pothole-detection-yolov5

December 6, 2023

[1]:
```
!nvidia-smi
```

```
Tue Dec  5 19:16:36 2023
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 525.105.17   Driver Version: 525.105.17   CUDA Version: 12.0     |
|-------------------------------+----------------------+----------------------+
| 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   37C    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                                                 |
+-----------------------------------------------------------------------------+
```

[2]:
```
!pip install torch torchvision
```

```
Requirement already satisfied: torch in /usr/local/lib/python3.10/dist-packages
(2.1.0+cu118)
Requirement already satisfied: torchvision in /usr/local/lib/python3.10/dist-
packages (0.16.0+cu118)
Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-
packages (from torch) (3.13.1)
Requirement already satisfied: typing-extensions in
/usr/local/lib/python3.10/dist-packages (from torch) (4.5.0)
Requirement already satisfied: sympy in /usr/local/lib/python3.10/dist-packages
(from torch) (1.12)
Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-
packages (from torch) (3.2.1)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.10/dist-packages
```

```
(from torch) (3.1.2)
Requirement already satisfied: fsspec in /usr/local/lib/python3.10/dist-packages
(from torch) (2023.6.0)
Requirement already satisfied: triton==2.1.0 in /usr/local/lib/python3.10/dist-
packages (from torch) (2.1.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages
(from torchvision) (1.23.5)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-
packages (from torchvision) (2.31.0)
Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in
/usr/local/lib/python3.10/dist-packages (from torchvision) (9.4.0)
Requirement already satisfied: MarkupSafe>=2.0 in
/usr/local/lib/python3.10/dist-packages (from jinja2->torch) (2.1.3)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.10/dist-packages (from requests->torchvision) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-
packages (from requests->torchvision) (3.6)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.10/dist-packages (from requests->torchvision) (2.0.7)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.10/dist-packages (from requests->torchvision)
(2023.11.17)
Requirement already satisfied: mpmath>=0.19 in /usr/local/lib/python3.10/dist-
packages (from sympy->torch) (1.3.0)
```

[3]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

[4]:
```
import zipfile
import os

# Path to the zip file (you can use the file browser to get this path)
zip_file_path = '/content/drive/MyDrive/Dataset_Potholes/Pothole_Images␣
 ↪(2)-20231121T011908Z-001.zip'

# Destination directory where you want to extract the files
destination_folder = '/content/pothholedetection/dataset'

# Create the destination folder if it does not exist
if not os.path.exists(destination_folder):
    os.makedirs(destination_folder)

# Unzipping the file
with zipfile.ZipFile(zip_file_path, 'r') as zip_ref:
    zip_ref.extractall(destination_folder)
```

```
print(f"Files extracted to: {destination_folder}")
```

```
Files extracted to: /content/pothholedetection/dataset
```

[5]:
```
import os
import shutil
import random

# Set the root directory containing images and labels
root_dir = '/content/pothholedetection/dataset/Pothole_Images (2)/'

# Set the name of the dataset folder to create
dataset_name = '/content/pothholedetection/dataset/data_ready_for_training/'

# Set the ratios for splitting the dataset
train_ratio = 0.8
val_ratio = 0.1  # 10% for validation

# Set the names of the subdirectories for images and labels
image_subdir = 'images'
label_subdir = 'labels'

# Create the dataset folder structure
dataset_dir = os.path.join(root_dir, dataset_name)
os.makedirs(os.path.join(dataset_dir, 'train', image_subdir), exist_ok=True)
os.makedirs(os.path.join(dataset_dir, 'train', label_subdir), exist_ok=True)
os.makedirs(os.path.join(dataset_dir, 'test', image_subdir), exist_ok=True)
os.makedirs(os.path.join(dataset_dir, 'test', label_subdir), exist_ok=True)
os.makedirs(os.path.join(dataset_dir, 'val', image_subdir), exist_ok=True)
os.makedirs(os.path.join(dataset_dir, 'val', label_subdir), exist_ok=True)

# List and shuffle all image files
image_files = [f for f in os.listdir(root_dir) if f.endswith('.jpg')]  # List␣
 ↪all .jpg files
random.shuffle(image_files)

# Calculate the number of files for train, test, and val sets
num_images = len(image_files)
num_train_files = int(train_ratio * num_images)
num_val_files = int(val_ratio * num_images)
num_test_files = num_images - num_train_files - num_val_files

# Function to copy files to a specific dataset
def copy_files(start_index, end_index, dataset_type):
    for i in range(start_index, end_index):
        image_name = image_files[i]
```

```
        label_name = os.path.splitext(image_name)[0] + '.txt'  # Assuming label␣
 ↪file has .txt extension

        src_image_path = os.path.join(root_dir, image_name)
        dst_image_path = os.path.join(dataset_dir, dataset_type, image_subdir,␣
 ↪image_name)
        shutil.copy(src_image_path, dst_image_path)

        src_label_path = os.path.join(root_dir, label_name)
        dst_label_path = os.path.join(dataset_dir, dataset_type, label_subdir,␣
 ↪label_name)
        shutil.copy(src_label_path, dst_label_path)

# Copy files to train, test, and val directories
copy_files(0, num_train_files, 'train')
copy_files(num_train_files, num_train_files + num_test_files, 'test')
copy_files(num_train_files + num_test_files, num_images, 'val')
```

[6]:
```
import yaml

def create_custom_yaml(path, nm_cls, classes):
    train_path = f"{path}/train"
    test_path = f"{path}/test"
    val_path = f"{path}/val"

    num_classes = nm_cls

    data = {
    'train': train_path,
    'test': test_path,
    'val': val_path,
    'nc': num_classes,
    'names': classes
    }

    with open('/content/potholes_data.yaml', 'w') as yaml_file:
        yaml.dump(data, yaml_file)

    print("YAML file created successfully.")
```

[7]:
```
create_custom_yaml('/content/pothholedetection/dataset/
 ↪data_ready_for_training', 1, ['potholes'])
```

```
YAML file created successfully.
```

[8]:
```
!git clone https://github.com/ultralytics/yolov5  # clone
%cd yolov5
```

```
!pip install -r requirements.txt  # install
```

```
Cloning into 'yolov5'…
remote: Enumerating objects: 16088, done.
remote: Counting objects: 100% (32/32), done.
remote: Compressing objects: 100% (30/30), done.
remote: Total 16088 (delta 10), reused 14 (delta 2), pack-reused 16056
Receiving objects: 100% (16088/16088), 14.71 MiB | 34.95 MiB/s, done.
Resolving deltas: 100% (11038/11038), done.
/content/yolov5
Collecting gitpython>=3.1.30 (from -r requirements.txt (line 5))
  Downloading GitPython-3.1.40-py3-none-any.whl (190 kB)
                             190.6/190.6
kB 4.3 MB/s eta 0:00:00
Requirement already satisfied: matplotlib>=3.3 in
/usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 6))
(3.7.1)
Requirement already satisfied: numpy>=1.22.2 in /usr/local/lib/python3.10/dist-
packages (from -r requirements.txt (line 7)) (1.23.5)
Requirement already satisfied: opencv-python>=4.1.1 in
/usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 8))
(4.8.0.76)
Collecting Pillow>=10.0.1 (from -r requirements.txt (line 9))
  Downloading Pillow-10.1.0-cp310-cp310-manylinux_2_28_x86_64.whl (3.6 MB)
                             3.6/3.6 MB
61.9 MB/s eta 0:00:00
Requirement already satisfied: psutil in /usr/local/lib/python3.10/dist-
packages (from -r requirements.txt (line 10)) (5.9.5)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.10/dist-
packages (from -r requirements.txt (line 11)) (6.0.1)
Requirement already satisfied: requests>=2.23.0 in
/usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 12))
(2.31.0)
Requirement already satisfied: scipy>=1.4.1 in /usr/local/lib/python3.10/dist-
packages (from -r requirements.txt (line 13)) (1.11.4)
Collecting thop>=0.1.1 (from -r requirements.txt (line 14))
  Downloading thop-0.1.1.post2209072238-py3-none-any.whl (15 kB)
Requirement already satisfied: torch>=1.8.0 in /usr/local/lib/python3.10/dist-
packages (from -r requirements.txt (line 15)) (2.1.0+cu118)
Requirement already satisfied: torchvision>=0.9.0 in
/usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 16))
(0.16.0+cu118)
Requirement already satisfied: tqdm>=4.64.0 in /usr/local/lib/python3.10/dist-
packages (from -r requirements.txt (line 17)) (4.66.1)
Collecting ultralytics>=8.0.147 (from -r requirements.txt (line 18))
  Downloading ultralytics-8.0.222-py3-none-any.whl (653 kB)
```

```
                                    654.0/654.0
kB 61.0 MB/s eta 0:00:00
Requirement already satisfied: pandas>=1.1.4 in
/usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 27))
(1.5.3)
Requirement already satisfied: seaborn>=0.11.0 in
/usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 28))
(0.12.2)
Requirement already satisfied: setuptools>=65.5.1 in
/usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 42))
(67.7.2)
Collecting gitdb<5,>=4.0.1 (from gitpython>=3.1.30->-r requirements.txt (line
5))
  Downloading gitdb-4.0.11-py3-none-any.whl (62 kB)
                                    62.7/62.7 kB
9.2 MB/s eta 0:00:00
Requirement already satisfied: contourpy>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r
requirements.txt (line 6)) (1.2.0)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-
packages (from matplotlib>=3.3->-r requirements.txt (line 6)) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in
/usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r
requirements.txt (line 6)) (4.45.1)
Requirement already satisfied: kiwisolver>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r
requirements.txt (line 6)) (1.4.5)
Requirement already satisfied: packaging>=20.0 in
/usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r
requirements.txt (line 6)) (23.2)
Requirement already satisfied: pyparsing>=2.3.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r
requirements.txt (line 6)) (3.1.1)
Requirement already satisfied: python-dateutil>=2.7 in
/usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3->-r
requirements.txt (line 6)) (2.8.2)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->-r
requirements.txt (line 12)) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-
packages (from requests>=2.23.0->-r requirements.txt (line 12)) (3.6)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->-r
requirements.txt (line 12)) (2.0.7)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->-r
requirements.txt (line 12)) (2023.11.17)
```

```
Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-
packages (from torch>=1.8.0->-r requirements.txt (line 15)) (3.13.1)
Requirement already satisfied: typing-extensions in
/usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->-r requirements.txt
(line 15)) (4.5.0)
Requirement already satisfied: sympy in /usr/local/lib/python3.10/dist-packages
(from torch>=1.8.0->-r requirements.txt (line 15)) (1.12)
Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-
packages (from torch>=1.8.0->-r requirements.txt (line 15)) (3.2.1)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.10/dist-packages
(from torch>=1.8.0->-r requirements.txt (line 15)) (3.1.2)
Requirement already satisfied: fsspec in /usr/local/lib/python3.10/dist-packages
(from torch>=1.8.0->-r requirements.txt (line 15)) (2023.6.0)
Requirement already satisfied: triton==2.1.0 in /usr/local/lib/python3.10/dist-
packages (from torch>=1.8.0->-r requirements.txt (line 15)) (2.1.0)
Requirement already satisfied: py-cpuinfo in /usr/local/lib/python3.10/dist-
packages (from ultralytics>=8.0.147->-r requirements.txt (line 18)) (9.0.0)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-
packages (from pandas>=1.1.4->-r requirements.txt (line 27)) (2023.3.post1)
Collecting smmap<6,>=3.0.1 (from gitdb<5,>=4.0.1->gitpython>=3.1.30->-r
requirements.txt (line 5))
  Downloading smmap-5.0.1-py3-none-any.whl (24 kB)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-
packages (from python-dateutil>=2.7->matplotlib>=3.3->-r requirements.txt (line
6)) (1.16.0)
Requirement already satisfied: MarkupSafe>=2.0 in
/usr/local/lib/python3.10/dist-packages (from jinja2->torch>=1.8.0->-r
requirements.txt (line 15)) (2.1.3)
Requirement already satisfied: mpmath>=0.19 in /usr/local/lib/python3.10/dist-
packages (from sympy->torch>=1.8.0->-r requirements.txt (line 15)) (1.3.0)
Installing collected packages: smmap, Pillow, gitdb, thop, gitpython,
ultralytics
  Attempting uninstall: Pillow
    Found existing installation: Pillow 9.4.0
    Uninstalling Pillow-9.4.0:
      Successfully uninstalled Pillow-9.4.0
ERROR: pip's dependency resolver does not currently take into account all
the packages that are installed. This behaviour is the source of the following
dependency conflicts.
imageio 2.31.6 requires pillow<10.1.0,>=8.3.2, but you have pillow 10.1.0 which
is incompatible.
Successfully installed Pillow-10.1.0 gitdb-4.0.11 gitpython-3.1.40
smmap-5.0.1 thop-0.1.1.post2209072238 ultralytics-8.0.222
```

