Business Understanding

Medical biology is a medical and pharmaceutical specialty which consists of the execution of analyzes on biological liquids (or tissue extracts/ground materials) and the medical interpretation of the results with the aim of characterizing the physio pathological origin of a disease. Medical biology contributes to 70 percent of medical diagnoses following additional examinations. It is therefore an important and even critical part for understanding diseases and also for the treatment of the patient. it is made up of several branches but here we will focus on microbes and bacteria, therefore microbiology and bacteriology

Data Comprehension

We have 2 folders of images. Here we need to do instance segmentation to detect correctly micro organism on images.

In [ ]:
```
from PIL import Image
import matplotlib.pyplot as plt
import os
```

In [ ]:
```
#path of images

path_img = '/content/drive/MyDrive/Project Segmentation PGE4/datasets/final/data.ya
train_img = os.path.join('/content/drive/MyDrive/Project Segmentation PGE4/datasets
```

In [ ]:
```
dir_train = os.listdir(train_img)
print(f'Train image: {len(dir_train)}')
```

```
Train image: 640
```

In [ ]:
```
def plot_images(path):
    '''
    Plot random image
    '''


    img_path = path
    img = Image.open(img_path)
    plt.title(str(img_path))
    plt.axis('off')
```

```
    plt.imshow(img)




def plot_result(model,image):
    '''
    Plot image and mask
    '''
    plt.figure(figsize=(8,8))

    plt.subplot(1,2,1)
    img = Image.open(image)
    plt.title('Original')
    plt.imshow(img)

    plt.subplot(1,2,2)
    plt.title('Mask')
    res = model.predict(image)
    res = res[0].plot()
    plt.imshow(res)
```

Data Processing

The data consists of images, and our task is to segment microbes within an image. It is crucial to create masks (ground truth) to enable the model to extract important features and generalize better on test images.

Ground truth serves as a reference for the model, allowing it to learn and evaluate its performance by comparing predicted masks to the ground truth.

We generated ground truth using Roboflow for instance segmentation. To enhance the model's performance, we applied data augmentation techniques, including:

- Adding noise
- Rotation
- Inverting images to black on white

The dataset was then split into 80% for training, 10% for validation, and 10% for testing.

In [ ]:
```
img = '/content/drive/MyDrive/Project Segmentation PGE4/datasets/final/train/images
plot_images(path=img)
```

/content/drive/MyDrive/Project Segmentation PGE4/datasets/final/train/images/0UyI9XpuaPnbmayvwnooW2ZvxJFk5UyqG6QLaa16_jpg.rf.6df7bc6b89f1f1b3f48e830d0f1b4afd.jpg

Modeling

After preparing the data on Roboflow, we obtain a `.yaml` file. This YAML file serves as the configuration containing the file paths and labels for classification and segmentation.

In this case, we are using the YOLO v8 (You Only Look Once) model, which is a convolutional neural network (CNN) architecture used for object detection in computer vision. This model is based on a PyTorch kernel.

Unlike some approaches that divide the image into regions and make separate predictions, YOLO performs a single pass over the entire image. This improves efficiency and detection speed.

In [ ]:
```
from ultralytics import YOLO
```

In [ ]:
```
model = YOLO('yolov8n-seg.pt')  #(recommended for training)
print('YOLO V8 load...')
```

```
YOLO V8 load...
```

`Explanation of hyperparameters:`

- project: Name of the project.
- name: Specific name for this model.
- deterministic: If True, ensures result reproducibility by fixing seeds.
- seed: The seed to initialize random number generators.
- data: Path to the directory containing training data.
- save: If True, saves model weights during training.
- save_period: Frequency of saving model weights (every 5 epochs, for example).
- pretrained: If True, uses a pre-trained model.
- imgsz: Size of input images.
- epochs: Number of training epochs.
- batch: Batch size for each training iteration.
- workers: Number of workers to load data in parallel.
- val: If True, performs evaluation on the validation set.
- device: Specifies the GPU number to use.
- lr0: Initial learning rate.
- optimizer: Optimizer to use (in this case, SGD).
- momentum: Momentum coefficient for SGD.
- weight_decay: Regularization term.
- close_mosaic: Application or model-specific parameter, likely controlling mosaic generation.

The training is conducted within the context of a project named "project_seg-result," focusing on the task of segmenting conidia in images. Several key parameters are specified for this training process.

The random seed is set to ensure reproducibility, and the model is pretrained for improved performance. The images are resized to 512x512 pixels, and training lasts for 130 epochs

with a batch size of 32. Eight workers are employed to handle data processing efficiently.

The optimization parameters include a learning rate of 0.018, SGD optimizer with momentum set to 0.947, and weight decay of 0.0005. Additionally, a mosaic augmentation technique is utilized with a close mosaic parameter of 3.

Throughout the training, checkpoints are saved every 20 epochs, and validation is performed. The overall goal is to fine-tune the model to accurately segment conidia in images.

