

yolov8_pothole_detection

June 2, 2025

```
[3]: import cv2
import matplotlib.pyplot as plt
import glob
import random
import os
```

0.1 Visualize Images from the Dataset

```
[4]: # Function to convert bounding boxes in YOLO format to xmin, ymin, xmax, ymax.
def yolo2bbox(bboxes):
    xmin, ymin = bboxes[0]-bboxes[2]/2, bboxes[1]-bboxes[3]/2
    xmax, ymax = bboxes[0]+bboxes[2]/2, bboxes[1]+bboxes[3]/2
    return xmin, ymin, xmax, ymax
```

```
[5]: def plot_box(image, bboxes, labels):
    h, w, _ = image.shape
    for box_num, box in enumerate(bboxes):
        x1, y1, x2, y2 = yolo2bbox(box)
        xmin = int(x1 * w)
        ymin = int(y1 * h)
        xmax = int(x2 * w)
        ymax = int(y2 * h)
        thickness = max(2, int(w / 275))
        cv2.rectangle(image, (xmin, ymin), (xmax, ymax), color=(0, 0, 255), thickness=thickness)
    return image
```

```
[6]: def plot(image_paths, label_paths, num_samples):
    all_images = glob.glob(os.path.join(image_paths, '*.jpg')) + glob.glob(os.path.join(image_paths, '*.JPG'))
    all_images.sort()
    num_images = len(all_images)

    plt.figure(figsize=(15, 12))
    for i in range(num_samples):
        j = random.randint(0, num_images - 1)
        image_file = all_images[j]
```

```

image_name = os.path.splitext(os.path.basename(image_file))[0]
image = cv2.imread(image_file)

bboxes, labels = [], []
with open(os.path.join(label_paths, image_name + '.txt'), 'r') as f:
    for line in f.readlines():
        parts = line.strip().split()
        if len(parts) != 5:
            continue
        label = parts[0]
        x_c, y_c, w, h = map(float, parts[1:])
        bboxes.append([x_c, y_c, w, h])
        labels.append(label)

result_image = plot_box(image, bboxes, labels)
plt.subplot(2, 2, i + 1)
plt.imshow(result_image[:, :, ::-1])
plt.axis('off')
plt.tight_layout()
plt.show()

```

[7]: # Visualize a few training images.

```

plot(
    image_paths='yolo_dataset/images/train',
    label_paths='yolo_dataset/labels/train',
    num_samples=4,
)

```



0.2 YOLOv8 Nano Training

```
[8]: EPOCHS = 5
!uv run yolo task=detect mode=train model=yolov8n.pt imgs=640
  ↪data=yolo_dataset/data.yaml epochs={EPOCHS} batch=2 device=cpu
  ↪name=yolov8n_v8_5e
```

New https://pypi.org/project/ultralytics/8.3.147 available Update with 'pip install -U ultralytics'

Ultralytics 8.3.146 Python-3.12.10 torch-2.7.0+cpu CPU (Intel Core(TM) i5-8350U 1.70GHz)

engine/trainer: agnostic_nms=False, amp=True, augment=False,
 auto_augment=randaugment, batch=2, bgr=0.0, box=7.5, cache=False, cfg=None,
 classes=None, close_mosaic=10, cls=0.5, conf=None, copy_paste=0.0,
 copy_paste_mode=flip, cos_lr=False, cutmix=0.0, data=yolo_dataset/data.yaml,
 degrees=0.0, deterministic=True, device=cpu, dfl=1.5, dnn=False, dropout=0.0,
 dynamic=False, embed=None, epochs=5, erasing=0.4, exist_ok=False, fliplr=0.5,
 flipud=0.0, format=torchscript, fraction=1.0, freeze=None, half=False,

```

hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, imgsz=640, int8=False, iou=0.7, keras=False,
kobj=1.0, line_width=None, lr0=0.01, lrf=0.01, mask_ratio=4, max_det=300,
mixup=0.0, mode=train, model=yolov8n.pt, momentum=0.937, mosaic=1.0,
multi_scale=False, name=yolov8n_v8_5e4, nbs=64, nms=False, opset=None,
optimize=False, optimizer=auto, overlap_mask=True, patience=100,
perspective=0.0, plots=True, pose=12.0, pretrained=True, profile=False,
project=None, rect=False, resume=False, retina_masks=False, save=True,
save_conf=False, save_crop=False,
save_dir=/home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e4, save_frames=False,
save_json=False, save_period=-1, save_txt=False, scale=0.5, seed=0, shear=0.0,
show=False, show_boxes=True, show_conf=True, show_labels=True, simplify=True,
single_cls=False, source=None, split=val, stream_buffer=False, task=detect,
time=None, tracker=botsort.yaml, translate=0.1, val=True, verbose=True,
vid_stride=1, visualize=False, warmup_bias_lr=0.1, warmup_epochs=3.0,
warmup_momentum=0.8, weight_decay=0.0005, workers=8, workspace=None
Overriding model.yaml nc=80 with nc=1