Training

Feature Extraction

[9]:
```
!python train.py --img 640 --batch 8 --epochs 100 --data '/content/
↪potholes_data.yaml' --weights 'yolov5m.pt' --project 'runs_pothole' --name␣
↪'feature_extraction' --cache --freeze 10
```

```
2023-12-05 19:19:55.102791: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_dnn.cc:9342] Unable to
register cuDNN factory: Attempting to register factory for plugin cuDNN when one
has already been registered
2023-12-05 19:19:55.102839: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_fft.cc:609] Unable to register
cuFFT factory: Attempting to register factory for plugin cuFFT when one has
already been registered
2023-12-05 19:19:55.102865: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_blas.cc:1518] Unable to
register cuBLAS factory: Attempting to register factory for plugin cuBLAS when
one has already been registered
train: weights=yolov5m.pt, cfg=, data=/content/potholes_data.yaml,
hyp=data/hyps/hyp.scratch-low.yaml, epochs=100, batch_size=8, imgsz=640,
rect=False, resume=False, nosave=False, noval=False, noautoanchor=False,
noplots=False, evolve=None, bucket=, cache=ram, image_weights=False, device=,
multi_scale=False, single_cls=False, optimizer=SGD, sync_bn=False, workers=8,
project=runs_pothole, name=feature_extraction, exist_ok=False, quad=False,
cos_lr=False, label_smoothing=0.0, patience=100, freeze=[10], save_period=-1,
seed=0, local_rank=-1, entity=None, upload_dataset=False, bbox_interval=-1,
artifact_alias=latest
github: up to date with https://github.com/ultralytics/yolov5
YOLOv5  v7.0-247-g3f02fde Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4,
15102MiB)

hyperparameters: lr0=0.01, lrf=0.01, momentum=0.937,
weight_decay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8, warmup_bias_lr=0.1,
box=0.05, cls=0.5, cls_pw=1.0, obj=1.0, obj_pw=1.0, iou_t=0.2, anchor_t=4.0,
fl_gamma=0.0, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0.1,
scale=0.5, shear=0.0, perspective=0.0, flipud=0.0, fliplr=0.5, mosaic=1.0,
mixup=0.0, copy_paste=0.0
Comet: run 'pip install comet_ml' to automatically track and
visualize YOLOv5  runs in Comet
TensorBoard: Start with 'tensorboard --logdir runs_pothole', view
at http://localhost:6006/
Downloading https://ultralytics.com/assets/Arial.ttf to
/root/.config/Ultralytics/Arial.ttf…
100% 755k/755k [00:00<00:00, 13.3MB/s]
Downloading
https://github.com/ultralytics/yolov5/releases/download/v7.0/yolov5m.pt to
yolov5m.pt…
100% 40.8M/40.8M [00:00<00:00, 207MB/s]
```

```
Overriding model.yaml nc=80 with nc=1

                 from  n    params  module                                  
arguments
  0                -1  1      5280  models.common.Conv                      [3,
48, 6, 2, 2]
  1                -1  1     41664  models.common.Conv                      [48,
96, 3, 2]
  2                -1  2     65280  models.common.C3                        [96,
96, 2]
  3                -1  1    166272  models.common.Conv                      [96,
192, 3, 2]
  4                -1  4    444672  models.common.C3
[192, 192, 4]
  5                -1  1    664320  models.common.Conv
[192, 384, 3, 2]
  6                -1  6   2512896  models.common.C3
[384, 384, 6]
  7                -1  1   2655744  models.common.Conv
[384, 768, 3, 2]
  8                -1  2   4134912  models.common.C3
[768, 768, 2]
  9                -1  1   1476864  models.common.SPPF
[768, 768, 5]
 10                -1  1    295680  models.common.Conv
[768, 384, 1, 1]
 11                -1  1         0  torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']
 12           [-1, 6]  1         0  models.common.Concat                    [1]
 13                -1  2   1182720  models.common.C3
[768, 384, 2, False]
 14                -1  1     74112  models.common.Conv
[384, 192, 1, 1]
 15                -1  1         0  torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']
 16           [-1, 4]  1         0  models.common.Concat                    [1]
 17                -1  2    296448  models.common.C3
[384, 192, 2, False]
 18                -1  1    332160  models.common.Conv
[192, 192, 3, 2]
 19          [-1, 14]  1         0  models.common.Concat                    [1]
 20                -1  2   1035264  models.common.C3
[384, 384, 2, False]
 21                -1  1   1327872  models.common.Conv
[384, 384, 3, 2]
 22          [-1, 10]  1         0  models.common.Concat                    [1]
 23                -1  2   4134912  models.common.C3
```

```
[768, 768, 2, False]
 24      [17, 20, 23]  1     24246  models.yolo.Detect                      [1,
[[10, 13, 16, 30, 33, 23], [30, 61, 62, 45, 59, 119], [116, 90, 156, 198, 373,
326]], [192, 384, 768]]
Model summary: 291 layers, 20871318 parameters, 20871318 gradients, 48.2 GFLOPs

Transferred 475/481 items from yolov5m.pt
AMP: checks passed
freezing model.0.conv.weight
freezing model.0.bn.weight
freezing model.0.bn.bias
freezing model.1.conv.weight
freezing model.1.bn.weight
freezing model.1.bn.bias
freezing model.2.cv1.conv.weight
freezing model.2.cv1.bn.weight
freezing model.2.cv1.bn.bias
freezing model.2.cv2.conv.weight
freezing model.2.cv2.bn.weight
freezing model.2.cv2.bn.bias
freezing model.2.cv3.conv.weight
freezing model.2.cv3.bn.weight
freezing model.2.cv3.bn.bias
freezing model.2.m.0.cv1.conv.weight
freezing model.2.m.0.cv1.bn.weight
freezing model.2.m.0.cv1.bn.bias
freezing model.2.m.0.cv2.conv.weight
freezing model.2.m.0.cv2.bn.weight
freezing model.2.m.0.cv2.bn.bias
freezing model.2.m.1.cv1.conv.weight
freezing model.2.m.1.cv1.bn.weight
freezing model.2.m.1.cv1.bn.bias
freezing model.2.m.1.cv2.conv.weight
freezing model.2.m.1.cv2.bn.weight
freezing model.2.m.1.cv2.bn.bias
freezing model.3.conv.weight
freezing model.3.bn.weight
freezing model.3.bn.bias
freezing model.4.cv1.conv.weight
freezing model.4.cv1.bn.weight
freezing model.4.cv1.bn.bias
freezing model.4.cv2.conv.weight
freezing model.4.cv2.bn.weight
freezing model.4.cv2.bn.bias
freezing model.4.cv3.conv.weight
freezing model.4.cv3.bn.weight
freezing model.4.cv3.bn.bias
freezing model.4.m.0.cv1.conv.weight
```

```
freezing model.4.m.0.cv1.bn.weight
freezing model.4.m.0.cv1.bn.bias
freezing model.4.m.0.cv2.conv.weight
freezing model.4.m.0.cv2.bn.weight
freezing model.4.m.0.cv2.bn.bias
freezing model.4.m.1.cv1.conv.weight
freezing model.4.m.1.cv1.bn.weight
freezing model.4.m.1.cv1.bn.bias
freezing model.4.m.1.cv2.conv.weight
freezing model.4.m.1.cv2.bn.weight
freezing model.4.m.1.cv2.bn.bias
freezing model.4.m.2.cv1.conv.weight
freezing model.4.m.2.cv1.bn.weight
freezing model.4.m.2.cv1.bn.bias
freezing model.4.m.2.cv2.conv.weight
freezing model.4.m.2.cv2.bn.weight
freezing model.4.m.2.cv2.bn.bias
freezing model.4.m.3.cv1.conv.weight
freezing model.4.m.3.cv1.bn.weight
freezing model.4.m.3.cv1.bn.bias
freezing model.4.m.3.cv2.conv.weight
freezing model.4.m.3.cv2.bn.weight
freezing model.4.m.3.cv2.bn.bias
freezing model.5.conv.weight
freezing model.5.bn.weight
freezing model.5.bn.bias
freezing model.6.cv1.conv.weight
freezing model.6.cv1.bn.weight
freezing model.6.cv1.bn.bias
freezing model.6.cv2.conv.weight
freezing model.6.cv2.bn.weight
freezing model.6.cv2.bn.bias
freezing model.6.cv3.conv.weight
freezing model.6.cv3.bn.weight
freezing model.6.cv3.bn.bias
freezing model.6.m.0.cv1.conv.weight
freezing model.6.m.0.cv1.bn.weight
freezing model.6.m.0.cv1.bn.bias
freezing model.6.m.0.cv2.conv.weight
freezing model.6.m.0.cv2.bn.weight
freezing model.6.m.0.cv2.bn.bias
freezing model.6.m.1.cv1.conv.weight
freezing model.6.m.1.cv1.bn.weight
freezing model.6.m.1.cv1.bn.bias
freezing model.6.m.1.cv2.conv.weight
freezing model.6.m.1.cv2.bn.weight
freezing model.6.m.1.cv2.bn.bias
freezing model.6.m.2.cv1.conv.weight
```

```
freezing model.6.m.2.cv1.bn.weight
freezing model.6.m.2.cv1.bn.bias
freezing model.6.m.2.cv2.conv.weight
freezing model.6.m.2.cv2.bn.weight
freezing model.6.m.2.cv2.bn.bias
freezing model.6.m.3.cv1.conv.weight
freezing model.6.m.3.cv1.bn.weight
freezing model.6.m.3.cv1.bn.bias
freezing model.6.m.3.cv2.conv.weight
freezing model.6.m.3.cv2.bn.weight
freezing model.6.m.3.cv2.bn.bias
freezing model.6.m.4.cv1.conv.weight
freezing model.6.m.4.cv1.bn.weight
freezing model.6.m.4.cv1.bn.bias
freezing model.6.m.4.cv2.conv.weight
freezing model.6.m.4.cv2.bn.weight
freezing model.6.m.4.cv2.bn.bias
freezing model.6.m.5.cv1.conv.weight
freezing model.6.m.5.cv1.bn.weight
freezing model.6.m.5.cv1.bn.bias
freezing model.6.m.5.cv2.conv.weight
freezing model.6.m.5.cv2.bn.weight
freezing model.6.m.5.cv2.bn.bias
freezing model.7.conv.weight
freezing model.7.bn.weight
freezing model.7.bn.bias
freezing model.8.cv1.conv.weight
freezing model.8.cv1.bn.weight
freezing model.8.cv1.bn.bias
freezing model.8.cv2.conv.weight
freezing model.8.cv2.bn.weight
freezing model.8.cv2.bn.bias
freezing model.8.cv3.conv.weight
freezing model.8.cv3.bn.weight
freezing model.8.cv3.bn.bias
freezing model.8.m.0.cv1.conv.weight
freezing model.8.m.0.cv1.bn.weight
freezing model.8.m.0.cv1.bn.bias
freezing model.8.m.0.cv2.conv.weight
freezing model.8.m.0.cv2.bn.weight
freezing model.8.m.0.cv2.bn.bias
freezing model.8.m.1.cv1.conv.weight
freezing model.8.m.1.cv1.bn.weight
freezing model.8.m.1.cv1.bn.bias
freezing model.8.m.1.cv2.conv.weight
freezing model.8.m.1.cv2.bn.weight
freezing model.8.m.1.cv2.bn.bias
freezing model.9.cv1.conv.weight
```

```
freezing model.9.cv1.bn.weight
freezing model.9.cv1.bn.bias
freezing model.9.cv2.conv.weight
freezing model.9.cv2.bn.weight
freezing model.9.cv2.bn.bias
optimizer: SGD(lr=0.01) with parameter groups 79 weight(decay=0.0),
82 weight(decay=0.0005), 82 bias
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))
train: Scanning
/content/pothholedetection/dataset/data_ready_for_training/train/labels… 144
images, 0 backgrounds, 0 corrupt: 100% 144/144 [00:03<00:00, 41.80it/s]
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/1.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/142.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/143.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/144.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/145.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/146.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/147.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/148.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/149.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/150.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/151.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/153.jpg:
```

```
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/154.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/155.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/156.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/157.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/158.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/159.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/160.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/161.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/162.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/163.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/164.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/165.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/166.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/167.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/169.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/170.jpg:
```

```
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/171.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/173.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/176.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/177.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/178.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/181.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/183.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/185.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/186.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/187.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/188.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/189.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/190.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/191.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/193.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/194.jpg:
```

```
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/195.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/196.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/198.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/2.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/200.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/3.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/5.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/6.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/8.jpg:
corrupt JPEG restored and saved
train: New cache created:
/content/pothholedetection/dataset/data_ready_for_training/train/labels.cache
train: Caching images (0.1GB ram): 100% 144/144 [00:07<00:00,
18.65it/s]
val: Scanning
/content/pothholedetection/dataset/data_ready_for_training/val/labels… 18
images, 0 backgrounds, 0 corrupt: 100% 18/18 [00:00<00:00, 35.29it/s]
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/152.jpg:
corrupt JPEG restored and saved
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/175.jpg:
corrupt JPEG restored and saved
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/192.jpg:
corrupt JPEG restored and saved
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/7.jpg:
corrupt JPEG restored and saved
val: WARNING
```

```
/content/pothholedetection/dataset/data_ready_for_training/val/images/9.jpg:
corrupt JPEG restored and saved
val: New cache created:
/content/pothholedetection/dataset/data_ready_for_training/val/labels.cache
val: Caching images (0.0GB ram): 100% 18/18 [00:01<00:00,
14.63it/s]

AutoAnchor: 3.94 anchors/target, 1.000 Best Possible Recall (BPR).