In [ ]:
```
# Train the model with 2 GPUs
result = model.train(
        # Project
        project="/content/drive/MyDrive/Project Segmentation PGE4/project_seg-resul
        name="conidia_lempa",

        # Random Seed parameters
        deterministic=True,
        seed=43,

        # Data & model parameters
        data=path_img,
        save=True,
        save_period=20,
        pretrained=True,
        imgsz=512,

        # Training parameters
        epochs=130,
        batch=32,
        workers=8,
        val=True,

        # Optimization parameters
        lr0=0.018,
        optimizer="SGD",
        momentum=0.947,
        weight_decay=0.0005,
        close_mosaic=3,
    )
```

```
Ultralytics YOLOv8.0.222 🚀 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla V100-SX
M2-16GB, 16151MiB)
engine/trainer: task=segment, mode=train, model=yolov8n-seg.pt, data=/content/driv
e/MyDrive/Project Segmentation PGE4/datasets/final/data.yaml, epochs=130, patience
=50, batch=32, imgsz=512, save=True, save_period=20, cache=False, device=None, wor
kers=8, project=/content/drive/MyDrive/Project Segmentation PGE4/project_seg-resul
t, name=conidia_lempa, exist_ok=False, pretrained=True, optimizer=SGD, verbose=Tru
e, seed=43, deterministic=True, single_cls=False, rect=False, cos_lr=False, close_
mosaic=3, resume=False, amp=True, fraction=1.0, profile=False, freeze=None, overla
p_mask=True, mask_ratio=4, dropout=0.0, val=True, split=val, save_json=False, save
_hybrid=False, conf=None, iou=0.7, max_det=300, half=False, dnn=False, plots=True,
source=None, vid_stride=1, stream_buffer=False, visualize=False, augment=False, ag
nostic_nms=False, classes=None, retina_masks=False, show=False, save_frames=False,
save_txt=False, save_conf=False, save_crop=False, show_labels=True, show_conf=Tru
e, show_boxes=True, line_width=None, format=torchscript, keras=False, optimize=Fal
se, int8=False, dynamic=False, simplify=False, opset=None, workspace=4, nms=False,
lr0=0.018, lrf=0.01, momentum=0.947, weight_decay=0.0005, warmup_epochs=3.0, warmu
p_momentum=0.8, warmup_bias_lr=0.1, box=7.5, cls=0.5, dfl=1.5, pose=12.0, kobj=1.
0, label_smoothing=0.0, nbs=64, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, tr
anslate=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, cfg=None, tracker=botsort.yaml, save_dir=/conten
t/drive/MyDrive/Project Segmentation PGE4/project_seg-result/conidia_lempa
Overriding model.yaml nc=80 with nc=5

                   from  n    params  module
arguments
  0                  -1  1       464  ultralytics.nn.modules.conv.Conv
[3, 16, 3, 2]
  1                  -1  1      4672  ultralytics.nn.modules.conv.Conv
[16, 32, 3, 2]
  2                  -1  1      7360  ultralytics.nn.modules.block.C2f
[32, 32, 1, True]
  3                  -1  1     18560  ultralytics.nn.modules.conv.Conv
[32, 64, 3, 2]
  4                  -1  2     49664  ultralytics.nn.modules.block.C2f
[64, 64, 2, True]
  5                  -1  1     73984  ultralytics.nn.modules.conv.Conv
[64, 128, 3, 2]
  6                  -1  2    197632  ultralytics.nn.modules.block.C2f
[128, 128, 2, True]
  7                  -1  1    295424  ultralytics.nn.modules.conv.Conv
[128, 256, 3, 2]
  8                  -1  1    460288  ultralytics.nn.modules.block.C2f
[256, 256, 1, True]
  9                  -1  1    164608  ultralytics.nn.modules.block.SPPF
[256, 256, 5]
 10                  -1  1         0  torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']
 11             [-1, 6]  1         0  ultralytics.nn.modules.conv.Concat
[1]
 12                  -1  1    148224  ultralytics.nn.modules.block.C2f
[384, 128, 1]
 13                  -1  1         0  torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']
 14             [-1, 4]  1         0  ultralytics.nn.modules.conv.Concat
[1]
 15                  -1  1     37248  ultralytics.nn.modules.block.C2f
[192, 64, 1]
 16                  -1  1     36992  ultralytics.nn.modules.conv.Conv
[64, 64, 3, 2]
 17            [-1, 12]  1         0  ultralytics.nn.modules.conv.Concat
[1]
 18                  -1  1    123648  ultralytics.nn.modules.block.C2f
[192, 128, 1]
```

```
 19                  -1  1    147712  ultralytics.nn.modules.conv.Conv
[128, 128, 3, 2]
 20             [-1, 9]  1         0  ultralytics.nn.modules.conv.Concat
[1]
 21                  -1  1    493056  ultralytics.nn.modules.block.C2f
[384, 256, 1]
 22        [15, 18, 21]  1   1005055  ultralytics.nn.modules.head.Segment
[5, 32, 64, [64, 128, 256]]
YOLOv8n-seg summary: 261 layers, 3264591 parameters, 3264575 gradients, 12.1 GFLOP
s

Transferred 381/417 items from pretrained weights
TensorBoard: Start with 'tensorboard --logdir /content/drive/MyDrive/Project Segme
ntation PGE4/project_seg-result/conidia_lempa', view at http://localhost:6006/
Freezing layer 'model.22.dfl.conv.weight'
AMP: running Automatic Mixed Precision (AMP) checks with YOLOv8n...
AMP: checks passed ✅
train: Scanning /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/tr
ain/labels.cache... 627 images, 13 backgrounds, 0 corrupt: 100%|██████████| 640/64
0 [00:00<?, ?it/s]
```

```
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/GtCTXnZXZTixbBSCRsv4QDyMNHZVROzYtsdCn6cJ_jpg.rf.043f526f187ba6e570e48
7821c15b463.jpg: 1 duplicate labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/GtCTXnZXZTixbBSCRsv4QDyMNHZVROzYtsdCn6cJ_jpg.rf.7aad142f775d39ea38fe5
cd7f06178d9.jpg: 1 duplicate labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/GtCTXnZXZTixbBSCRsv4QDyMNHZVROzYtsdCn6cJ_jpg.rf.a6fc93d9d69343535aad0
a1e4dcdb905.jpg: 1 duplicate labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.1b7875ad4068dcf89fb80bf6374974df.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.2a4022f0e1b828cd93e53c8a084d524c.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.439eae23a6cbb6d24537ee04bcf64ea4.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.65d9af877ed84d9082bfe454be057a25.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.8bc2b3306af0f85f9ee2db030d49c55a.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.9d34ce9b7e21587cfbd10d51e6f81b55.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.d5244b5cbf90462f423f976dd2b2366f.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.d876cf3ff95745471e3d82af704a28a6.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/IMG_1515_JPG_jpg.rf.d961eb38b84683a522cebe198e11f661.jpg: 1 duplicate
labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/Z59fXeJ2CLgniYctJByvaPlkW5zTUwQfOZeVEzHa_jpg.rf.40a1eb854b017b9f6a196
75753df2100.jpg: 1 duplicate labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/Z59fXeJ2CLgniYctJByvaPlkW5zTUwQfOZeVEzHa_jpg.rf.8a6148e2f110409894eea
d2d1d1d71cc.jpg: 1 duplicate labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/Z59fXeJ2CLgniYctJByvaPlkW5zTUwQfOZeVEzHa_jpg.rf.cccad52917605094ee9d4
bef4569046f.jpg: 1 duplicate labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/yCUKWPzPXrAMeShcHJQ4iO2truN5cF0qfnliCjXk_jpg.rf.0582006c30a7a88207498
a9fb3c9496d.jpg: 1 duplicate labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/yCUKWPzPXrAMeShcHJQ4iO2truN5cF0qfnliCjXk_jpg.rf.2ac115274d5655ab73fa2
d9ce6219839.jpg: 1 duplicate labels removed
train: WARNING ⚠️ /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/
train/images/yCUKWPzPXrAMeShcHJQ4iO2truN5cF0qfnliCjXk_jpg.rf.3a86e8c1eb06b1a750349
88c0437da85.jpg: 1 duplicate labels removed
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))
val: Scanning /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/vali
d/labels.cache... 26 images, 0 backgrounds, 0 corrupt: 100%|██████████| 26/26 [00:
00<?, ?it/s]
```

```
Plotting labels to /content/drive/MyDrive/Project Segmentation PGE4/project_seg-result/conidia_lempa/labels.jpg...
optimizer: SGD(lr=0.018, momentum=0.947) with parameter groups 66 weight(decay=0.0), 77 weight(decay=0.0005), 76 bias(decay=0.0)
Image sizes 512 train, 512 val
Using 8 dataloader workers
Logging results to /content/drive/MyDrive/Project Segmentation PGE4/project_seg-result/conidia_lempa
Starting training for 130 epochs...

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances       Size
      1/130       6.1G      2.171      3.886      4.076      1.398       1592
512: 100%|██████████| 20/20 [00:32<00:00,  1.61s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:03<00:00,  3.56s/it]
                   all         26        886    0.00106    0.00187    0.00153    0.00105    0.00106    0.00187    0.00153   0.000995

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances       Size
      2/130       6.5G      2.055      3.131      2.092      1.173       2068
512: 100%|██████████| 20/20 [00:26<00:00,  1.34s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<00:00,  1.50s/it]
                   all         26        886     0.0192     0.0405     0.0382     0.0225     0.0197     0.0414     0.0395     0.0236

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances       Size
      3/130      8.56G      2.071       3.07      1.692      1.133       1541
512: 100%|██████████| 20/20 [00:30<00:00,  1.54s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<00:00,  2.26s/it]
                   all         26        886     0.0194     0.0638     0.0385     0.0189     0.0173     0.0544     0.0352     0.0155