```

	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     751507 ultralytics.nn.modules.head.Detect
[1, [64, 128, 256]]
Model summary: 129 layers, 3,011,043 parameters, 3,011,027 gradients, 8.2 GFLOPs

```

```

Transferred 319/355 items from pretrained weights
Freezing layer 'model.22.dfl.conv.weight'
train: Fast image access (ping: 0.0±0.0 ms, read: 60.9±42.2 MB/s,
size: 71.6 KB)
train: Scanning /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_
/home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/.venv/lib/python3.12/site-
packages/torch/utils/data/dataloader.py:665: UserWarning: 'pin_memory' argument
is set as true but no accelerator is found, then device pinned memory won't be
used.
    warnings.warn(warn_msg)
val: Fast image access (ping: 0.0±0.0 ms, read: 43.3±21.0 MB/s,
size: 39.7 KB)
val: Scanning /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_im
/home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/.venv/lib/python3.12/site-
packages/torch/utils/data/dataloader.py:665: UserWarning: 'pin_memory' argument
is set as true but no accelerator is found, then device pinned memory won't be
used.
    warnings.warn(warn_msg)
Plotting labels to /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e4/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=0.002, momentum=0.9) with parameter groups 57

```

```

weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)
Image sizes 640 train, 640 val
Using 0 dataloader workers
Logging results to /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e4
Starting training for 5 epochs...

```

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
1/5	0G	1.691	2.669	1.621	6	640: 1
	Class	Images	Instances	Box(P)	R	mAP50 m
	all	133	299	0.569	0.388	0.445
0.233						
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
2/5	0G	1.627	2.347	1.621	7	640: 1
	Class	Images	Instances	Box(P)	R	mAP50 m
	all	133	299	0.503	0.478	0.44
0.222						
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
3/5	0G	1.635	2.139	1.593	13	640: 1
	Class	Images	Instances	Box(P)	R	mAP50 m
	all	133	299	0.47	0.448	0.427
0.232						
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
4/5	0G	1.562	2.02	1.558	2	640: 1
	Class	Images	Instances	Box(P)	R	mAP50 m
	all	133	299	0.619	0.559	0.617
0.357						
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
5/5	0G	1.504	1.877	1.483	6	640: 1
	Class	Images	Instances	Box(P)	R	mAP50 m
	all	133	299	0.68	0.612	0.676
0.403						

5 epochs completed in 0.342 hours.

```

Optimizer stripped from /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e4/weights/last.pt, 6.2MB
Optimizer stripped from /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e4/weights/best.pt, 6.2MB

```

```

Validating /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e4/weights/best.pt...
Ultralytics 8.3.146 Python-3.12.10 torch-2.7.0+cpu CPU (Intel Core(TM)
i5-8350U 1.70GHz)

```

```

Model summary (fused): 72 layers, 3,005,843 parameters, 0 gradients, 8.1 GFLOPs
      Class     Images   Instances       Box(P)        R      mAP50   m
          all         133        299        0.685      0.609      0.676
          0.404
Speed: 2.0ms preprocess, 102.1ms inference, 0.0ms loss, 6.3ms postprocess per
image
Results saved to /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e4
Learn more at https://docs.ultralytics.com/modes/train

```

0.3 Evaluation on Validation Images

```
[9]: !uv run yolo task=detect mode=val model=runs/detect/yolov8n_v8_5e/weights/best.
      ->pt name=yolov8n_v8_5e_val data=yolo_dataset/data.yaml
```