Current anchors are a good fit to dataset
Plotting labels to runs_pothole/feature_extraction/labels.jpg…
Image sizes 640 train, 640 val
Using 8 dataloader workers
Logging results to runs_pothole/feature_extraction
Starting training for 100 epochs…

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       0/99      1.24G     0.1077    0.03155          0         28        640:
100% 18/18 [00:06<00:00,  2.86it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:01<00:00,  1.23it/s]
                   all         18         26    0.00333      0.692       0.01
0.00259

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       1/99      1.86G     0.0935    0.03142          0         20        640:
100% 18/18 [00:02<00:00,  8.58it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  6.00it/s]
                   all         18         26    0.00407      0.846       0.04
0.0122

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       2/99      1.87G    0.08478    0.03219          0         21        640:
100% 18/18 [00:01<00:00,  9.04it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  6.44it/s]
                   all         18         26    0.00444      0.923      0.046
0.0152

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       3/99      1.87G    0.07871    0.03263          0         24        640:
100% 18/18 [00:02<00:00,  8.96it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.20it/s]
                   all         18         26    0.00426      0.885     0.0486
0.0131

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
       4/99      1.87G    0.07187    0.03343          0         27        640:
100% 18/18 [00:01<00:00,  9.16it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.59it/s]
                   all         18         26     0.0216      0.654     0.0566
0.0106

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       5/99      1.87G    0.07244    0.03163          0         26        640:
100% 18/18 [00:01<00:00,  9.13it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.23it/s]
                   all         18         26     0.0329      0.615     0.0508
0.0107

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       6/99      1.87G    0.07023    0.03142          0         20        640:
100% 18/18 [00:01<00:00,  9.17it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.93it/s]
                   all         18         26      0.125      0.154      0.103
0.0187

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       7/99      1.87G    0.06745    0.03099          0         29        640:
100% 18/18 [00:01<00:00,  9.15it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.02it/s]
                   all         18         26      0.169      0.231      0.146
0.0279

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       8/99      1.87G     0.0654    0.02804          0         17        640:
100% 18/18 [00:01<00:00,  9.10it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.89it/s]
                   all         18         26      0.137      0.115      0.115
0.0371

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       9/99      1.87G      0.065     0.0308          0         30        640:
100% 18/18 [00:01<00:00,  9.06it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.42it/s]
                   all         18         26      0.126      0.115      0.121
0.0235

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      10/99      1.87G    0.06761    0.02922          0         23        640:
100% 18/18 [00:01<00:00,  9.18it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.28it/s]
                   all         18         26       0.14      0.115     0.0885
0.0202

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      11/99      1.87G    0.06688    0.02759          0         26        640:
100% 18/18 [00:01<00:00,  9.07it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.09it/s]
                   all         18         26      0.166      0.192      0.114
0.0204

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      12/99      1.87G    0.05846    0.02979          0         30        640:
100% 18/18 [00:01<00:00,  9.10it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.14it/s]
                   all         18         26      0.174      0.154      0.112
0.0182

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      13/99      1.87G    0.06645    0.02989          0         28        640:
100% 18/18 [00:02<00:00,  8.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.20it/s]
                   all         18         26      0.105      0.385      0.099
0.0255

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      14/99      1.87G    0.06001    0.03131          0         31        640:
100% 18/18 [00:01<00:00,  9.10it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.18it/s]
                   all         18         26      0.111      0.197      0.102
0.0231

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      15/99      1.87G    0.06065    0.03014          0         22        640:
100% 18/18 [00:01<00:00,  9.13it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.94it/s]
                   all         18         26      0.141      0.269      0.109
0.0336

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      16/99      1.87G    0.05699    0.03017          0         30        640:
100% 18/18 [00:01<00:00,  9.11it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.95it/s]
                   all         18         26      0.107      0.308      0.117
0.0351

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      17/99      1.87G    0.06024    0.02757          0         19        640:
100% 18/18 [00:01<00:00,  9.00it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.43it/s]
                   all         18         26      0.179      0.488      0.204
0.0568

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      18/99      1.87G    0.05669    0.03018          0         22        640:
100% 18/18 [00:01<00:00,  9.01it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.97it/s]
                   all         18         26      0.137      0.367      0.202
0.0514

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      19/99      1.87G    0.05244    0.02628          0         20        640:
100% 18/18 [00:01<00:00,  9.04it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.03it/s]
                   all         18         26      0.141      0.385      0.209
0.0522

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      20/99      1.87G    0.05665    0.02904          0         28        640:
100% 18/18 [00:01<00:00,  9.00it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.83it/s]
                   all         18         26      0.121      0.462      0.139
0.0497

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      21/99      1.87G      0.055    0.02653          0         25        640:
100% 18/18 [00:02<00:00,  8.96it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.97it/s]
                   all         18         26       0.13      0.346      0.125
0.042

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      22/99      1.87G    0.05389    0.02555          0         19        640:
100% 18/18 [00:01<00:00,  9.04it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.17it/s]
                   all         18         26      0.117      0.231      0.169
0.0552

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      23/99      1.87G    0.05658    0.02797          0         18        640:
100% 18/18 [00:02<00:00,  8.99it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.19it/s]
                   all         18         26      0.118      0.346      0.193
0.036

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      24/99      1.87G    0.05713    0.02795          0         25        640:
100% 18/18 [00:02<00:00,  8.97it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.98it/s]
                   all         18         26      0.162      0.356      0.135
0.0405

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      25/99      1.87G    0.05621    0.02656          0         16        640:
100% 18/18 [00:02<00:00,  8.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.18it/s]
                   all         18         26      0.165      0.346      0.141
0.0547

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      26/99      1.87G    0.05533    0.02761          0         25        640:
100% 18/18 [00:01<00:00,  9.02it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.26it/s]
                   all         18         26       0.15      0.385      0.128
0.0485

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      27/99      1.87G    0.05318    0.02753          0         25        640:
100% 18/18 [00:02<00:00,  8.98it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.14it/s]
                   all         18         26      0.207      0.269      0.185
0.0423

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      28/99      1.87G    0.05245    0.02819          0         23        640:
100% 18/18 [00:02<00:00,  8.99it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.10it/s]
                   all         18         26      0.146      0.385      0.151
0.0491

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      29/99      1.87G    0.05307    0.02905          0         24        640:
100% 18/18 [00:02<00:00,  8.81it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.03it/s]
                   all         18         26      0.137      0.384       0.17
0.053

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      30/99      1.87G    0.05245    0.02823          0         24        640:
100% 18/18 [00:02<00:00,  8.80it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.19it/s]
                   all         18         26      0.158      0.385      0.179
0.0561

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      31/99      1.87G    0.05172    0.02797          0         29        640:
100% 18/18 [00:02<00:00,  8.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.22it/s]
                   all         18         26       0.11      0.308      0.151
0.0516

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      32/99      1.87G    0.05306    0.02595          0         21        640:
100% 18/18 [00:02<00:00,  8.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.27it/s]
                   all         18         26      0.264      0.308       0.22
0.0721

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      33/99      1.87G    0.05502    0.02795          0         27        640:
100% 18/18 [00:02<00:00,  8.84it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.24it/s]
                   all         18         26      0.319        0.5      0.279
0.0693

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      34/99      1.87G    0.04974    0.02745          0         17        640:
100% 18/18 [00:02<00:00,  8.83it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.84it/s]
                   all         18         26      0.323      0.423        0.3
0.102

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      35/99      1.87G    0.05056     0.0273          0         24        640:
100% 18/18 [00:02<00:00,  8.82it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.09it/s]
                   all         18         26      0.336      0.538      0.298
0.0851

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      36/99      1.87G     0.0493    0.02569          0         22        640:
100% 18/18 [00:02<00:00,  8.84it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.28it/s]
                   all         18         26      0.324      0.462      0.316
0.1

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      37/99      1.87G    0.05215    0.02598          0         16        640:
100% 18/18 [00:02<00:00,  8.82it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.08it/s]
                   all         18         26      0.378      0.385      0.302
0.0919

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      38/99      1.87G    0.05054    0.02655          0         26        640:
100% 18/18 [00:02<00:00,  8.83it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.06it/s]
                   all         18         26      0.451      0.346      0.306
0.0823

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      39/99      1.87G    0.04666    0.02695          0         17        640:
100% 18/18 [00:02<00:00,  8.77it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.97it/s]
                   all         18         26      0.477      0.346      0.315
0.0925

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      40/99      1.87G    0.05023     0.0261          0         23        640:
100% 18/18 [00:02<00:00,  8.76it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.16it/s]
                   all         18         26      0.364      0.538      0.326
0.0718

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      41/99      1.87G    0.04932    0.02625          0         27        640:
100% 18/18 [00:02<00:00,  8.73it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.36it/s]
                   all         18         26      0.331      0.533      0.244
0.0653

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      42/99      1.87G    0.04605    0.02623          0         23        640:
100% 18/18 [00:02<00:00,  8.77it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.36it/s]
                   all         18         26      0.309      0.462      0.243
0.0655

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      43/99      1.87G    0.04751    0.02466          0         26        640:
100% 18/18 [00:02<00:00,  8.80it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.08it/s]
                   all         18         26      0.224      0.346      0.198
0.0487