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances       Size
      4/130      5.79G      2.096       2.99      1.642      1.114       1196
512: 100%|██████████| 20/20 [00:39<00:00,  2.00s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<00:00,  2.07s/it]
                   all         26        886     0.0327      0.285     0.0916     0.0376     0.0273      0.224     0.0668     0.0271

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances       Size
      5/130      5.27G      2.098      3.217       1.54      1.136       1490
512: 100%|██████████| 20/20 [00:37<00:00,  1.89s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<00:00,  1.47s/it]
                   all         26        886      0.595     0.0506     0.0696     0.0203      0.517     0.0496     0.0697     0.0197

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances       Size
```

```
      6/130      6.03G      2.173      3.128      1.684      1.134       1856
512: 100%|██████████| 20/20 [00:38<00:00,  1.92s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.04s/it]
                   all         26        886      0.536      0.247      0.236
0.0768      0.101      0.436      0.239     0.0992

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
      7/130      6.42G      2.104      3.055      1.503      1.103       1646
512: 100%|██████████| 20/20 [00:38<00:00,  1.93s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.06s/it]
                   all         26        886      0.514       0.21      0.199
0.0804      0.537      0.211      0.221      0.107

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
      8/130      5.95G      2.045      2.911      1.437      1.096       1872
512: 100%|██████████| 20/20 [00:35<00:00,  1.75s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.14s/it]
                   all         26        886      0.795      0.253      0.272
0.105      0.782      0.239      0.247     0.0966

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
      9/130      5.43G       1.94      2.827      1.374      1.063       1410
512: 100%|██████████| 20/20 [00:36<00:00,  1.81s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.96s/it]
                   all         26        886       0.71      0.353      0.294
0.115      0.661      0.376      0.294      0.126

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     10/130      6.31G      1.966      2.825      1.296      1.047       2020
512: 100%|██████████| 20/20 [00:35<00:00,  1.77s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.75s/it]
                   all         26        886      0.527      0.352       0.33
0.144      0.529      0.343      0.313      0.126

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     11/130      5.18G      1.919      2.775      1.261       1.04       1503
512: 100%|██████████| 20/20 [00:36<00:00,  1.81s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.21s/it]
                   all         26        886      0.574      0.451      0.351
0.146      0.487      0.391      0.286      0.108

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     12/130      6.52G      1.874      2.693      1.277      1.034       1807
512: 100%|██████████| 20/20 [00:39<00:00,  1.97s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.49s/it]
                   all         26        886      0.544      0.338      0.278
0.126      0.538      0.323      0.284      0.134

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     13/130      7.09G      1.821      2.631      1.203      1.024       1556
512: 100%|██████████| 20/20 [00:35<00:00,  1.75s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.92s/it]
                   all         26        886      0.657      0.393      0.349
0.15       0.24       0.444       0.28       0.11

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     14/130      6.21G      1.766      2.587      1.154      1.032       1683
512: 100%|██████████| 20/20 [00:37<00:00,  1.88s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.20s/it]
                   all         26        886      0.595      0.355      0.325
0.155      0.594      0.348      0.324      0.148

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     15/130      6.15G       1.77      2.632      1.124      1.025       1442
512: 100%|██████████| 20/20 [00:34<00:00,  1.72s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.03s/it]
                   all         26        886      0.527      0.341      0.348
0.188      0.484      0.302       0.31      0.138

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     16/130      7.01G      1.758      2.561      1.095       1.01       1840
512: 100%|██████████| 20/20 [00:36<00:00,  1.83s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.11s/it]
                   all         26        886      0.609      0.405      0.424
0.2      0.509      0.322      0.311      0.131

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     17/130      7.19G      1.751      2.567      1.146      1.019       1517
512: 100%|██████████| 20/20 [00:33<00:00,  1.66s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.25s/it]
                   all         26        886      0.612      0.472      0.408
0.21      0.545      0.437      0.345      0.157

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

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     18/130      6.16G        1.7      2.508      1.071      1.003       1583
512: 100%|██████████| 20/20 [00:40<00:00,  2.00s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.89s/it]
                   all         26        886      0.636      0.394      0.394
0.194      0.543      0.406      0.345      0.147

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     19/130      6.21G      1.719      2.527      1.096      1.009       1062
512: 100%|██████████| 20/20 [00:30<00:00,  1.53s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.81s/it]
                   all         26        886      0.615      0.473      0.392
0.188      0.587      0.403      0.345      0.142

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     20/130      7.33G      1.709      2.513      1.058     0.9997       1531
512: 100%|██████████| 20/20 [00:39<00:00,  1.95s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.17s/it]
                   all         26        886      0.595      0.428      0.382
0.174      0.491       0.45      0.307      0.112

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     21/130       6.4G       1.68      2.503      1.073      1.001       1799
512: 100%|██████████| 20/20 [00:30<00:00,  1.53s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.11s/it]
                   all         26        886      0.694      0.394      0.431
0.207      0.569      0.314      0.321      0.124

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     22/130      5.36G      1.688      2.456      1.045      0.997       1759
512: 100%|██████████| 20/20 [00:40<00:00,  2.01s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.01s/it]
                   all         26        886      0.779      0.388      0.441
0.241       0.72      0.345      0.385      0.164

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     23/130      6.42G      1.658      2.432      1.025     0.9916       1598
512: 100%|██████████| 20/20 [00:31<00:00,  1.58s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.95s/it]
                   all         26        886      0.526       0.65      0.468
0.228      0.325      0.471      0.335       0.15

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

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     24/130      7.18G      1.623      2.412      1.009     0.9904       1786
512: 100%|██████████| 20/20 [00:39<00:00,  2.00s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.06s/it]
                   all         26        886      0.712      0.502      0.523
0.287      0.622      0.402      0.409      0.171

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     25/130      4.88G      1.641      2.392      1.011     0.9876       1835
512: 100%|██████████| 20/20 [00:29<00:00,  1.50s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:02<0
0:00,  2.25s/it]
                   all         26        886      0.679      0.498      0.481
0.251      0.649      0.473      0.441      0.204

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     26/130      6.56G      1.611      2.378     0.9923     0.9779       1761
512: 100%|██████████| 20/20 [00:35<00:00,  1.78s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.21s/it]
                   all         26        886      0.584      0.432      0.396
0.204      0.502      0.398      0.303      0.142

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     27/130       5.6G      1.585      2.343     0.9724      0.982       1325
512: 100%|██████████| 20/20 [00:35<00:00,  1.79s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.16s/it]
                   all         26        886      0.659      0.483      0.481
0.261      0.638      0.484      0.455      0.221

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     28/130      6.26G      1.623      2.365     0.9676     0.9687       1444