```

Ultralytics 8.3.146 Python-3.12.10 torch-2.7.0+cpu CPU (Intel Core(TM)
i5-8350U 1.70GHz)
Model summary (fused): 72 layers, 3,005,843 parameters, 0 gradients, 8.1 GFLOPs
val: Fast image access (ping: 0.0±0.0 ms, read: 2166.4±738.3
MB/s, size: 91.9 KB)
val: Scanning /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_im
/home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/.venv/lib/python3.12/site-
packages/torch/utils/data/dataloader.py:665: UserWarning: 'pin_memory' argument
is set as true but no accelerator is found, then device pinned memory won't be
used.
    warnings.warn(warn_msg)
      Class     Images   Instances       Box(P)        R      mAP50   m
          all         133        299        0.688      0.612      0.677
          0.405
Speed: 2.9ms preprocess, 122.1ms inference, 0.0ms loss, 7.0ms postprocess per
image
Results saved to /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e_val3
Learn more at https://docs.ultralytics.com/modes/val

```

0.4 Inference on Validation Images

```
[10]: !uv run yolo task=detect \
mode=predict \
model=runs/detect/yolov8n_v8_5e/weights/best.pt \
source=yolo_dataset/images/val \
imgszz=640 \
name=yolov8n_v8_5e_predict \
hide_labels=True \
save_txt=True

WARNING  'hide_labels' is deprecated and will be removed in in the future. Use
'show_labels' instead.
Ultralytics 8.3.146  Python-3.12.10 torch-2.7.0+cpu CPU (Intel Core(TM)
i5-8350U 1.70GHz)
Model summary (fused): 72 layers, 3,005,843 parameters, 0 gradients, 8.1 GFLOPs

image 1/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-10.jpg: 640x640 1
pothole, 119.2ms
image 2/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-102.jpg: 640x640 2
potholes, 103.5ms
image 3/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-107.jpg: 640x640 3
potholes, 105.1ms
image 4/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-11.jpg: 640x640 1
pothole, 102.5ms
image 5/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-114.jpg: 640x640 4
potholes, 104.5ms
image 6/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-117.jpg: 640x640 (no
detections), 106.8ms
image 7/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-118.jpg: 640x640 2
potholes, 104.2ms
image 8/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-120.jpg: 640x640 2
potholes, 110.7ms
image 9/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-121.jpg: 640x640 2
potholes, 111.8ms
image 10/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-122.jpg: 640x640 2
potholes, 114.7ms
image 11/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-124.jpg: 640x640 2
potholes, 179.8ms
```

```
image 12/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-127.jpg: 640x640 2  
potholes, 115.6ms  
image 13/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-131.jpg: 640x640 3  
potholes, 126.3ms  
image 14/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-133.jpg: 640x640 1  
pothole, 119.1ms  
image 15/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-137.jpg: 640x640 2  
potholes, 125.7ms  
image 16/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-138.jpg: 640x640 1  
pothole, 132.8ms  
image 17/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-140.jpg: 640x640 2  
potholes, 184.3ms  
image 18/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-141.jpg: 640x640 4  
potholes, 108.5ms  
image 19/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-143.jpg: 640x640 1  
pothole, 116.2ms  
image 20/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-146.jpg: 640x640 (no  
detections), 100.2ms  
image 21/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-147.jpg: 640x640 (no  
detections), 108.9ms  
image 22/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-156.jpg: 640x640 1  
pothole, 102.2ms  
image 23/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-161.jpg: 640x640 2  
potholes, 110.0ms  
image 24/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-164.jpg: 640x640 1  
pothole, 111.3ms  
image 25/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-169.jpg: 640x640 2  
potholes, 101.3ms  
image 26/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-173.jpg: 640x640 3  
potholes, 103.2ms  
image 27/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-177.jpg: 640x640 1  
pothole, 98.6ms
```

```
image 28/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-190.jpg: 640x640 2  
potholes, 104.4ms  
image 29/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-192.jpg: 640x640 1  
pothole, 112.6ms  
image 30/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-193.jpg: 640x640 4  
potholes, 109.9ms  
image 31/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-205.jpg: 640x640 5  
potholes, 104.9ms  
image 32/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-207.jpg: 640x640 1  
pothole, 305.1ms  
image 33/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-211.jpg: 640x640 1  
pothole, 117.1ms  
image 34/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-217.jpg: 640x640 2  
potholes, 117.0ms  
image 35/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-22.jpg: 640x640 3  
potholes, 124.0ms  
image 36/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-223.jpg: 640x640 2  
potholes, 115.9ms  
image 37/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-231.jpg: 640x640 2  
potholes, 104.4ms  
image 38/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-232.jpg: 640x640 2  
potholes, 108.6ms  
image 39/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-234.jpg: 640x640 1  
pothole, 195.8ms  
image 40/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-238.jpg: 640x640 2  
potholes, 105.1ms  
image 41/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-241.jpg: 640x640 5  
potholes, 107.7ms  
image 42/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-248.jpg: 640x640 4  
potholes, 113.6ms  
image 43/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-25.jpg: 640x640 2  
potholes, 103.6ms
```