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      44/99      1.87G    0.04862    0.02609          0         16        640:
100% 18/18 [00:02<00:00,  8.81it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.17it/s]
                   all         18         26      0.237      0.308      0.182
0.0642

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      45/99      1.87G    0.05048    0.02565          0         25        640:
100% 18/18 [00:02<00:00,  8.50it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.18it/s]
                   all         18         26      0.221      0.385      0.204
0.0651

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      46/99      1.87G    0.04898    0.02474          0         25        640:
100% 18/18 [00:02<00:00,  8.70it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.02it/s]
                   all         18         26       0.33      0.308      0.206
0.0599

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      47/99      1.87G     0.0452    0.02515          0         25        640:
100% 18/18 [00:02<00:00,  8.67it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.24it/s]
                   all         18         26      0.413      0.346      0.276
0.0819

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      48/99      1.87G    0.04936    0.02405          0         15        640:
100% 18/18 [00:02<00:00,  8.71it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.97it/s]
                   all         18         26      0.376      0.385      0.294
0.0992

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      49/99      1.87G    0.04319    0.02383          0         23        640:
100% 18/18 [00:02<00:00,  8.73it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.26it/s]
                   all         18         26      0.482      0.423      0.303
0.0878

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      50/99      1.87G    0.04582    0.02346          0         25        640:
100% 18/18 [00:02<00:00,  8.73it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.22it/s]
                   all         18         26       0.36      0.455      0.283
0.0778

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      51/99      1.87G    0.04424    0.02449          0         22        640:
100% 18/18 [00:02<00:00,  8.72it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.26it/s]
                   all         18         26      0.308      0.411      0.253
0.0692

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      52/99      1.87G    0.04452    0.02389          0         23        640:
100% 18/18 [00:02<00:00,  8.69it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.12it/s]
                   all         18         26      0.395      0.385      0.274
0.0641

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      53/99      1.87G    0.04575    0.02213          0         13        640:
100% 18/18 [00:02<00:00,  8.64it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.23it/s]
                   all         18         26      0.478      0.308      0.241
0.0761

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      54/99      1.87G    0.04552    0.02464          0         19        640:
100% 18/18 [00:02<00:00,  8.77it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.92it/s]
                   all         18         26      0.472      0.346      0.281
0.086

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      55/99      1.87G    0.04535    0.02393          0         20        640:
100% 18/18 [00:02<00:00,  8.64it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.14it/s]
                   all         18         26      0.526      0.384      0.328
0.0883

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      56/99      1.87G    0.04416    0.02348          0         27        640:
100% 18/18 [00:02<00:00,  8.70it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.13it/s]
                   all         18         26      0.336      0.385      0.303
0.0877

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      57/99      1.87G    0.04468    0.02214          0         19        640:
100% 18/18 [00:02<00:00,  8.67it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.34it/s]
                   all         18         26      0.285      0.385      0.192
0.0648

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      58/99      1.87G    0.04558    0.02319          0         17        640:
100% 18/18 [00:02<00:00,  8.73it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.43it/s]
                   all         18         26      0.331      0.385      0.231
0.0792

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      59/99      1.87G    0.04498    0.02579          0         28        640:
100% 18/18 [00:02<00:00,  8.70it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.92it/s]
                   all         18         26      0.284      0.385      0.269
0.0661

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      60/99      1.87G    0.04392    0.02477          0         21        640:
100% 18/18 [00:02<00:00,  8.64it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.12it/s]
                   all         18         26      0.294      0.346       0.25
0.0933

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      61/99      1.87G    0.04196    0.02231          0         26        640:
100% 18/18 [00:02<00:00,  8.74it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.35it/s]
                   all         18         26      0.394      0.308      0.239
0.0602

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      62/99      1.87G    0.04385    0.02501          0         32        640:
100% 18/18 [00:02<00:00,  8.68it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.32it/s]
                   all         18         26      0.393      0.346      0.229
0.0557

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      63/99      1.87G      0.041    0.02223          0         22        640:
100% 18/18 [00:02<00:00,  8.75it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.26it/s]
                   all         18         26      0.396      0.346      0.246
0.0683

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      64/99      1.87G    0.04109    0.02224          0         18        640:
100% 18/18 [00:02<00:00,  8.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.48it/s]
                   all         18         26      0.337      0.385      0.224
0.0614

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      65/99      1.87G    0.04336    0.02221          0         20        640:
100% 18/18 [00:02<00:00,  8.70it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.14it/s]
                   all         18         26      0.458      0.192      0.234
0.0771

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      66/99      1.87G    0.04118    0.02398          0         21        640:
100% 18/18 [00:02<00:00,  8.68it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.38it/s]
                   all         18         26      0.321      0.269       0.24
0.0661

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      67/99      1.87G    0.04097    0.02457          0         20        640:
100% 18/18 [00:02<00:00,  8.74it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.44it/s]
                   all         18         26      0.219      0.308      0.238
0.0658

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      68/99      1.87G    0.04267    0.02221          0         20        640:
100% 18/18 [00:02<00:00,  8.72it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.23it/s]
                   all         18         26      0.269      0.462      0.232
0.0566

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      69/99      1.87G    0.03761    0.02062          0         20        640:
100% 18/18 [00:02<00:00,  8.71it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.40it/s]
                   all         18         26      0.304      0.462      0.214
0.0527

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      70/99      1.87G     0.0418    0.02193          0         31        640:
100% 18/18 [00:02<00:00,  8.64it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.09it/s]
                   all         18         26      0.317      0.346      0.236
0.0694

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      71/99      1.87G    0.04248    0.02132          0         21        640:
100% 18/18 [00:02<00:00,  8.77it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.27it/s]
                   all         18         26      0.324      0.308      0.223
0.0663

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      72/99      1.87G    0.04067    0.02252          0         20        640:
100% 18/18 [00:02<00:00,  8.81it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.30it/s]
                   all         18         26      0.308      0.385      0.261
0.0733

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      73/99      1.87G    0.03915    0.02055          0         17        640:
100% 18/18 [00:02<00:00,  8.77it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.35it/s]
                   all         18         26      0.312      0.462      0.259
0.0706

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      74/99      1.87G    0.03923    0.02018          0         27        640:
100% 18/18 [00:02<00:00,  8.81it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.10it/s]
                   all         18         26      0.265      0.385      0.273
0.0685

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      75/99      1.87G    0.04113    0.02341          0         25        640:
100% 18/18 [00:02<00:00,  8.78it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.13it/s]
                   all         18         26      0.279      0.371      0.288
0.0943

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      76/99      1.87G    0.03742    0.02205          0         30        640:
100% 18/18 [00:02<00:00,  8.80it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.33it/s]
                   all         18         26      0.268      0.385      0.298
0.0903

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      77/99      1.87G     0.0393    0.02187          0         22        640:
100% 18/18 [00:02<00:00,  8.80it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.24it/s]
                   all         18         26      0.292      0.462      0.331
0.101

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      78/99      1.87G    0.03711    0.02062          0         15        640:
100% 18/18 [00:02<00:00,  8.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.35it/s]
                   all         18         26      0.284      0.381      0.315
0.106

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      79/99      1.87G    0.04177    0.02501          0         27        640:
100% 18/18 [00:02<00:00,  8.78it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.24it/s]
                   all         18         26       0.28      0.346      0.295
0.095

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      80/99      1.87G    0.03883    0.02118          0         26        640:
100% 18/18 [00:02<00:00,  8.70it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.24it/s]
                   all         18         26      0.367      0.308      0.313
0.1

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      81/99      1.87G    0.03974    0.02015          0         15        640:
100% 18/18 [00:02<00:00,  8.71it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.21it/s]
                   all         18         26      0.374      0.308      0.297
0.101

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      82/99      1.87G    0.03983    0.02206          0         21        640:
100% 18/18 [00:02<00:00,  8.83it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.29it/s]
                   all         18         26       0.39      0.308      0.303
0.108

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      83/99      1.87G    0.03861    0.02237          0         31        640:
100% 18/18 [00:02<00:00,  8.84it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.42it/s]
                   all         18         26      0.344      0.344      0.289
0.0903

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      84/99      1.87G    0.03911    0.02239          0         26        640:
100% 18/18 [00:02<00:00,  8.76it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.44it/s]
                   all         18         26      0.317      0.346      0.285
0.0961

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      85/99      1.87G    0.03877    0.02287          0         21        640:
100% 18/18 [00:02<00:00,  8.68it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.28it/s]
                   all         18         26      0.286      0.346      0.284
0.0891

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      86/99      1.87G    0.03985    0.02214          0         32        640:
100% 18/18 [00:02<00:00,  8.81it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.46it/s]
                   all         18         26      0.344      0.346      0.298
0.0923

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      87/99      1.87G    0.03602    0.02419          0         22        640:
100% 18/18 [00:02<00:00,  8.85it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.42it/s]
                   all         18         26      0.451      0.379      0.301
0.0885

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

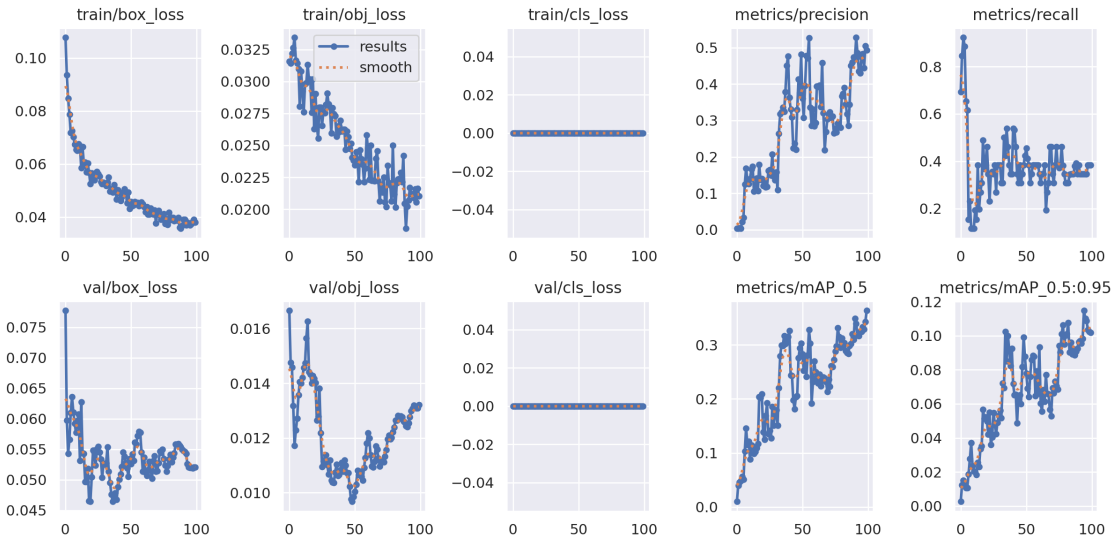
```
      88/99      1.87G    0.03566    0.02045          0         24        640:
100% 18/18 [00:02<00:00,  8.80it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.35it/s]
                   all         18         26      0.459      0.392       0.32
0.0908