512: 100%|██████████| 20/20 [00:36<00:00,  1.82s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.45s/it]
                   all         26        886      0.745      0.449      0.466
0.245      0.665      0.375      0.377       0.15

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     29/130      7.14G      1.593       2.32     0.9779     0.9767       1628
512: 100%|██████████| 20/20 [00:33<00:00,  1.69s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.45s/it]
                   all         26        886      0.549      0.529       0.51
0.262      0.437      0.433      0.383      0.154

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     30/130      6.57G      1.575      2.341     0.9657     0.9687       1903
512: 100%|██████████| 20/20 [00:40<00:00,  2.02s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.26s/it]
                   all         26        886      0.812      0.503      0.554
0.292      0.686      0.393      0.422      0.191

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     31/130      7.28G      1.615      2.377     0.9589     0.9695       1473
512: 100%|██████████| 20/20 [00:32<00:00,  1.61s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.84s/it]
                   all         26        886      0.727      0.466      0.485
0.265      0.629      0.391      0.383      0.173

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     32/130      7.94G      1.589      2.343     0.9399     0.9667       1303
512: 100%|██████████| 20/20 [00:41<00:00,  2.07s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.59s/it]
                   all         26        886      0.758      0.463      0.477
0.246      0.629      0.373      0.354       0.15

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     33/130      6.13G      1.585      2.328      0.946     0.9636       2103
512: 100%|██████████| 20/20 [00:34<00:00,  1.73s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.24s/it]
                   all         26        886       0.49      0.648      0.484
0.263      0.404      0.555      0.386      0.183

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     34/130      7.61G      1.574      2.319     0.9374     0.9586       1578
512: 100%|██████████| 20/20 [00:38<00:00,  1.94s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.54s/it]
                   all         26        886      0.607      0.655      0.519
0.285      0.461      0.552      0.403      0.191

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     35/130      4.88G      1.553      2.279     0.9265     0.9664       1538
512: 100%|██████████| 20/20 [00:35<00:00,  1.77s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.22s/it]
                   all         26        886      0.714      0.487      0.501
0.273        0.6      0.369      0.351      0.146

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     36/130      6.27G      1.556      2.283     0.9183     0.9613       1345
512: 100%|██████████| 20/20 [00:32<00:00,  1.63s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.44s/it]
                   all         26        886      0.716      0.531      0.513
0.296      0.607      0.443      0.397      0.176

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     37/130      5.62G      1.605      2.362     0.9534     0.9638       1432
512: 100%|██████████| 20/20 [00:34<00:00,  1.72s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.66s/it]
                   all         26        886      0.657      0.439      0.419
0.209       0.58      0.364      0.346      0.157

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     38/130      6.66G      1.568      2.282     0.9323     0.9662       1183
512: 100%|██████████| 20/20 [00:31<00:00,  1.56s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.56s/it]
                   all         26        886      0.643      0.543      0.468
0.255      0.428      0.461      0.372      0.158

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     39/130      5.66G      1.535      2.268     0.9189     0.9612       1589
512: 100%|██████████| 20/20 [00:41<00:00,  2.06s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.02s/it]
                   all         26        886      0.705      0.482      0.497
0.267      0.583      0.372       0.35      0.151

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     40/130      6.61G      1.481      2.155     0.8748     0.9586       1637
512: 100%|██████████| 20/20 [00:35<00:00,  1.75s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.28s/it]
                   all         26        886      0.498      0.635      0.485
0.278      0.425      0.573      0.401      0.171

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     41/130      6.71G      1.543      2.261     0.8989     0.9564       2228
512: 100%|██████████| 20/20 [00:45<00:00,  2.29s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.13s/it]
                   all         26        886      0.539      0.545       0.48
0.27      0.485      0.502       0.43      0.201

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     42/130      5.98G      1.537      2.257     0.9089      0.957       1462
512: 100%|██████████| 20/20 [00:23<00:00,  1.15s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.40s/it]
                   all         26        886      0.787      0.425      0.493
0.268      0.724      0.373      0.417      0.199

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     43/130      6.11G      1.553      2.195     0.8863     0.9491       1633
512: 100%|██████████| 20/20 [00:41<00:00,  2.05s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.50s/it]
                   all         26        886      0.502      0.541      0.462
0.259      0.437      0.476      0.384      0.189

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     44/130      7.52G      1.475      2.157     0.8663     0.9486       1680
512: 100%|██████████| 20/20 [00:29<00:00,  1.50s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.40s/it]
                   all         26        886      0.642      0.468      0.414
0.228      0.588      0.444      0.381      0.175

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     45/130      4.91G      1.537      2.206     0.8793     0.9563       1649
512: 100%|██████████| 20/20 [00:40<00:00,  2.03s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.49s/it]
                   all         26        886      0.454       0.55      0.489
0.275      0.408      0.513      0.393       0.18

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     46/130      6.55G        1.5      2.211     0.8694     0.9503       1164
512: 100%|██████████| 20/20 [00:31<00:00,  1.59s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.07s/it]
                   all         26        886      0.684      0.536      0.494
0.28      0.499      0.519       0.39      0.189

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     47/130       4.7G      1.533      2.222     0.8659     0.9396       1865
512: 100%|██████████| 20/20 [00:44<00:00,  2.25s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.24s/it]
                   all         26        886      0.632      0.497      0.447
0.245      0.539      0.483       0.38      0.171

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     48/130      6.29G      1.462      2.143     0.8598     0.9538       1357
512: 100%|██████████| 20/20 [00:30<00:00,  1.53s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.47s/it]
                   all         26        886      0.522      0.415      0.419
0.227      0.444      0.342       0.33      0.146

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     49/130      6.74G      1.517      2.218     0.8828     0.9415       1656
512: 100%|██████████| 20/20 [00:38<00:00,  1.95s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.52s/it]
                   all         26        886        0.6      0.478      0.456
0.241       0.54      0.405      0.371      0.154

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     50/130      6.05G      1.475      2.153     0.8336     0.9401       1752
512: 100%|██████████| 20/20 [00:30<00:00,  1.52s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.13s/it]
                   all         26        886      0.501      0.548      0.523
0.302      0.412      0.469      0.434      0.203

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     51/130      6.42G      1.489       2.18     0.8648     0.9378       1994
512: 100%|██████████| 20/20 [00:42<00:00,  2.12s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.02s/it]
                   all         26        886      0.544      0.529      0.472
0.263      0.465      0.457      0.389      0.194

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     52/130      6.56G       1.51      2.215     0.8489     0.9429       1163
512: 100%|██████████| 20/20 [00:36<00:00,  1.84s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.54s/it]
                   all         26        886      0.475       0.57      0.487
0.267      0.437      0.536      0.453      0.218

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     53/130      5.98G      1.445      2.101     0.8233     0.9425       1373