```
image 44/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-257.jpg: 640x640 2  
potholes, 109.0ms  
image 45/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-26.jpg: 640x640 1  
pothole, 107.6ms  
image 46/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-263.jpg: 640x640 2  
potholes, 113.2ms  
image 47/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-265.jpg: 640x640 1  
pothole, 141.7ms  
image 48/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-268.jpg: 640x640 4  
potholes, 145.9ms  
image 49/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-270.jpg: 640x640 5  
potholes, 117.3ms  
image 50/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-275.jpg: 640x640 3  
potholes, 115.1ms  
image 51/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-28.jpg: 640x640 3  
potholes, 159.1ms  
image 52/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-282.jpg: 640x640 2  
potholes, 143.4ms  
image 53/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-290.jpg: 384x640 1  
pothole, 93.6ms  
image 54/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-291.jpg: 384x640 2  
potholes, 74.6ms  
image 55/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-297.jpg: 384x640 5  
potholes, 77.2ms  
image 56/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-302.jpg: 480x640 2  
potholes, 102.9ms  
image 57/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-306.jpg: 384x640 (no  
detections), 75.0ms  
image 58/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-313.jpg: 480x640 1  
pothole, 95.8ms  
image 59/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-319.jpg: 640x544 1  
pothole, 116.2ms
```

```
image 60/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-339.jpg: 352x640 2  
potholes, 77.0ms  
image 61/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-349.jpg: 448x640 4  
potholes, 88.8ms  
image 62/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-35.jpg: 640x640 1  
pothole, 110.0ms  
image 63/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-352.jpg: 480x640 3  
potholes, 226.6ms  
image 64/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-357.jpg: 448x640 2  
potholes, 81.1ms  
image 65/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-359.jpg: 448x640 3  
potholes, 81.8ms  
image 66/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-365.jpg: 352x640 8  
potholes, 66.9ms  
image 67/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-366.jpg: 416x640 1  
pothole, 85.9ms  
image 68/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-368.jpg: 384x640 2  
potholes, 72.5ms  
image 69/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-378.jpg: 480x640 1  
pothole, 86.8ms  
image 70/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-379.jpg: 480x640 2  
potholes, 83.3ms  
image 71/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-386.jpg: 416x640 3  
potholes, 73.9ms  
image 72/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-388.jpg: 480x640 2  
potholes, 83.0ms  
image 73/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-395.jpg: 448x640 5  
potholes, 80.8ms  
image 74/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-396.jpg: 384x640 (no  
detections), 70.1ms  
image 75/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-40.jpg: 640x640 2  
potholes, 114.6ms
```

```
image 76/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-410.jpg: 480x640 6  
potholes, 85.5ms  
image 77/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-416.jpg: 416x640 4  
potholes, 78.6ms  
image 78/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-422.jpg: 448x640 (no  
detections), 79.2ms  
image 79/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-430.jpg: 448x640 1  
pothole, 80.9ms  
image 80/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-434.jpg: 448x640 1  
pothole, 73.2ms  
image 81/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-435.jpg: 320x640 1  
pothole, 82.3ms  
image 82/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-437.jpg: 384x640 1  
pothole, 70.2ms  
image 83/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-439.jpg: 288x640 5  
potholes, 66.1ms  
image 84/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-440.jpg: 384x640 1  
pothole, 74.6ms  
image 85/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-444.jpg: 448x640 2  
potholes, 85.3ms  
image 86/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-449.jpg: 352x640 3  
potholes, 64.7ms  
image 87/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-452.jpg: 320x640 1  
pothole, 61.9ms  
image 88/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-464.jpg: 288x640 1  
pothole, 56.7ms  
image 89/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-470.jpg: 448x640 3  
potholes, 83.1ms  
image 90/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-472.jpg: 384x640 1  
pothole, 75.4ms  
image 91/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-476.jpg: 448x640 6  
potholes, 84.3ms
```

```
image 92/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-492.jpg: 640x480 5  
potholes, 101.4ms  
image 93/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-494.jpg: 480x640 1  
pothole, 95.3ms  
image 94/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-498.jpg: 448x640 5  
potholes, 87.1ms  
image 95/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-503.jpg: 320x640 4  
potholes, 64.3ms  
image 96/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-521.jpg: 448x640 2  
potholes, 83.1ms  
image 97/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-528.jpg: 448x640 3  
potholes, 76.8ms  
image 98/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-529.jpg: 448x640 5  
potholes, 83.1ms  
image 99/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-537.jpg: 480x640 1  
pothole, 84.2ms  
image 100/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-543.jpg: 544x640 1  
pothole, 103.9ms  
image 101/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-545.jpg: 288x640 2  
potholes, 54.0ms  
image 102/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-551.jpg: 384x640 6  
potholes, 65.7ms  
image 103/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-555.jpg: 480x640 1  
pothole, 84.3ms  
image 104/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-557.jpg: 480x640 2  
potholes, 201.6ms  
image 105/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-564.jpg: 480x640 10  
potholes, 112.8ms  
image 106/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-565.jpg: 480x640 (no  
detections), 117.4ms  
image 107/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-577.jpg: 416x640 9  
potholes, 107.5ms
```

```
image 108/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-583.jpg: 384x640 1  
pothole, 96.4ms  
image 109/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-594.jpg: 448x640 3  
potholes, 96.2ms  
image 110/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-596.jpg: 448x640 2  
potholes, 83.8ms  
image 111/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-597.jpg: 448x640 1  
pothole, 83.5ms  
image 112/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-598.jpg: 384x640 6  
potholes, 70.3ms  
image 113/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-6.jpg: 640x640 1  
pothole, 115.5ms  
image 114/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-60.jpg: 640x640 2  
potholes, 111.2ms  
image 115/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-611.jpg: 448x640 3  
potholes, 81.6ms  
image 116/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-612.jpg: 480x640 4  
potholes, 84.7ms  
image 117/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-614.jpg: 416x640 2  
potholes, 74.6ms  
image 118/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-617.jpg: 448x640 8  
potholes, 75.3ms  
image 119/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-624.jpg: 480x640 8  
potholes, 83.3ms  
image 120/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-627.jpg: 320x640 1  
pothole, 59.9ms  
image 121/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-633.jpg: 512x640 2  
potholes, 101.5ms  
image 122/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-637.jpg: 416x640 5  
potholes, 70.5ms  
image 123/133 /home/anifyuli/Developments/Python/college/Computer  
Vision/yolo_image_detection/yolo_dataset/images/val/img-639.jpg: 384x640 3  
potholes, 69.5ms
```

```

image 124/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-641.jpg: 416x640 1
pothole, 75.1ms
image 125/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-642.jpg: 640x480 3
potholes, 89.1ms
image 126/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-646.jpg: 384x640 1
pothole, 68.5ms
image 127/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-65.jpg: 640x640 (no
detections), 119.1ms
image 128/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-656.jpg: 640x448 1
pothole, 91.1ms
image 129/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-657.jpg: 480x640 3
potholes, 89.2ms
image 130/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-662.jpg: 448x640 6
potholes, 83.0ms
image 131/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-68.jpg: 640x640 1
pothole, 115.1ms
image 132/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-76.jpg: 640x640 3
potholes, 109.7ms
image 133/133 /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/yolo_dataset/images/val/img-9.jpg: 640x640 2
potholes, 106.3ms
Speed: 4.1ms preprocess, 101.3ms inference, 1.3ms postprocess per image at shape
(1, 3, 640, 640)
Results saved to /home/anifyuli/Developments/Python/college/Computer

Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e_predict3
125 labels saved to /home/anifyuli/Developments/Python/college/Computer
Vision/yolo_image_detection/runs/detect/yolov8n_v8_5e_predict3/labels
Learn more at https://docs.ultralytics.com/modes/predict

```

0.5 Visualize Validation Results

```
[11]: def visualize(result_dir, num_samples=4):
    plt.figure(figsize=(20, 12))
    image_names = glob.glob(os.path.join(result_dir, '*.jpg'))
    random.shuffle(image_names)
    for i, image_name in enumerate(image_names[:num_samples]):
        image = plt.imread(image_name)
        plt.subplot(2, 2, i + 1)
```

```
plt.imshow(image)
plt.axis('off')
plt.tight_layout()
plt.show()
```

[12]: `visualize('runs/detect/yolov8n_v8_5e_predict')`