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      89/99      1.87G    0.03683    0.01849          0         22        640:
100% 18/18 [00:02<00:00,  8.74it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.06it/s]
                   all         18         26      0.473      0.346       0.31
0.0926

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      90/99      1.87G    0.03907    0.02024          0         22        640:
100% 18/18 [00:02<00:00,  8.67it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.98it/s]
                   all         18         26      0.469      0.385      0.349
0.0964

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      91/99      1.87G    0.03905     0.0207          0         30        640:
100% 18/18 [00:02<00:00,  8.71it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.07it/s]
                   all         18         26      0.528      0.346      0.339
0.0969

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      92/99      1.87G    0.03687    0.02169          0         16        640:
100% 18/18 [00:02<00:00,  8.80it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.23it/s]
                   all         18         26      0.486      0.346      0.317
0.0955

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      93/99      1.87G    0.03797    0.02121          0         18        640:
100% 18/18 [00:02<00:00,  8.78it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.41it/s]
                   all         18         26      0.436      0.346      0.317
0.0982

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      94/99      1.87G    0.03739    0.02114          0         23        640:
100% 18/18 [00:02<00:00,  8.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.16it/s]
                   all         18         26       0.43      0.346      0.325
0.115

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      95/99      1.87G    0.03692     0.0209          0         21        640:
100% 18/18 [00:02<00:00,  8.75it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.26it/s]
                   all         18         26      0.474      0.346      0.324
0.11

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      96/99      1.87G    0.03749    0.02159          0         30        640:
100% 18/18 [00:02<00:00,  8.75it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.48it/s]
                   all         18         26      0.483      0.346      0.333
0.109

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      97/99      1.87G    0.03828    0.02056          0         28        640:
100% 18/18 [00:02<00:00,  8.72it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.98it/s]
                   all         18         26      0.444      0.385      0.329
0.104

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      98/99      1.87G    0.03915    0.02161          0         30        640:
100% 18/18 [00:02<00:00,  8.71it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.38it/s]
                   all         18         26      0.504      0.385      0.342
0.102

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      99/99      1.87G    0.03808    0.02104          0         21        640:
100% 18/18 [00:02<00:00,  8.72it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.35it/s]
                   all         18         26      0.493      0.385      0.363
0.102

100 epochs completed in 0.080 hours.
```

```
Optimizer stripped from runs_pothole/feature_extraction/weights/last.pt, 42.2MB
Optimizer stripped from runs_pothole/feature_extraction/weights/best.pt, 42.2MB

Validating runs_pothole/feature_extraction/weights/best.pt…
Fusing layers…
Model summary: 212 layers, 20852934 parameters, 0 gradients, 47.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.75it/s]
                   all         18         26      0.429      0.346      0.328
0.108
Results saved to runs_pothole/feature_extraction
```

[10]:
```
from IPython import display
display.Image(f"runs_pothole/feature_extraction/results.png")
```

[10]:



Fine Tuning

[11]:
```
!python train.py --img 640 --hyp '/content/yolov5/data/hyps/hyp.VOC.yaml'␣
↪--batch 8 --epochs 100 --data '/content/potholes_data.yaml' --weights '/
↪content/yolov5/runs_pothole/feature_extraction/weights/best.pt' --project␣
↪'runs_pothole' --name 'fine-tuning' --cache
```

```
2023-12-05 19:27:07.831277: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_dnn.cc:9342] Unable to
register cuDNN factory: Attempting to register factory for plugin cuDNN when one
has already been registered
2023-12-05 19:27:07.831337: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_fft.cc:609] Unable to register
cuFFT factory: Attempting to register factory for plugin cuFFT when one has
```

```
already been registered
2023-12-05 19:27:07.831377: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_blas.cc:1518] Unable to
register cuBLAS factory: Attempting to register factory for plugin cuBLAS when
one has already been registered
train:

weights=/content/yolov5/runs_pothole/feature_extraction/weights/best.pt,
cfg=, data=/content/potholes_data.yaml,
hyp=/content/yolov5/data/hyps/hyp.VOC.yaml, epochs=100, batch_size=8, imgsz=640,
rect=False, resume=False, nosave=False, noval=False, noautoanchor=False,
noplots=False, evolve=None, bucket=, cache=ram, image_weights=False, device=,
multi_scale=False, single_cls=False, optimizer=SGD, sync_bn=False, workers=8,
project=runs_pothole, name=fine-tuning, exist_ok=False, quad=False,
cos_lr=False, label_smoothing=0.0, patience=100, freeze=[0], save_period=-1,
seed=0, local_rank=-1, entity=None, upload_dataset=False, bbox_interval=-1,
artifact_alias=latest
github: up to date with https://github.com/ultralytics/yolov5
YOLOv5  v7.0-247-g3f02fde Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4,
15102MiB)

hyperparameters: lr0=0.00334, lrf=0.15135, momentum=0.74832,
weight_decay=0.00025, warmup_epochs=3.3835, warmup_momentum=0.59462,
warmup_bias_lr=0.18657, box=0.02, cls=0.21638, cls_pw=0.5, obj=0.51728,
obj_pw=0.67198, iou_t=0.2, anchor_t=3.3744, fl_gamma=0.0, hsv_h=0.01041,
hsv_s=0.54703, hsv_v=0.27739, degrees=0.0, translate=0.04591, scale=0.75544,
shear=0.0, perspective=0.0, flipud=0.0, fliplr=0.5, mosaic=0.85834,
mixup=0.04266, copy_paste=0.0, anchors=3.412
Comet: run 'pip install comet_ml' to automatically track and
visualize YOLOv5  runs in Comet
TensorBoard: Start with 'tensorboard --logdir runs_pothole', view
at http://localhost:6006/
Overriding model.yaml anchors with anchors=3.412

                from  n    params  module
arguments
  0               -1  1      5280  models.common.Conv                      [3,
48, 6, 2, 2]
  1               -1  1     41664  models.common.Conv                      [48,
96, 3, 2]
  2               -1  2     65280  models.common.C3                        [96,
96, 2]
  3               -1  1    166272  models.common.Conv                      [96,
192, 3, 2]
  4               -1  4    444672  models.common.C3
[192, 192, 4]
  5               -1  1    664320  models.common.Conv
[192, 384, 3, 2]
```