512: 100%|██████████| 20/20 [00:38<00:00,  1.90s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.45s/it]
                   all         26        886      0.551      0.536      0.472
0.246      0.429      0.477      0.392      0.181

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     54/130      6.27G      1.487      2.142     0.8373     0.9416       1492
512: 100%|██████████| 20/20 [00:39<00:00,  1.95s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.25it/s]
                   all         26        886      0.762      0.496      0.526
0.299      0.679      0.417      0.443      0.218

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     55/130      6.98G      1.455       2.14     0.8328     0.9402       1823
512: 100%|██████████| 20/20 [00:33<00:00,  1.65s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.12s/it]
                   all         26        886      0.739      0.499      0.523
0.289      0.661      0.433      0.442      0.209

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     56/130      5.77G      1.428      2.075     0.8142     0.9364       1320
512: 100%|██████████| 20/20 [00:43<00:00,  2.19s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.27it/s]
                   all         26        886      0.664      0.538      0.478
0.258      0.461      0.515      0.402      0.185

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     57/130      5.16G      1.442      2.108     0.8294     0.9407       1403
512: 100%|██████████| 20/20 [00:31<00:00,  1.58s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.03s/it]
                   all         26        886      0.563      0.596      0.564
0.314      0.443      0.476       0.41      0.194

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     58/130      5.71G      1.435      2.089     0.8052     0.9335       1533
512: 100%|██████████| 20/20 [00:42<00:00,  2.12s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.29s/it]
                   all         26        886       0.57      0.583      0.547
0.327      0.514      0.527      0.455      0.215

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     59/130      6.64G       1.45      2.096     0.8244     0.9343       1444
512: 100%|██████████| 20/20 [00:29<00:00,  1.49s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.34s/it]
                   all         26        886      0.483      0.622      0.535
0.303       0.39      0.531      0.416      0.188

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     60/130      5.99G      1.428      2.075     0.8112     0.9238       1335
512: 100%|██████████| 20/20 [00:40<00:00,  2.04s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.05s/it]
                   all         26        886      0.562      0.569      0.499
0.281      0.467      0.493      0.415      0.198

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     61/130      5.67G      1.464      2.139     0.8162     0.9349       1248
512: 100%|██████████| 20/20 [00:33<00:00,  1.66s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.43s/it]
                   all         26        886      0.476      0.674      0.481
0.256      0.401      0.585      0.393      0.175

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     62/130      6.22G      1.442      2.109     0.8018     0.9325       2060
512: 100%|██████████| 20/20 [00:34<00:00,  1.73s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.24s/it]
                   all         26        886      0.532      0.529      0.456
0.257      0.399      0.414      0.341      0.149

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     63/130      5.89G      1.434      2.074     0.8219      0.934       1491
512: 100%|██████████| 20/20 [00:35<00:00,  1.77s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.72s/it]
                   all         26        886      0.521      0.583      0.479
0.26      0.429      0.498      0.388      0.174

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     64/130       6.3G      1.424      2.073     0.8105     0.9342       1355
512: 100%|██████████| 20/20 [00:35<00:00,  1.78s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.35s/it]
                   all         26        886      0.535      0.575      0.518
0.298      0.454      0.511      0.439      0.204

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     65/130      6.94G        1.4      2.036      0.788     0.9282       1675
512: 100%|██████████| 20/20 [00:36<00:00,  1.82s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.04s/it]
                   all         26        886      0.722      0.523      0.531
0.31      0.464      0.517      0.447      0.208

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     66/130      5.78G      1.404      2.037     0.7961     0.9249       1458
512: 100%|██████████| 20/20 [00:41<00:00,  2.05s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.25s/it]
                   all         26        886      0.553       0.52      0.525
0.294      0.442      0.416      0.385      0.179

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     67/130       5.7G      1.436      2.076     0.8067     0.9255       1478
512: 100%|██████████| 20/20 [00:30<00:00,  1.52s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.17s/it]
                   all         26        886      0.543      0.549      0.478
0.258      0.422      0.455      0.368      0.162

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     68/130      7.56G      1.424      2.066     0.7964     0.9284       2127
512: 100%|██████████| 20/20 [00:43<00:00,  2.17s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.15s/it]
                   all         26        886      0.488      0.581       0.48
0.258      0.417      0.506      0.395      0.178

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     69/130      6.06G      1.412       2.03     0.7996     0.9262       1882
512: 100%|██████████| 20/20 [00:33<00:00,  1.66s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.24s/it]
                   all         26        886      0.466      0.587      0.437
0.236      0.396      0.533      0.389      0.168

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     70/130      6.17G      1.408      2.037     0.7783     0.9247       1548
512: 100%|██████████| 20/20 [00:45<00:00,  2.25s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.35s/it]
                   all         26        886      0.527      0.605      0.465
0.255      0.427      0.538      0.379      0.169

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     71/130      6.44G      1.429      2.074     0.7805     0.9209       1444
512: 100%|██████████| 20/20 [00:29<00:00,  1.49s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.23s/it]
                   all         26        886      0.528      0.573      0.477
0.27      0.455        0.5      0.368      0.168

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     72/130      5.43G      1.418      2.024     0.7865      0.919       1734
512: 100%|██████████| 20/20 [00:41<00:00,  2.08s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.46s/it]
                   all         26        886      0.539      0.517      0.489
0.281       0.44      0.431      0.398      0.189

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     73/130      6.35G      1.385      2.024     0.7785     0.9229       1383
512: 100%|██████████| 20/20 [00:30<00:00,  1.55s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.15s/it]
                   all         26        886      0.503      0.574      0.471
0.272      0.436      0.504      0.387      0.176

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     74/130      6.32G      1.386      2.016     0.7562     0.9126       1496
512: 100%|██████████| 20/20 [00:40<00:00,  2.03s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.12s/it]
                   all         26        886      0.533      0.562      0.472
0.267      0.431      0.498      0.394      0.172

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     75/130      7.66G       1.39      1.985     0.7615     0.9129       2325
512: 100%|██████████| 20/20 [00:31<00:00,  1.59s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.53s/it]
                   all         26        886       0.56      0.502      0.495
0.281      0.441      0.403      0.378      0.173

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     76/130      8.58G       1.38      1.995     0.7661     0.9192       1565
512: 100%|██████████| 20/20 [00:33<00:00,  1.65s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.73s/it]
                   all         26        886      0.602      0.558      0.492
0.283      0.552      0.511      0.441      0.205

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     77/130      6.65G      1.375      1.969     0.7613     0.9131       1030
512: 100%|██████████| 20/20 [00:43<00:00,  2.15s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.06s/it]
                   all         26        886      0.505      0.606      0.483
0.269      0.421      0.527      0.374      0.182

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     78/130      6.57G       1.38      1.991     0.7532     0.9168       1407
