3e0-ph_72.jpg: 384x640 1 High, 1 Medium, 9.5ms
image 30/50 /content/data/validation/images/ad54179a-ph_18.jpg: 448x640 2 Highs, 11.1ms
image 31/50 /content/data/validation/images/b1a08885-ph_434.jpg: 448x640 (no detections), 10.1ms
image 32/50 /content/data/validation/images/b3b86a43-ph_404.jpg: 384x640 1 Medium, 9.6ms
image 33/50 /content/data/validation/images/b4661d66-ph_127.jpg: 480x640 1 Low, 11.0ms
image 34/50 /content/data/validation/images/b9599cea-ph_284.jpg: 576x640 1 Medium, 47.9ms
image 35/50 /content/data/validation/images/bf053d47-ph_317.jpg: 384x640 1 High, 2 Lows, 6 Mediums, 9.6ms
image 36/50 /content/data/validation/images/c82ee2ac-ph_86.jpg: 640x640 1 High, 1 Medium, 13.6ms
image 37/50 /content/data/validation/images/c985571e-ph_430.jpg: 448x640 2 Lows, 1 Medium, 10.7ms
image 38/50 /content/data/validation/images/c9a3a578-ph_166.jpg: 480x640 1 Low, 1 Medium, 10.9ms
image 39/50 /content/data/validation/images/d3427c97-ph_458.jpg: 384x640 2 Highs, 2 Mediums, 9.5ms
image 40/50 /content/data/validation/images/dba75f78-ph_46.jpg: 448x640 1 Medium, 10.6ms
image 41/50 /content/data/validation/images/dd4c7614-ph_205.jpg: 448x640 1 Medium, 10.1ms
image 42/50 /content/data/validation/images/de48b3c6-ph_432.jpg: 256x640 10 Highs, 6 Mediums, 54.1ms
image 43/50 /content/data/validation/images/e14572d7-ph_124.jpg: 448x640 1 Medium, 10.9ms
image 44/50 /content/data/validation/images/e26420cf-ph_469.jpg: 384x640 2 Mediums, 10.2ms
image 45/50 /content/data/validation/images/e6c74b04-ph_410.jpg: 320x640 1 Medium, 9.3ms
image 46/50 /content/data/validation/images/e8dc3dbd-ph_372.jpg: 384x640 1 High, 9.5ms
image 47/50 /content/data/validation/images/e95084b9-ph_75.jpg: 320x640 1 High, 9.3ms
image 48/50 /content/data/validation/images/f73a7580-ph_169.jpg: 640x640 2 Highs, 1 Low, 10 Mediums, 13.6ms
image 49/50 /content/data/validation/images/f888b51c-ph_93.jpg: 448x640 1 Medium, 10.7ms
image 50/50 /content/data/validation/images/fd168cf5-ph_451.jpg: 384x640 1 Medium, 9.6ms
Speed: 2.0ms preprocess, 18.5ms inference, 4.1ms postprocess per image at shape (1, 3, 384, 640)
Results saved to runs/detect/predict
💡 Learn more at https://docs.ultralytics.com/modes/predict
```

```
import glob
from IPython.display import Image, display
for image_path in glob.glob(f'/content/runs/detect/predict/*.jpg')[:20]:
  display(Image(filename=image_path, height=400))
  print('\n')
```

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