```
  6                -1  6   2512896  models.common.C3
[384, 384, 6]
  7                -1  1   2655744  models.common.Conv
[384, 768, 3, 2]
  8                -1  2   4134912  models.common.C3
[768, 768, 2]
  9                -1  1   1476864  models.common.SPPF
[768, 768, 5]
 10                -1  1    295680  models.common.Conv
[768, 384, 1, 1]
 11                -1  1         0  torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']
 12           [-1, 6]  1         0  models.common.Concat                    [1]
 13                -1  2   1182720  models.common.C3
[768, 384, 2, False]
 14                -1  1     74112  models.common.Conv
[384, 192, 1, 1]
 15                -1  1         0  torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']
 16           [-1, 4]  1         0  models.common.Concat                    [1]
 17                -1  2    296448  models.common.C3
[384, 192, 2, False]
 18                -1  1    332160  models.common.Conv
[192, 192, 3, 2]
 19          [-1, 14]  1         0  models.common.Concat                    [1]
 20                -1  2   1035264  models.common.C3
[384, 384, 2, False]
 21                -1  1   1327872  models.common.Conv
[384, 384, 3, 2]
 22          [-1, 10]  1         0  models.common.Concat                    [1]
 23                -1  2   4134912  models.common.C3
[768, 768, 2, False]
 24      [17, 20, 23]  1     24246  models.yolo.Detect                      [1,
[[0, 1, 2, 3, 4, 5], [0, 1, 2, 3, 4, 5], [0, 1, 2, 3, 4, 5]], [192, 384, 768]]
Model summary: 291 layers, 20871318 parameters, 20871318 gradients, 48.2 GFLOPs

Transferred 480/481 items from
/content/yolov5/runs_pothole/feature_extraction/weights/best.pt
AMP: checks passed
optimizer: SGD(lr=0.00334) with parameter groups 79
weight(decay=0.0), 82 weight(decay=0.00025), 82 bias
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))
train: Scanning
/content/pothholedetection/dataset/data_ready_for_training/train/labels.cache…
144 images, 0 backgrounds, 0 corrupt: 100% 144/144 [00:00<?, ?it/s]
train: WARNING
```

```
/content/pothholedetection/dataset/data_ready_for_training/train/images/1.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/142.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/143.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/144.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/145.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/146.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/147.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/148.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/149.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/150.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/151.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/153.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/154.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/155.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/156.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/157.jpg:
corrupt JPEG restored and saved
train: WARNING
```

```
/content/pothholedetection/dataset/data_ready_for_training/train/images/158.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/159.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/160.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/161.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/162.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/163.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/164.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/165.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/166.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/167.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/169.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/170.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/171.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/173.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/176.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/177.jpg:
corrupt JPEG restored and saved
train: WARNING
```

```
/content/pothholedetection/dataset/data_ready_for_training/train/images/178.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/181.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/183.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/185.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/186.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/187.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/188.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/189.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/190.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/191.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/193.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/194.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/195.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/196.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/198.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/2.jpg:
corrupt JPEG restored and saved
train: WARNING
```

```
/content/pothholedetection/dataset/data_ready_for_training/train/images/200.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/3.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/5.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/6.jpg:
corrupt JPEG restored and saved
train: WARNING
/content/pothholedetection/dataset/data_ready_for_training/train/images/8.jpg:
corrupt JPEG restored and saved
train: Caching images (0.1GB ram): 100% 144/144 [00:07<00:00,
18.83it/s]
val: Scanning
/content/pothholedetection/dataset/data_ready_for_training/val/labels.cache…
18 images, 0 backgrounds, 0 corrupt: 100% 18/18 [00:00<?, ?it/s]
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/152.jpg:
corrupt JPEG restored and saved
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/175.jpg:
corrupt JPEG restored and saved
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/192.jpg:
corrupt JPEG restored and saved
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/7.jpg:
corrupt JPEG restored and saved
val: WARNING
/content/pothholedetection/dataset/data_ready_for_training/val/images/9.jpg:
corrupt JPEG restored and saved
val: Caching images (0.0GB ram): 100% 18/18 [00:01<00:00,
14.50it/s]

AutoAnchor: 0.00 anchors/target, 0.000 Best Possible Recall (BPR).
Anchors are a poor fit to dataset  , attempting to improve…
AutoAnchor: Running kmeans for 9 anchors on 201 points…
AutoAnchor: Evolving anchors with Genetic Algorithm: fitness =
0.8006: 100% 1000/1000 [00:00<00:00, 2656.43it/s]
AutoAnchor: thr=0.30: 1.0000 best possible recall, 6.91 anchors
past thr
AutoAnchor: n=9, img_size=640, metric_all=0.466/0.801-mean/best,
past_thr=0.541-mean: 96,48, 100,144, 216,103, 167,170, 131,254, 436,93, 224,222,
350,207, 258,351
AutoAnchor: Done   (optional: update model *.yaml to use these
```

```
anchors in the future)
Plotting labels to runs_pothole/fine-tuning/labels.jpg…
Image sizes 640 train, 640 val
Using 8 dataloader workers
Logging results to runs_pothole/fine-tuning
Starting training for 100 epochs…

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       0/99      3.12G    0.04583   0.008548          0         22        640:
100% 18/18 [00:06<00:00,  2.72it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  5.00it/s]
                   all         18         26      0.174      0.423      0.142
0.0349

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       1/99      3.73G    0.04449   0.008345          0         34        640:
100% 18/18 [00:03<00:00,  4.96it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.98it/s]
                   all         18         26      0.184      0.308      0.142
0.0378

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       2/99      3.74G    0.04331    0.00819          0         24        640:
100% 18/18 [00:03<00:00,  4.97it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.85it/s]
                   all         18         26      0.252      0.308      0.182
0.0563

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       3/99      3.74G    0.04159   0.007181          0         22        640:
100% 18/18 [00:03<00:00,  4.97it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.23it/s]
                   all         18         26      0.224      0.377      0.243
0.0858

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       4/99      3.74G    0.04038   0.007532          0         15        640:
100% 18/18 [00:03<00:00,  5.04it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.21it/s]
                   all         18         26      0.273      0.448      0.279
0.0865

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
       5/99      3.74G    0.04019   0.007312          0         12        640:
100% 18/18 [00:03<00:00,  4.93it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.03it/s]
                   all         18         26      0.298      0.423      0.296
0.0955

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       6/99      3.74G    0.03915   0.007639          0         21        640:
100% 18/18 [00:03<00:00,  4.99it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.44it/s]
                   all         18         26      0.397      0.269      0.297
0.102

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       7/99      3.74G    0.03818   0.007678          0         14        640:
100% 18/18 [00:03<00:00,  4.93it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.00it/s]
                   all         18         26      0.438      0.385      0.339
0.116

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       8/99      3.74G    0.03784   0.007589          0         19        640:
100% 18/18 [00:03<00:00,  4.94it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.27it/s]
                   all         18         26      0.519      0.308      0.305
0.103

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
       9/99      3.74G    0.03753   0.007484          0         25        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.19it/s]
                   all         18         26      0.517      0.346      0.324
0.101

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      10/99      3.74G    0.03688    0.00743          0         20        640:
100% 18/18 [00:03<00:00,  4.93it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.00it/s]
                   all         18         26      0.443      0.346      0.333
0.118

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      11/99      3.74G    0.03615   0.008292          0         24        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.18it/s]
                   all         18         26      0.478      0.387      0.348
0.131

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      12/99      3.74G    0.03631   0.009089          0         17        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.11it/s]
                   all         18         26      0.502      0.385       0.34
0.122

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      13/99      3.74G    0.03547   0.007936          0         26        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.23it/s]
                   all         18         26      0.404      0.346      0.334
0.116

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      14/99      3.74G    0.03449   0.008875          0         16        640:
100% 18/18 [00:03<00:00,  4.85it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.85it/s]
                   all         18         26       0.57      0.423      0.378
0.144

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      15/99      3.74G    0.03408    0.00808          0         19        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.81it/s]
                   all         18         26      0.547      0.346      0.337
0.112

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      16/99      3.74G    0.03294   0.008912          0         23        640:
100% 18/18 [00:03<00:00,  4.86it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.03it/s]
                   all         18         26      0.583      0.346      0.355
0.115

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      17/99      3.74G     0.0332   0.009364          0         12        640:
100% 18/18 [00:03<00:00,  4.86it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.89it/s]
                   all         18         26      0.521      0.346      0.351
0.119

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      18/99      3.74G    0.03159   0.009082          0         27        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.01it/s]
                   all         18         26      0.439      0.346      0.351
0.124

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      19/99      3.74G    0.03035   0.008904          0         17        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.14it/s]
                   all         18         26      0.471      0.346      0.316
0.112

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      20/99      3.74G     0.0291   0.009175          0         17        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.14it/s]
                   all         18         26      0.572      0.385      0.406
0.126

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      21/99      3.74G    0.02912   0.009316          0         26        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.70it/s]
                   all         18         26      0.591      0.385       0.43
0.121

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      22/99      3.74G    0.02817    0.01021          0         28        640:
100% 18/18 [00:03<00:00,  4.94it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.24it/s]
                   all         18         26       0.55      0.385      0.393
0.127

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      23/99      3.74G    0.02777    0.01044          0         25        640:
100% 18/18 [00:03<00:00,  4.95it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.20it/s]
                   all         18         26      0.558      0.388      0.392
0.115

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      24/99      3.74G    0.02778    0.01061          0         36        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.81it/s]
                   all         18         26      0.433      0.469      0.331
0.108

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      25/99      3.74G    0.02668   0.009694          0         24        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.23it/s]
                   all         18         26      0.443      0.423      0.366
0.117

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      26/99      3.74G    0.02595   0.009859          0         21        640:
100% 18/18 [00:03<00:00,  4.94it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.00it/s]
                   all         18         26      0.463      0.385      0.387
0.127

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      27/99      3.74G    0.02529    0.01066          0         22        640:
100% 18/18 [00:03<00:00,  4.94it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.95it/s]
                   all         18         26      0.497      0.419      0.345
0.117

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      28/99      3.74G    0.02557     0.0104          0         24        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.06it/s]
                   all         18         26      0.312      0.385      0.288
0.114

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      29/99      3.74G    0.02563    0.01035          0         23        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.17it/s]
                   all         18         26      0.348      0.385      0.305
0.0919

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      30/99      3.74G    0.02352     0.0111          0         22        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.81it/s]
                   all         18         26      0.324      0.423      0.358
0.0913

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      31/99      3.74G    0.02272    0.01122          0         16        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.99it/s]
                   all         18         26      0.419      0.423      0.356
0.0987

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      32/99      3.74G    0.02386    0.01171          0         33        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.96it/s]
                   all         18         26      0.376      0.462      0.327
0.102

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      33/99      3.74G    0.02292    0.01081          0         24        640:
100% 18/18 [00:03<00:00,  4.86it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.81it/s]
                   all         18         26      0.457        0.5      0.353
0.103

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      34/99      3.74G    0.02224    0.01161          0         33        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.88it/s]
                   all         18         26      0.406      0.525      0.344
0.11

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      35/99      3.74G    0.02153    0.01117          0         22        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.96it/s]
                   all         18         26      0.387      0.461      0.332
0.102