512: 100%|██████████| 20/20 [00:30<00:00,  1.54s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.03it/s]
                   all         26        886      0.563      0.508      0.493
0.266      0.474      0.425      0.394      0.178

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     79/130      6.43G      1.354      1.969     0.7561     0.9157        940
512: 100%|██████████| 20/20 [00:40<00:00,  2.03s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.19s/it]
                   all         26        886      0.559      0.574       0.45
0.245      0.489      0.517      0.392      0.177

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     80/130      6.67G      1.375      2.001     0.7625     0.9171       2204
512: 100%|██████████| 20/20 [00:33<00:00,  1.68s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.54s/it]
                   all         26        886       0.51      0.537      0.441
0.24      0.472      0.505      0.401      0.175

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     81/130      5.66G      1.368      1.972     0.7492     0.9061       2167
512: 100%|██████████| 20/20 [00:35<00:00,  1.80s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.35s/it]
                   all         26        886      0.537      0.569      0.482
0.272      0.471      0.508      0.417      0.188

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     82/130      4.76G      1.346      1.917     0.7425     0.9144       1402
512: 100%|██████████| 20/20 [00:38<00:00,  1.93s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.31s/it]
                   all         26        886      0.491      0.501      0.436
0.245      0.421      0.438      0.369      0.171

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     83/130      4.49G       1.34      1.926     0.7362     0.9098       1535
512: 100%|██████████| 20/20 [00:32<00:00,  1.62s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.36s/it]
                   all         26        886      0.478      0.546      0.445
0.249      0.383      0.455      0.345      0.157

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     84/130      7.61G      1.362      1.981     0.7419     0.9173       1166
512: 100%|██████████| 20/20 [00:40<00:00,  2.01s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.09it/s]
                   all         26        886       0.49      0.552      0.463
0.263      0.423      0.487      0.383      0.183

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     85/130      6.52G      1.333      1.925     0.7323     0.9117       1687
512: 100%|██████████| 20/20 [00:32<00:00,  1.62s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.33s/it]
                   all         26        886      0.509      0.525      0.458
0.249      0.444       0.49       0.38      0.176

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     86/130       4.7G      1.367      1.976     0.7496     0.9146       1002
512: 100%|██████████| 20/20 [00:41<00:00,  2.05s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.31s/it]
                   all         26        886      0.524      0.563      0.462
0.266      0.452      0.494      0.385      0.183

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     87/130      6.82G      1.375      1.958      0.738     0.9096       1425
512: 100%|██████████| 20/20 [00:34<00:00,  1.74s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.17s/it]
                   all         26        886      0.452      0.559      0.448
0.253      0.384      0.489      0.358      0.165

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     88/130      5.53G      1.351      1.925     0.7386     0.9059       1566
512: 100%|██████████| 20/20 [00:40<00:00,  2.01s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.03s/it]
                   all         26        886      0.669      0.513      0.454
0.252      0.337      0.521      0.332      0.151

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     89/130      6.14G      1.351      1.921     0.7327     0.9103       1643
512: 100%|██████████| 20/20 [00:32<00:00,  1.63s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.08s/it]
                   all         26        886      0.706      0.502      0.448
0.255      0.407      0.501      0.377      0.177

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     90/130      5.46G      1.338      1.902     0.7398     0.9159       1021
512: 100%|██████████| 20/20 [00:37<00:00,  1.90s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.13s/it]
                   all         26        886      0.493      0.556       0.46
0.264      0.426      0.489      0.376       0.17

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     91/130      6.54G      1.329      1.905     0.7154       0.91       1239
512: 100%|██████████| 20/20 [00:31<00:00,  1.56s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.12s/it]
                   all         26        886      0.476      0.547      0.449
0.253      0.407      0.482      0.374       0.17

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     92/130      5.87G      1.354      1.919     0.7286     0.9039       1773
512: 100%|██████████| 20/20 [00:45<00:00,  2.26s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.10s/it]
                   all         26        886      0.556      0.579      0.475
0.273      0.471       0.48       0.36      0.169

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     93/130      6.62G      1.327      1.908     0.7204     0.9073       1106
512: 100%|██████████| 20/20 [00:32<00:00,  1.61s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.37s/it]
                   all         26        886      0.544      0.561      0.493
0.286      0.469      0.496      0.416      0.197

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     94/130       6.8G      1.301      1.874     0.6996     0.9057       2025
512: 100%|██████████| 20/20 [00:38<00:00,  1.92s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.20s/it]
                   all         26        886      0.602      0.536      0.523
0.313      0.516      0.458      0.433      0.209

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     95/130      7.06G      1.299      1.884     0.7049     0.9063       1865
512: 100%|██████████| 20/20 [00:32<00:00,  1.64s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.04it/s]
                   all         26        886      0.514      0.588      0.502
0.292      0.448      0.526      0.445      0.214

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
     96/130      6.35G      1.307      1.876     0.7059     0.9022       1852
512: 100%|██████████| 20/20 [00:44<00:00,  2.24s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.36it/s]
                   all         26        886      0.532       0.62       0.53
0.314       0.44      0.533      0.426      0.204

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     97/130      7.11G      1.289       1.86     0.6937     0.9021       1879
512: 100%|██████████| 20/20 [00:32<00:00,  1.64s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.47s/it]
                   all         26        886      0.579       0.556       0.51
0.301      0.497      0.482      0.423      0.194

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     98/130       6.9G      1.335      1.896      0.714     0.8961       1588
512: 100%|██████████| 20/20 [00:38<00:00,  1.94s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.02it/s]
                   all         26        886      0.462      0.578       0.49
0.291      0.385      0.528      0.407      0.201

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
     99/130      7.95G      1.278       1.83     0.6924     0.8986       1802
512: 100%|██████████| 20/20 [00:33<00:00,  1.70s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.07s/it]
                   all         26        886      0.461      0.607      0.483
0.289      0.366      0.515      0.376      0.177

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
    100/130      6.56G      1.286      1.873     0.6992     0.9008       2066
512: 100%|██████████| 20/20 [00:44<00:00,  2.21s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.21it/s]
                   all         26        886      0.477      0.571      0.492
0.289      0.387        0.5      0.401      0.182

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
    101/130      6.36G      1.269      1.835     0.6801     0.8955       1212
512: 100%|██████████| 20/20 [00:31<00:00,  1.57s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.10s/it]
                   all         26        886      0.539      0.539      0.473
0.273      0.468      0.471        0.4      0.182

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

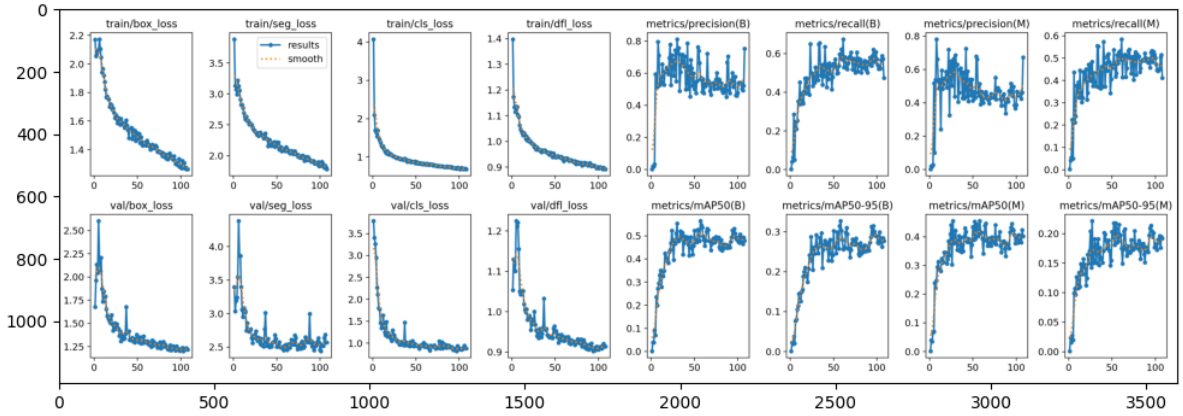
```
    102/130      6.05G      1.321      1.901     0.7095     0.9008       1617
512: 100%|██████████| 20/20 [00:34<00:00,  1.74s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:00<0
0:00,  1.02it/s]
                   all         26        886      0.542       0.52      0.469
0.271      0.446      0.445      0.379      0.172