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      36/99      3.74G    0.02116    0.01131          0         22        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.98it/s]
                   all         18         26      0.425      0.455      0.332
0.11

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      37/99      3.74G    0.02078    0.01123          0         22        640:
100% 18/18 [00:03<00:00,  4.86it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.77it/s]
                   all         18         26       0.58      0.346      0.391
0.112

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      38/99      3.74G    0.02048    0.01104          0         41        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.15it/s]
                   all         18         26      0.526      0.385      0.383
0.0915

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      39/99      3.74G    0.02012    0.01143          0         33        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.91it/s]
                   all         18         26       0.41      0.375      0.347
0.0952

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      40/99      3.74G    0.01977    0.01193          0         21        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.79it/s]
                   all         18         26      0.348      0.385      0.341
0.0903

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      41/99      3.74G    0.01864    0.01214          0         13        640:
100% 18/18 [00:03<00:00,  4.87it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.96it/s]
                   all         18         26      0.309      0.385      0.284
0.093

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      42/99      3.74G    0.01937    0.01095          0         20        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.00it/s]
                   all         18         26      0.379      0.423      0.316
0.113

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      43/99      3.74G    0.01764    0.01187          0         24        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.87it/s]
                   all         18         26      0.341      0.423      0.315
0.111

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      44/99      3.74G    0.01779    0.01183          0         20        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.93it/s]
                   all         18         26      0.365      0.423      0.321
0.0992

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      45/99      3.74G    0.01772     0.0125          0         31        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.96it/s]
                   all         18         26      0.381      0.385      0.318
0.109

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      46/99      3.74G    0.01843    0.01181          0         15        640:
100% 18/18 [00:03<00:00,  4.94it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.73it/s]
                   all         18         26      0.488      0.346       0.34
0.11

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      47/99      3.74G    0.01805    0.01152          0         23        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.08it/s]
                   all         18         26      0.444      0.346      0.363
0.0913

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      48/99      3.74G    0.01808    0.01144          0         21        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.04it/s]
                   all         18         26       0.52      0.346      0.358
0.0951

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      49/99      3.74G    0.01827     0.0124          0         26        640:
100% 18/18 [00:03<00:00,  4.87it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.07it/s]
                   all         18         26      0.585      0.346       0.37
0.1

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      50/99      3.74G    0.01765    0.01198          0         31        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.97it/s]
                   all         18         26      0.562      0.297      0.336
0.107

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      51/99      3.74G    0.01782     0.0125          0         35        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.00it/s]
                   all         18         26      0.582      0.308      0.343
0.11

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      52/99      3.74G     0.0174    0.01211          0         23        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.87it/s]
                   all         18         26      0.512      0.308      0.276
0.0985

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      53/99      3.74G    0.01758    0.01195          0         17        640:
100% 18/18 [00:03<00:00,  4.87it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.12it/s]
                   all         18         26      0.494      0.308      0.332
0.0947

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      54/99      3.74G    0.01726    0.01287          0         13        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.98it/s]
                   all         18         26      0.516      0.308      0.337
0.102

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      55/99      3.74G    0.01771    0.01188          0         35        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.04it/s]
                   all         18         26      0.492      0.308      0.308
0.0947

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      56/99      3.74G    0.01686     0.0114          0         16        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.62it/s]
                   all         18         26      0.365      0.385      0.284
0.0794

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      57/99      3.74G    0.01691    0.01152          0         20        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.75it/s]
                   all         18         26      0.483      0.346      0.364
0.106

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      58/99      3.74G    0.01624    0.01123          0         33        640:
100% 18/18 [00:03<00:00,  4.93it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.02it/s]
                   all         18         26      0.489      0.346      0.339
0.11

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      59/99      3.74G    0.01681    0.01242          0         35        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.80it/s]
                   all         18         26      0.638      0.346      0.355
0.113

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      60/99      3.74G    0.01691    0.01186          0         20        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.88it/s]
                   all         18         26      0.495      0.308      0.328
0.105

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      61/99      3.74G    0.01597    0.01054          0         25        640:
100% 18/18 [00:03<00:00,  4.87it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.02it/s]
                   all         18         26      0.549      0.385      0.355
0.122

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      62/99      3.74G    0.01625    0.01223          0         20        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.10it/s]
                   all         18         26      0.612      0.385      0.349
0.11

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      63/99      3.74G    0.01653    0.01231          0         29        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.09it/s]
                   all         18         26      0.589      0.346      0.349
0.0933

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      64/99      3.74G    0.01708    0.01236          0         24        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.21it/s]
                   all         18         26      0.487      0.308      0.295
0.0875

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      65/99      3.74G    0.01649    0.01159          0         24        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.00it/s]
                   all         18         26      0.422      0.385       0.31
0.0953

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      66/99      3.74G    0.01723    0.01221          0         30        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.96it/s]
                   all         18         26      0.478      0.282      0.285
0.0982

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      67/99      3.74G     0.0167    0.01066          0         20        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.02it/s]
                   all         18         26      0.482      0.346      0.303
0.0851

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      68/99      3.74G     0.0161    0.01152          0         12        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.00it/s]
                   all         18         26      0.461      0.308      0.299
0.0953

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      69/99      3.74G    0.01606    0.01207          0         19        640:
100% 18/18 [00:03<00:00,  4.68it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.12it/s]
                   all         18         26      0.484      0.385      0.335
0.104

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      70/99      3.74G    0.01639    0.01178          0         22        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.13it/s]
                   all         18         26      0.449      0.377       0.33
0.101

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      71/99      3.74G    0.01595    0.01275          0         25        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.13it/s]
                   all         18         26      0.388      0.423       0.35
0.105

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      72/99      3.74G    0.01604    0.01195          0         22        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.18it/s]
                   all         18         26      0.406      0.385      0.302
0.11

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      73/99      3.74G    0.01582    0.01143          0         22        640:
100% 18/18 [00:03<00:00,  4.86it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.00it/s]
                   all         18         26      0.419      0.385      0.342
0.109

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      74/99      3.74G     0.0157    0.01264          0         22        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.02it/s]
                   all         18         26      0.431      0.346      0.302
0.1

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      75/99      3.74G    0.01581    0.01154          0         27        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.85it/s]
                   all         18         26      0.306      0.308      0.273
0.0931

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      76/99      3.74G    0.01659    0.01219          0         32        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.23it/s]
                   all         18         26      0.341      0.378      0.314
0.0981

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      77/99      3.74G    0.01559    0.01145          0         29        640:
100% 18/18 [00:03<00:00,  4.84it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.77it/s]
                   all         18         26       0.46      0.328      0.317
0.1

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      78/99      3.74G    0.01541    0.01143          0         18        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.19it/s]
                   all         18         26      0.523      0.346      0.334
0.0929

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      79/99      3.74G    0.01533    0.01237          0         22        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.79it/s]
                   all         18         26      0.447      0.374      0.339
0.0928

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      80/99      3.74G    0.01607    0.01299          0         24        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.03it/s]
                   all         18         26      0.434      0.346      0.332
0.0912

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      81/99      3.74G    0.01573    0.01183          0         34        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.18it/s]
                   all         18         26      0.404      0.366       0.33
0.0935

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      82/99      3.74G    0.01531    0.01171          0         25        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.09it/s]
                   all         18         26      0.473      0.308      0.314
0.0893

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      83/99      3.74G    0.01528    0.01239          0         26        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.98it/s]
                   all         18         26        0.5      0.308      0.324
0.0917

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      84/99      3.74G     0.0154    0.01114          0         22        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.97it/s]
                   all         18         26      0.537      0.308      0.322
0.0958

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      85/99      3.74G    0.01552    0.01183          0         26        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.05it/s]
                   all         18         26      0.545      0.346      0.331
0.0884

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      86/99      3.74G    0.01601     0.0116          0         33        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.87it/s]
                   all         18         26      0.536      0.346      0.329
0.0874

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      87/99      3.74G     0.0155    0.01168          0         13        640:
100% 18/18 [00:03<00:00,  4.92it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.86it/s]
                   all         18         26      0.513      0.346       0.33
0.0911

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      88/99      3.74G    0.01558    0.01187          0         20        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.99it/s]
                   all         18         26       0.54      0.346       0.34
0.0932

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

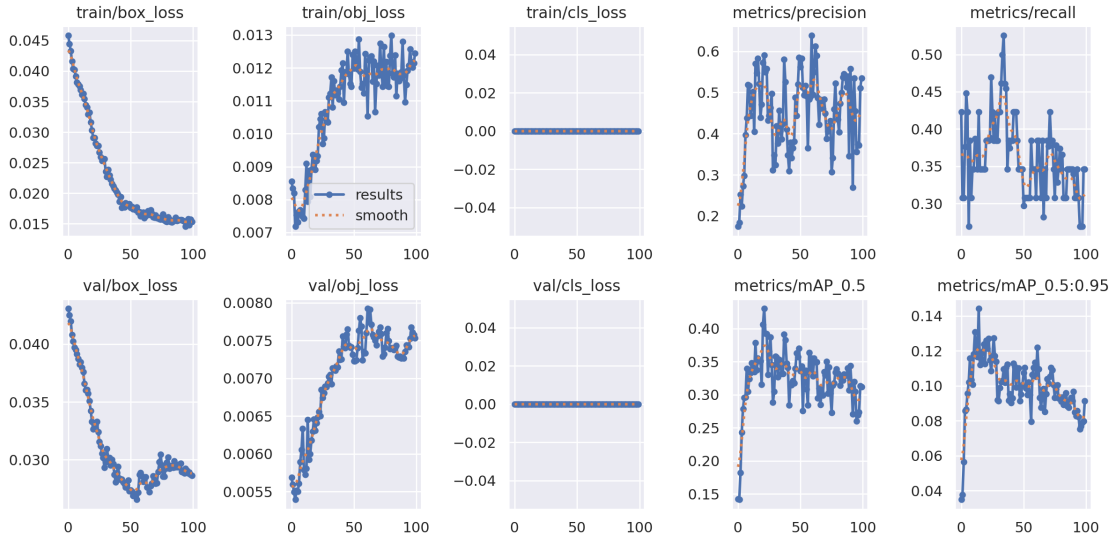
```
      89/99      3.74G     0.0156    0.01279          0         13        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.17it/s]
                   all         18         26      0.345      0.346      0.307
0.0912

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      90/99      3.74G    0.01568    0.01177          0         24        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.13it/s]
                   all         18         26      0.558       0.34      0.344
0.0967

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      91/99      3.74G    0.01565    0.01095          0         25        640:
100% 18/18 [00:03<00:00,  4.93it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.19it/s]
                   all         18         26      0.487      0.308      0.315
0.0847

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      92/99      3.74G    0.01548    0.01149          0         24        640:
100% 18/18 [00:03<00:00,  4.91it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.80it/s]
                   all         18         26      0.269      0.308      0.271
0.0828

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      93/99      3.74G    0.01537    0.01192          0         27        640:
100% 18/18 [00:03<00:00,  4.87it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.19it/s]
                   all         18         26      0.535      0.346       0.32
0.0857

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      94/99      3.74G    0.01454    0.01207          0         26        640:
100% 18/18 [00:03<00:00,  4.60it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.83it/s]
                   all         18         26      0.455      0.308      0.305
0.0821

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```

```
      95/99      3.74G    0.01509    0.01257          0         27        640:
100% 18/18 [00:03<00:00,  4.90it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.22it/s]
                   all         18         26      0.355      0.269       0.26
0.0752

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      96/99      3.74G    0.01578    0.01219          0         31        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.07it/s]
                   all         18         26      0.374      0.269      0.269
0.0769

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      97/99      3.74G    0.01481    0.01201          0         21        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.04it/s]
                   all         18         26      0.372      0.269      0.274
0.0788

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      98/99      3.74G    0.01572    0.01214          0         39        640:
100% 18/18 [00:03<00:00,  4.89it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  8.10it/s]
                   all         18         26      0.511      0.346      0.313
0.0798

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      99/99      3.74G    0.01531    0.01245          0         18        640:
100% 18/18 [00:03<00:00,  4.88it/s]
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  7.89it/s]
                   all         18         26      0.535      0.346      0.312
0.0913

100 epochs completed in 0.129 hours.
Optimizer stripped from runs_pothole/fine-tuning/weights/last.pt, 42.2MB
Optimizer stripped from runs_pothole/fine-tuning/weights/best.pt, 42.2MB

Validating runs_pothole/fine-tuning/weights/best.pt…
Fusing layers…
Model summary: 212 layers, 20852934 parameters, 0 gradients, 47.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 2/2 [00:00<00:00,  6.02it/s]
```

```
                 all         18         26      0.564      0.423      0.383
0.141
Results saved to runs_pothole/fine-tuning
```

[12]:
```
display.Image(f"runs_pothole/fine-tuning/results.png")
```

[12]:



Validation

[13]:
```
!python val.py --weights 'runs_pothole/fine-tuning/weights/best.pt' --batch 8␣
↪--data '/content/potholes_data.yaml' --task test --project 'runs_pothole'␣
↪--name 'validation_on_test_data' --augment
```

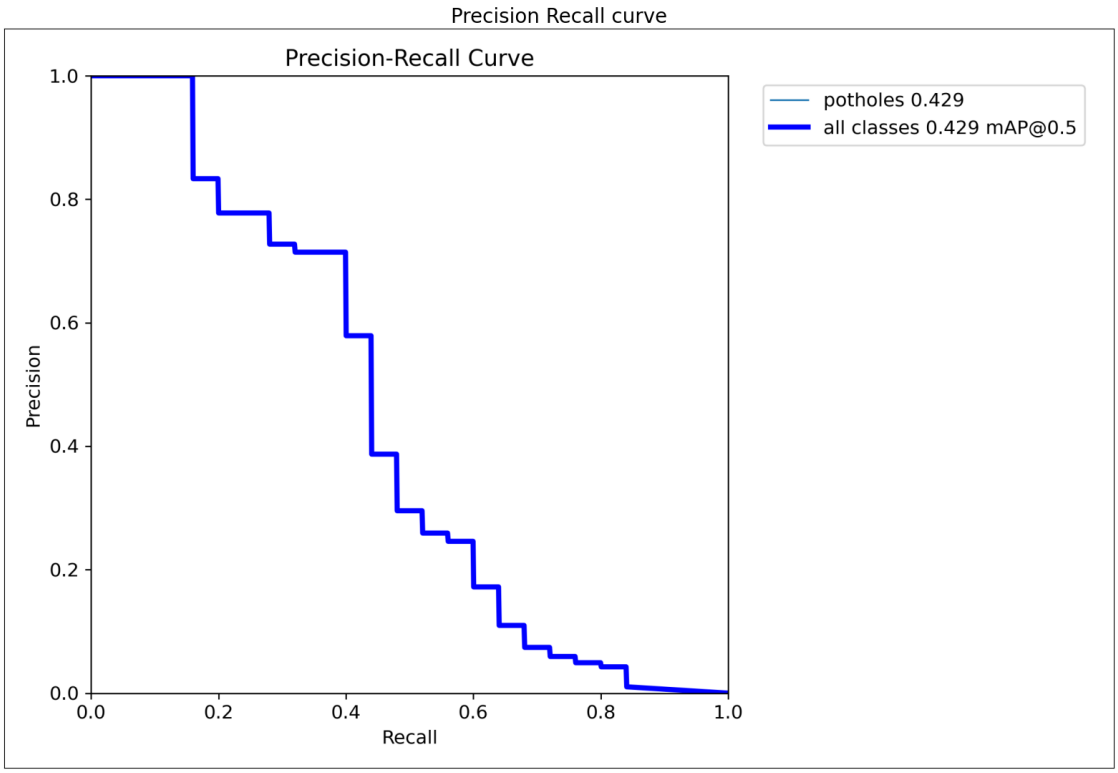
```
val: data=/content/potholes_data.yaml, weights=['runs_pothole/fine-
tuning/weights/best.pt'], batch_size=8, imgsz=640, conf_thres=0.001,
iou_thres=0.6, max_det=300, task=test, device=, workers=8, single_cls=False,
augment=True, verbose=False, save_txt=False, save_hybrid=False, save_conf=False,
save_json=False, project=runs_pothole, name=validation_on_test_data,
exist_ok=False, half=False, dnn=False
YOLOv5   v7.0-247-g3f02fde Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4,
15102MiB)

Fusing layers…
Model summary: 212 layers, 20852934 parameters, 0 gradients, 47.9 GFLOPs
test: Scanning
/content/pothholedetection/dataset/data_ready_for_training/test/labels… 18
images, 0 backgrounds, 0 corrupt: 100% 18/18 [00:00<00:00, 28.39it/s]
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/168.jpg:
corrupt JPEG restored and saved
```

```
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/172.jpg:
corrupt JPEG restored and saved
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/174.jpg:
corrupt JPEG restored and saved
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/179.jpg:
corrupt JPEG restored and saved
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/180.jpg:
corrupt JPEG restored and saved
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/182.jpg:
corrupt JPEG restored and saved
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/184.jpg:
corrupt JPEG restored and saved
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/197.jpg:
corrupt JPEG restored and saved
test: WARNING
/content/pothholedetection/dataset/data_ready_for_training/test/images/4.jpg:
corrupt JPEG restored and saved
test: New cache created:
/content/pothholedetection/dataset/data_ready_for_training/test/labels.cache
                 Class     Images  Instances          P          R      mAP50
mAP50-95: 100% 3/3 [00:05<00:00,  1.72s/it]
                   all         18         25      0.663        0.4      0.429
0.0988
Speed: 0.2ms pre-process, 50.6ms inference, 1.2ms NMS per image at shape (8, 3,
640, 640)
Results saved to runs_pothole/validation_on_test_data
```

Plot Precision Recall-Curve

[14]:
```
import matplotlib.pyplot as plt
import matplotlib.image as mpimg

plt.figure(figsize=(20,20))
plt.plot(figsize=(20,20))
plt.title('Precision Recall curve', fontsize=20)
plt.tick_params(left = False, right = False , labelleft = False, labelbottom =␣
 ↪False, bottom = False)
plt.imshow(mpimg.imread('runs_pothole/validation_on_test_data/PR_curve.png'))
```

[14]:
```
<matplotlib.image.AxesImage at 0x7826603a8b20>
```



Inference

[15]:
```
!python detect.py --source '/content/pothholedetection/dataset/
↪data_ready_for_training/test/images' --weights 'runs_pothole/fine-tuning/
↪weights/best.pt' --max-det 3  --conf-thres 0.25 --classes 0 --name␣
↪'detect_test'
```

```
detect: weights=['runs_pothole/fine-tuning/weights/best.pt'],
source=/content/pothholedetection/dataset/data_ready_for_training/test/images,
data=data/coco128.yaml, imgsz=[640, 640], conf_thres=0.25, iou_thres=0.45,
max_det=3, device=, view_img=False, save_txt=False, save_csv=False,
save_conf=False, save_crop=False, nosave=False, classes=[0], agnostic_nms=False,
augment=False, visualize=False, update=False, project=runs/detect,
name=detect_test, exist_ok=False, line_thickness=3, hide_labels=False,
hide_conf=False, half=False, dnn=False, vid_stride=1
YOLOv5  v7.0-247-g3f02fde Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4,
15102MiB)

Fusing layers…
Model summary: 212 layers, 20852934 parameters, 0 gradients, 47.9 GFLOPs
image 1/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/107.jpg:
640x480 1 potholes, 47.5ms
```

```
image 2/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/108.jpg:
640x480 1 potholes, 20.5ms
image 3/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/168.jpg:
640x480 1 potholes, 20.5ms
image 4/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/172.jpg:
640x480 1 potholes, 20.5ms
image 5/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/174.jpg:
640x480 1 potholes, 20.5ms
image 6/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/179.jpg:
640x480 2 potholess, 20.5ms
image 7/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/180.jpg:
640x480 (no detections), 20.5ms
image 8/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/182.jpg:
640x480 (no detections), 20.5ms
image 9/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/184.jpg:
640x480 1 potholes, 20.5ms
image 10/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/197.jpg:
640x480 1 potholes, 20.5ms
image 11/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/199.jpg:
640x480 1 potholes, 20.5ms
image 12/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/20.jpg:
640x480 1 potholes, 20.5ms
image 13/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/21.jpg:
640x480 (no detections), 20.5ms
image 14/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/4.jpg:
640x480 (no detections), 20.5ms
image 15/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/57.jpg:
640x480 1 potholes, 20.4ms
image 16/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/71.jpg:
640x480 1 potholes, 20.5ms
image 17/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/79.jpg:
480x640 1 potholes, 45.8ms
```

```
image 18/18
/content/pothholedetection/dataset/data_ready_for_training/test/images/95.jpg:
480x640 2 potholess, 21.4ms
Speed: 0.6ms pre-process, 23.4ms inference, 1.1ms NMS per image at shape (1, 3,
640, 640)
Results saved to runs/detect/detect_test
```

View Results

[ ]:
```python
from IPython.display import Image, display
import os

# Path to the folder containing images
folder_path = '//content/yolov5/runs/detect/detect_test'

# Display all images in the folder
for filename in os.listdir(folder_path):
    if filename.endswith(".jpg"):
        file_path = os.path.join(folder_path, filename)
        display(Image(filename=file_path))
```

Ouput Cleared since it made the file too large to convert to pdf