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
    103/130      5.91G      1.303      1.883     0.7121     0.8976       2015
512: 100%|██████████| 20/20 [00:30<00:00,  1.54s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.35s/it]
                   all         26        886      0.534      0.526      0.506
0.299      0.445      0.442      0.406       0.19

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
    104/130      6.56G      1.306      1.857      0.692      0.897       1210
512: 100%|██████████| 20/20 [00:42<00:00,  2.13s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.23s/it]
                   all         26        886      0.536      0.522      0.481
0.279      0.454      0.448      0.392      0.185

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
    105/130      5.86G      1.266      1.805     0.6795     0.8917       1731
512: 100%|██████████| 20/20 [00:31<00:00,  1.59s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.02s/it]
                   all         26        886      0.503      0.568      0.492
0.284      0.449      0.453      0.402      0.196

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
    106/130      6.73G      1.273      1.834     0.6846     0.8977        849
512: 100%|██████████| 20/20 [00:41<00:00,  2.08s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.03s/it]
                   all         26        886      0.492      0.589      0.465
0.263      0.425      0.503       0.38      0.176

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
    107/130      6.02G      1.263      1.805     0.6897     0.8944       1427
512: 100%|██████████| 20/20 [00:33<00:00,  1.66s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.15s/it]
                   all         26        886      0.522      0.573      0.492
0.284       0.46      0.515      0.424      0.195

      Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss  Instances
Size
```

```
    108/130      6.65G      1.262       1.78     0.6756     0.8922       1930
512: 100%|██████████| 20/20 [00:41<00:00,  2.05s/it]
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.01s/it]
                   all         26        886      0.754      0.475       0.48
0.277      0.672      0.411      0.402      0.192

Stopping training early as no improvement observed in last 50 epochs. Best results
observed at epoch 58, best model saved as best.pt.
To update EarlyStopping(patience=50) pass a new patience value, i.e. `patience=300
` or use `patience=0` to disable EarlyStopping.

108 epochs completed in 1.210 hours.
Optimizer stripped from /content/drive/MyDrive/Project Segmentation PGE4/project_s
eg-result/conidia_lempa/weights/last.pt, 6.8MB
Optimizer stripped from /content/drive/MyDrive/Project Segmentation PGE4/project_s
eg-result/conidia_lempa/weights/best.pt, 6.8MB

Validating /content/drive/MyDrive/Project Segmentation PGE4/project_seg-result/con
idia_lempa/weights/best.pt...
Ultralytics YOLOv8.0.222 🚀 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla V100-SX
M2-16GB, 16151MiB)
YOLOv8n-seg summary (fused): 195 layers, 3259039 parameters, 0 gradients, 12.0 GFL
OPs
                 Class     Images  Instances      Box(P          R      mAP50  mAP
50-95)     Mask(P          R      mAP50  mAP50-95): 100%|██████████| 1/1 [00:01<0
0:00,  1.62s/it]
                   all         26        886       0.57      0.583      0.546
0.326      0.512      0.525      0.454      0.215
              Bacteria         26          8      0.161       0.75      0.531
0.407      0.156       0.75      0.517      0.281
                 Fungi         26        642      0.666      0.618      0.611
0.384      0.588      0.551      0.542      0.267
                   LAB         26        101      0.579      0.594      0.494
0.191      0.436      0.455       0.34      0.132
                   YCG         26        126      0.946       0.84      0.923
0.52       0.76      0.679      0.697      0.275
                 Yeast         26          9      0.495       0.11      0.171
0.13      0.618      0.189      0.174      0.119
Speed: 0.1ms preprocess, 2.9ms inference, 0.0ms loss, 1.1ms postprocess per image
Results saved to /content/drive/MyDrive/Project Segmentation PGE4/project_seg-resu
lt/conidia_lempa
```

Evaluation

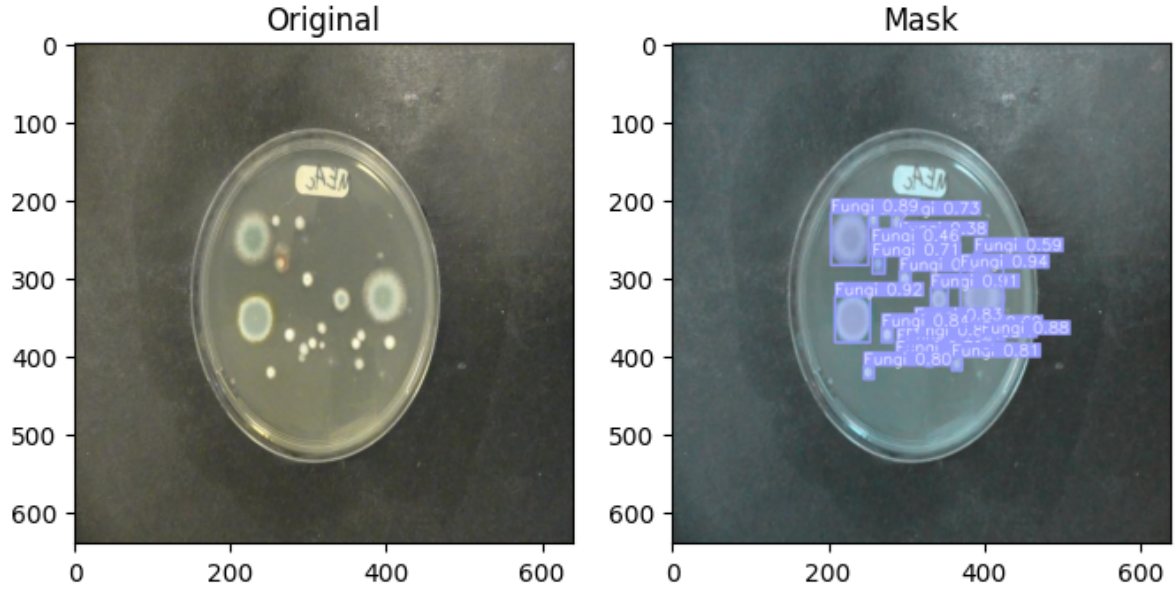
In [ ]:
```
train_model = YOLO('/content/project_seg/conidia_lempa/weights/last.pt')
```

In [ ]:
```
img = '/content/project_seg/conidia_lempa/results.png'
img_plot = Image.open(img)

plt.figure(figsize=(12,12))
plt.imshow(img_plot)
plt.show()
```



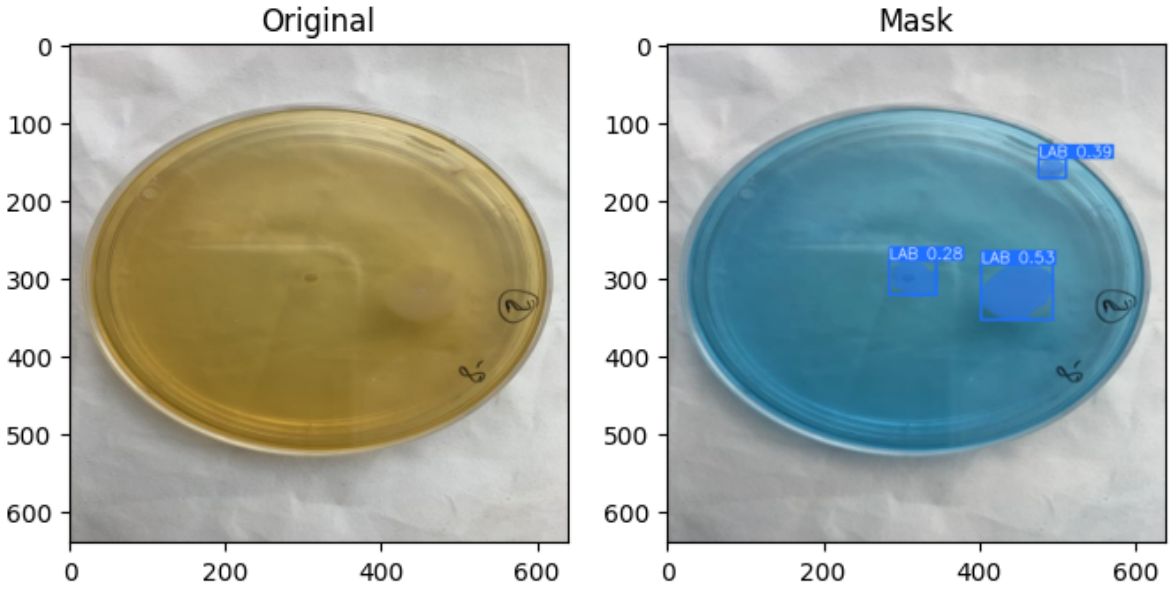
In [ ]:
```
test_img = '/content/drive/MyDrive/Project Segmentation PGE4/datasets/final/valid/i
plot_result(train_model, test_img)
```

```
image 1/1 /content/drive/MyDrive/Project Segmentation PGE4/datasets/final/valid/im
ages/9_JPG.rf.7a1a2f69c0eba527a693dd8972b09713.jpg: 512x512 23 Fungis, 9.2ms
Speed: 2.0ms preprocess, 9.2ms inference, 5.2ms postprocess per image at shape (1,
3, 512, 512)
```



In [ ]:
```
test_img2 = '/content/drive/MyDrive/Project Segmentation PGE4/datasets/datas_yolo/t
plot_result(train_model, test_img2)
```

```
image 1/1 /content/drive/MyDrive/Project Segmentation PGE4/datasets/datas_yolo/tes
t/images/IMG_1735_JPG_jpg.rf.8a81b7d877d85952b32461611967dbe7.jpg: 512x512 3 LABs,
10.8ms
Speed: 2.1ms preprocess, 10.8ms inference, 4.5ms postprocess per image at shape
(1, 3, 512, 512)
```



Deployment

In [ ]: