

1. Clone yolov5 repository from ultralytics

```
In [ ]: !git clone https://github.com/ultralytics/yolov5  
%cd yolov5  
  
Cloning into 'yolov5'...  
remote: Enumerating objects: 16008, done.  
remote: Total 16008 (delta 0), reused 0 (delta 0), pack-reused 16008  
Receiving objects: 100% (16008/16008), 14.51 MiB | 25.23 MiB/s, done.  
Resolving deltas: 100% (11012/11012), done.  
/content/yolov5
```

2. Install all requirements

3. Dataset uploading

Unzip the dataset folder to obtain the dataset.

The dataset consists of training and validation set of images and labels under 'train' and 'val' folders.

The dataset is created using <https://www.makesense.ai/>

```
In [ ]: !unzip /content/hen_dataset.zip -d /content
```

```
Archive: /content/hen_dataset.zip
creating: /content/train_data_hen/
creating: /content/train_data_hen/images/
creating: /content/train_data_hen/images/train/
inflating: /content/train_data_hen/images/train/1.jpg
inflating: /content/train_data_hen/images/train/10.jpg
inflating: /content/train_data_hen/images/train/11.jpg
inflating: /content/train_data_hen/images/train/12.jpg
inflating: /content/train_data_hen/images/train/13.jpg
inflating: /content/train_data_hen/images/train/14.jpg
inflating: /content/train_data_hen/images/train/15.jpg
inflating: /content/train_data_hen/images/train/16.jpg
inflating: /content/train_data_hen/images/train/17.jpg
inflating: /content/train_data_hen/images/train/18.jpg
inflating: /content/train_data_hen/images/train/19.jpg
inflating: /content/train_data_hen/images/train/2.jpeg
inflating: /content/train_data_hen/images/train/20.jpg
inflating: /content/train_data_hen/images/train/21.jpg
inflating: /content/train_data_hen/images/train/22.jpg
inflating: /content/train_data_hen/images/train/23.jpg
inflating: /content/train_data_hen/images/train/24.jpg
inflating: /content/train_data_hen/images/train/25.jpg
inflating: /content/train_data_hen/images/train/26.jpg
inflating: /content/train_data_hen/images/train/27.jpg
inflating: /content/train_data_hen/images/train/28.jpg
inflating: /content/train_data_hen/images/train/29.jpg
inflating: /content/train_data_hen/images/train/3.jpg
inflating: /content/train_data_hen/images/train/30.jpg
inflating: /content/train_data_hen/images/train/35.jpg
inflating: /content/train_data_hen/images/train/4.jpg
inflating: /content/train_data_hen/images/train/5.jpg
inflating: /content/train_data_hen/images/train/6.jpg
inflating: /content/train_data_hen/images/train/7.jpg
inflating: /content/train_data_hen/images/train/8.jpg
inflating: /content/train_data_hen/images/train/9.jpg
creating: /content/train_data_hen/images/val/
inflating: /content/train_data_hen/images/val/31.jpg
inflating: /content/train_data_hen/images/val/32.jpg
inflating: /content/train_data_hen/images/val/33.jpg
inflating: /content/train_data_hen/images/val/34.jpg
inflating: /content/train_data_hen/images/val/36.jpg
inflating: /content/train_data_hen/images/val/37.jpg
inflating: /content/train_data_hen/images/val/38.jpg
inflating: /content/train_data_hen/images/val/39.jpg
inflating: /content/train_data_hen/images/val/40.jpg
creating: /content/train_data_hen/labels/
creating: /content/train_data_hen/labels/train/
inflating: /content/train_data_hen/labels/train/1.txt
inflating: /content/train_data_hen/labels/train/10.txt
inflating: /content/train_data_hen/labels/train/11.txt
inflating: /content/train_data_hen/labels/train/12.txt
inflating: /content/train_data_hen/labels/train/13.txt
inflating: /content/train_data_hen/labels/train/14.txt
inflating: /content/train_data_hen/labels/train/15.txt
inflating: /content/train_data_hen/labels/train/16.txt
inflating: /content/train_data_hen/labels/train/17.txt
inflating: /content/train_data_hen/labels/train/18.txt
inflating: /content/train_data_hen/labels/train/19.txt
inflating: /content/train_data_hen/labels/train/2.txt
inflating: /content/train_data_hen/labels/train/20.txt
```

```

inflating: /content/train_data_hen/labels/train/21.txt
inflating: /content/train_data_hen/labels/train/22.txt
inflating: /content/train_data_hen/labels/train/23.txt
inflating: /content/train_data_hen/labels/train/24.txt
inflating: /content/train_data_hen/labels/train/25.txt
inflating: /content/train_data_hen/labels/train/26.txt
inflating: /content/train_data_hen/labels/train/27.txt
inflating: /content/train_data_hen/labels/train/28.txt
inflating: /content/train_data_hen/labels/train/29.txt
inflating: /content/train_data_hen/labels/train/3.txt
inflating: /content/train_data_hen/labels/train/30.txt
inflating: /content/train_data_hen/labels/train/35.txt
inflating: /content/train_data_hen/labels/train/4.txt
inflating: /content/train_data_hen/labels/train/5.txt
inflating: /content/train_data_hen/labels/train/6.txt
inflating: /content/train_data_hen/labels/train/7.txt
inflating: /content/train_data_hen/labels/train/8.txt
inflating: /content/train_data_hen/labels/train/9.txt
    creating: /content/train_data_hen/labels/val/
inflating: /content/train_data_hen/labels/val/31.txt
inflating: /content/train_data_hen/labels/val/32.txt
inflating: /content/train_data_hen/labels/val/33.txt
inflating: /content/train_data_hen/labels/val/34.txt
inflating: /content/train_data_hen/labels/val/36.txt
inflating: /content/train_data_hen/labels/val/37.txt
inflating: /content/train_data_hen/labels/val/38.txt
inflating: /content/train_data_hen/labels/val/39.txt
inflating: /content/train_data_hen/labels/val/40.txt

```

4. Set data-configurations file

The data-configurations file describes the dataset parameters.

Edit this file and provide: the paths to the train, validation and test (optional) datasets and the names of the classes in the same order as their index.

Here there is only one class, named 'hen' and class:0.

The custom data configurations file is saved as 'hen_custom.yaml' under the 'data' directory.

The content of this YAML file is displayed using 'cat' command as follows:

In []: `| cat data/hen_custom.yaml`

```

# dataset root dir
path: /content/hen_dataset

# train images (relative to 'path')
train: images/train

# val images (relative to 'path')
val: images/val

test: # test images (optional)

# Classes
names:
  0: Hen

```

5.Training - Transfer Learning

For training, custom dataset is created with 31 images for training and 9 images for validation which are stored in 'images' folder.

Corresponding labels are saved in 'train' and 'val' folder in 'labels' folder.

The labels are text files. Each text file contains one bounding-box (BBox) annotation for each of the objects in the image. The format is as:

object-class-ID X-center Y-center Box-width Box-height

As the dataset is too small, YOLOv5s6 pretrained model is used.

For the model, we use the same backbone as the pretrained COCO model, and only train the model's head.

YOLOv5s6 backbone consists of 12 layers, which will be freezed by the 'freeze' argument. Training is done using 'train.py' script.

- batch — batch size (-1 for auto batch size). Use the largest batch size that your hardware allows for.
- epochs — number of epochs.
- data — path to the data-configurations file.
- cfg — path to the model-configurations file
- weights — path to initial weights.
- cache — cache images for faster training.
- img — image size in pixels (default — 640).
- freeze — number of layers to freeze
- project — name of the project
- name — name of run

```
In [ ]: !python train.py --batch 4 --epochs 100 --data data/hen_custom.yaml --weights yolov5s6
```

```
train: weights=yolov5s6.pt, cfg=, data=data/hen_custom.yaml, hyp=data/hyps/hyp.scratch-low.yaml, epochs=100, batch_size=4, 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/train, name=exp, exist_ok=False, quad=False, cos_lr=False, label_smoothing=0.0, patience=100, freeze=[12], 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 🚀 v7.0-187-g0004c74 Python-3.10.12 torch-2.0.1+cu118 CPU
```

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/train', 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, 15.7MB/s]

Downloading https://github.com/ultralytics/yolov5/releases/download/v7.0/yolov5s6.pt to yolov5s6.pt...

100% 24.8M/24.8M [00:00<00:00, 77.2MB/s]

Overriding model.yaml nc=80 with nc=1

	from	n	params	module	arguments
0	-1	1	3520	models.common.Conv	[3, 32,
6, 2, 2]					
1	-1	1	18560	models.common.Conv	[32, 64,
3, 2]					
2	-1	1	18816	models.common.C3	[64, 64,
1]					
3	-1	1	73984	models.common.Conv	[64, 128,
3, 2]					
4	-1	2	115712	models.common.C3	[128, 12
8, 2]					
5	-1	1	295424	models.common.Conv	[128, 25
6, 3, 2]					
6	-1	3	625152	models.common.C3	[256, 25
6, 3]					
7	-1	1	885504	models.common.Conv	[256, 38
4, 3, 2]					
8	-1	1	665856	models.common.C3	[384, 38
4, 1]					
9	-1	1	1770496	models.common.Conv	[384, 51
2, 3, 2]					
10	-1	1	1182720	models.common.C3	[512, 51
2, 1]					
11	-1	1	656896	models.common.SPPF	[512, 51
2, 5]					
12	-1	1	197376	models.common.Conv	[512, 38
4, 1, 1]					
13	-1	1	0	torch.nn.modules.upsampling.Upsample	[None, 2,
'nearest']					
14	[-1, 8]	1	0	models.common.Concat	[1]
15	-1	1	813312	models.common.C3	[768, 38

```

4, 1, False]
 16           -1  1    98816  models.common.Conv          [384, 25
6, 1, 1]
 17           -1  1      0  torch.nn.modules.upsampling.Upsample  [None, 2,
'nearest']
 18           [-1, 6] 1      0  models.common.Concat        [1]
 19           -1  1   361984  models.common.C3          [512, 25
6, 1, False]
 20           -1  1   33024  models.common.Conv          [256, 12
8, 1, 1]
 21           -1  1      0  torch.nn.modules.upsampling.Upsample  [None, 2,
'nearest']
 22           [-1, 4] 1      0  models.common.Concat        [1]
 23           -1  1   90880  models.common.C3          [256, 12
8, 1, False]
 24           -1  1  147712  models.common.Conv          [128, 12
8, 3, 2]
 25           [-1, 20] 1      0  models.common.Concat        [1]
 26           -1  1   296448  models.common.C3          [256, 25
6, 1, False]
 27           -1  1   590336  models.common.Conv          [256, 25
6, 3, 2]
 28           [-1, 16] 1      0  models.common.Concat        [1]
 29           -1  1   715008  models.common.C3          [512, 38
4, 1, False]
 30           -1  1  1327872  models.common.Conv          [384, 38
4, 3, 2]
 31           [-1, 12] 1      0  models.common.Concat        [1]
 32           -1  1   1313792  models.common.C3          [768, 51
2, 1, False]
 33 [23, 26, 29, 32] 1   23112  models.yolo.Detect      [1, [[19,
27, 44, 40, 38, 94], [96, 68, 86, 152, 180, 137], [140, 301, 303, 264, 238, 542], [43
6, 615, 739, 380, 925, 792]], [128, 256, 384, 512]]
Model summary: 281 layers, 12322312 parameters, 12322312 gradients, 16.3 GFLOPs

```

Transferred 451/459 items from yolov5s6.pt

```

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.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.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.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.9.conv.weight
freezing model.9.bn.weight
freezing model.9.bn.bias
freezing model.10.cv1.conv.weight
freezing model.10.cv1.bn.weight
freezing model.10.cv1.bn.bias
freezing model.10.cv2.conv.weight
freezing model.10.cv2.bn.weight
freezing model.10.cv2.bn.bias
freezing model.10.cv3.conv.weight
freezing model.10.cv3.bn.weight
freezing model.10.cv3.bn.bias
freezing model.10.m.0.cv1.conv.weight
freezing model.10.m.0.cv1.bn.weight
freezing model.10.m.0.cv1.bn.bias
freezing model.10.m.0.cv2.conv.weight
freezing model.10.m.0.cv2.bn.weight
freezing model.10.m.0.cv2.bn.bias
freezing model.11.cv1.conv.weight
freezing model.11.cv1.bn.weight
freezing model.11.cv1.bn.bias
freezing model.11.cv2.conv.weight
freezing model.11.cv2.bn.weight
freezing model.11.cv2.bn.bias
optimizer: SGD(lr=0.01) with parameter groups 75 weight(decay=0.0), 79 weight(decay=0.0005), 79 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/hen_dataset/labels/train... 31 images, 0 backgrounds, 0 corrupt: 100% 31/31 [00:00<00:00, 813.01it/s]
train: New cache created: /content/hen_dataset/labels/train.cache
train: Caching images (0.0GB ram): 100% 31/31 [00:00<00:00, 186.80it/s]
val: Scanning /content/hen_dataset/labels/val... 9 images, 0 backgrounds, 0 corrupt: 100% 9/9 [00:00<00:00, 158.65it/s]
val: New cache created: /content/hen_dataset/labels/val.cache
val: Caching images (0.0GB ram): 100% 9/9 [00:00<00:00, 131.81it/s]

```

AutoAnchor: 7.33 anchors/target, 1.000 Best Possible Recall (BPR). Current anchors are a good fit to dataset

Plotting labels to runs/train/exp/labels.jpg...

Image sizes 640 train, 640 val

Using 2 dataloader workers

Logging results to runs/train/exp

Starting training for 100 epochs...

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
0/99	0G	0.1133	0.03369		0	12
8/8 [00:29<00:00, 3.73s/it]						640: 100%
	Class	Images	Instances	P	R	mAP50
-95:	0% 0/2 [00:00<?, ?it/s]	WARNING NMS time limit 0.900s exceeded				mAP50
	Class	Images	Instances	P	R	mAP50

-95: 100% 2/2 [00:04<00:00, 2.13s/it]	all	9	20	0.235	0.124	0.0698	0.0
158							
Epoch 1/99 GPU_mem 0G box_loss 0.1136 obj_loss 0.034 cls_loss 0 Instances 8 Size 640: 100%							
8/8 [00:24<00:00, 3.01s/it]							
Class Images Instances P R mAP50 mAP50							
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded							
Class Images Instances P R mAP50 mAP50							
-95: 100% 2/2 [00:05<00:00, 2.59s/it]							
all 9 20 0.127 0.1 0.0412 0.0							
135							
Epoch 2/99 GPU_mem 0G box_loss 0.1067 obj_loss 0.03535 cls_loss 0 Instances 9 Size 640: 100%							
8/8 [00:23<00:00, 3.00s/it]							
Class Images Instances P R mAP50 mAP50							
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded							
Class Images Instances P R mAP50 mAP50							
-95: 100% 2/2 [00:04<00:00, 2.08s/it]							
all 9 20 0.322 0.1 0.0541 0.0							
122							
Epoch 3/99 GPU_mem 0G box_loss 0.09966 obj_loss 0.03628 cls_loss 0 Instances 8 Size 640: 100%							
8/8 [00:24<00:00, 3.02s/it]							
Class Images Instances P R mAP50 mAP50							
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded							
Class Images Instances P R mAP50 mAP50							
-95: 100% 2/2 [00:04<00:00, 2.04s/it]							
all 9 20 0.495 0.0986 0.0577 0.0							
148							
Epoch 4/99 GPU_mem 0G box_loss 0.09447 obj_loss 0.04116 cls_loss 0 Instances 18 Size 640: 100%							
8/8 [00:27<00:00, 3.38s/it]							
Class Images Instances P R mAP50 mAP50							
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded							
Class Images Instances P R mAP50 mAP50							
-95: 100% 2/2 [00:05<00:00, 2.61s/it]							
all 9 20 0.296 0.05 0.0466 0.0							
0.01							
Epoch 5/99 GPU_mem 0G box_loss 0.09283 obj_loss 0.03496 cls_loss 0 Instances 13 Size 640: 100%							
8/8 [00:24<00:00, 3.04s/it]							
Class Images Instances P R mAP50 mAP50							
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded							
Class Images Instances P R mAP50 mAP50							
-95: 100% 2/2 [00:04<00:00, 2.17s/it]							
all 9 20 0.131 0.05 0.0291 0.00							
737							
Epoch 6/99 GPU_mem 0G box_loss 0.08853 obj_loss 0.04183 cls_loss 0 Instances 13 Size 640: 100%							
8/8 [00:23<00:00, 2.98s/it]							
Class Images Instances P R mAP50 mAP50							
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded							
Class Images Instances P R mAP50 mAP50							

-95: 100% 2/2 [00:04<00:00, 2.36s/it]
 all 9 20 0.0916 0.05 0.0382 0.0
 106

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
7/99	0G	0.08293	0.03753	0	13	640: 100%
8/8 [00:23<00:00, 2.93s/it]						
Class Images Instances P R mAP50 mAP50						
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded						
Class Images Instances P R mAP50 mAP50						
-95: 100% 2/2 [00:04<00:00, 2.48s/it]						
all	9	20	0.0914	0.2	0.0489	0.0

172

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
8/99	0G	0.08257	0.03735	0	11	640: 100%
8/8 [00:24<00:00, 3.04s/it]						
Class Images Instances P R mAP50 mAP50						
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded						
Class Images Instances P R mAP50 mAP50						
-95: 100% 2/2 [00:04<00:00, 2.06s/it]						
all	9	20	0.158	0.2	0.128	0.0

384

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
9/99	0G	0.07537	0.03869	0	6	640: 100%
8/8 [00:24<00:00, 3.02s/it]						
Class Images Instances P R mAP50 mAP50						
-95: 0% 0/2 [00:00<?, ?it/s]WARNING ⚠ NMS time limit 0.900s exceeded						
Class Images Instances P R mAP50 mAP50						
-95: 100% 2/2 [00:04<00:00, 2.23s/it]						
all	9	20	0.158	0.2	0.128	0.0

384

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
10/99	0G	0.07734	0.03569	0	9	640: 100%
8/8 [00:23<00:00, 2.93s/it]						
Class Images Instances P R mAP50 mAP50						
-95: 100% 2/2 [00:04<00:00, 2.29s/it]						
all	9	20	0.187	0.35	0.144	0.0

348

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
11/99	0G	0.07477	0.03684	0	12	640: 100%
8/8 [00:23<00:00, 2.99s/it]						
Class Images Instances P R mAP50 mAP50						
-95: 100% 2/2 [00:03<00:00, 1.88s/it]						
all	9	20	0.187	0.35	0.144	0.0

348

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
12/99	0G	0.07064	0.03774	0	10	640: 100%
8/8 [00:24<00:00, 3.01s/it]						
Class Images Instances P R mAP50 mAP50						
-95: 100% 2/2 [00:03<00:00, 1.73s/it]						
all	9	20	0.195	0.424	0.201	0.

059

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
13/99	0G	0.06756	0.03793	0	8	640: 100%

8/8 [00:23<00:00, 3.00s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:04<00:00, 2.32s/it]	all	9	20	0.195	0.424	0.201	0.
059	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
14/99	0G	0.06732	0.03522	0	0	7	640: 100%
8/8 [00:23<00:00, 3.00s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:03<00:00, 1.73s/it]	all	9	20	0.285	0.479	0.245	0.
065	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
15/99	0G	0.06779	0.03301	0	0	15	640: 100%
8/8 [00:23<00:00, 2.99s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:03<00:00, 1.73s/it]	all	9	20	0.285	0.479	0.245	0.
065	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
16/99	0G	0.06406	0.0407	0	0	21	640: 100%
8/8 [00:24<00:00, 3.01s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:03<00:00, 1.79s/it]	all	9	20	0.573	0.336	0.486	0.
199	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
17/99	0G	0.06353	0.03708	0	0	13	640: 100%
8/8 [00:23<00:00, 2.92s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:04<00:00, 2.07s/it]	all	9	20	0.573	0.336	0.486	0.
199	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
18/99	0G	0.06127	0.04181	0	0	16	640: 100%
8/8 [00:24<00:00, 3.00s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:03<00:00, 1.60s/it]	all	9	20	0.537	0.3	0.457	0.
187	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
19/99	0G	0.06085	0.03308	0	0	15	640: 100%
8/8 [00:24<00:00, 3.00s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:03<00:00, 1.65s/it]	all	9	20	0.537	0.3	0.457	0.
187	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
20/99	0G	0.06097	0.03428	0	0	13	640: 100%
8/8 [00:24<00:00, 3.00s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:03<00:00, 1.70s/it]	all	9	20	0.679	0.5	0.597	0.

186

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
21/99	0G	0.06062	0.03273	0	6	640: 100%
8/8 [00:23<00:00, 2.98s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.99s/it]						
	all	9	20	0.679	0.5	0.597 0.

186

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
22/99	0G	0.06111	0.02777	0	9	640: 100%
8/8 [00:24<00:00, 3.03s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.59s/it]						
	all	9	20	0.619	0.45	0.554 0.

301

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
23/99	0G	0.05966	0.03213	0	8	640: 100%
8/8 [00:23<00:00, 2.99s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.61s/it]						
	all	9	20	0.619	0.45	0.554 0.

301

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
24/99	0G	0.06077	0.03399	0	22	640: 100%
8/8 [00:24<00:00, 3.02s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.75s/it]						
	all	9	20	0.527	0.35	0.513 0.

215

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
25/99	0G	0.05533	0.02729	0	7	640: 100%
8/8 [00:28<00:00, 3.58s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.68s/it]						
	all	9	20	0.527	0.35	0.513 0.

215

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
26/99	0G	0.05494	0.03234	0	18	640: 100%
8/8 [00:24<00:00, 3.05s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.61s/it]						
	all	9	20	0.647	0.5	0.688 0.

256

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
27/99	0G	0.05554	0.03507	0	15	640: 100%
8/8 [00:24<00:00, 3.02s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.76s/it]						
	all	9	20	0.647	0.5	0.688 0.

256

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
28/99	0G	0.05499	0.03753	0	26	640: 100%

	8/8 [00:23<00:00, 2.99s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.85s/it]							
		all	9	20	0.574	0.674	0.686	0.
334								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
29/99		0G	0.05191	0.02896	0	6	640:	100%
8/8 [00:24<00:00, 3.06s/it]	Class	Images	Instances		P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.65s/it]							
		all	9	20	0.574	0.674	0.686	0.
334								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
30/99		0G	0.05438	0.0331	0	9	640:	100%
8/8 [00:24<00:00, 3.03s/it]	Class	Images	Instances		P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.57s/it]							
		all	9	20	0.277	0.65	0.392	0.
153								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
31/99		0G	0.05714	0.02678	0	13	640:	100%
8/8 [00:24<00:00, 3.00s/it]	Class	Images	Instances		P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.92s/it]							
		all	9	20	0.277	0.65	0.392	0.
153								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
32/99		0G	0.05632	0.02662	0	14	640:	100%
8/8 [00:23<00:00, 2.95s/it]	Class	Images	Instances		P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.77s/it]							
		all	9	20	0.325	0.698	0.425	0.
159								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
33/99		0G	0.05401	0.0297	0	11	640:	100%
8/8 [00:24<00:00, 3.08s/it]	Class	Images	Instances		P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.55s/it]							
		all	9	20	0.325	0.698	0.425	0.
159								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
34/99		0G	0.05053	0.02716	0	9	640:	100%
8/8 [00:24<00:00, 3.01s/it]	Class	Images	Instances		P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.59s/it]							
		all	9	20	0.438	0.742	0.585	0.
285								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
35/99		0G	0.05154	0.03206	0	11	640:	100%
8/8 [00:24<00:00, 3.03s/it]	Class	Images	Instances		P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.80s/it]							
		all	9	20	0.438	0.742	0.585	0.

285

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
36/99	0G	0.05081	0.03677	0	22	640: 100%
8/8 [00:23<00:00, 2.91s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.83s/it]						
	all	9	20	0.625	0.666	0.655
0.29						

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
37/99	0G	0.04569	0.02671	0	7	640: 100%
8/8 [00:23<00:00, 2.99s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.56s/it]						
	all	9	20	0.625	0.666	0.655
0.29						

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
38/99	0G	0.04786	0.02947	0	7	640: 100%
8/8 [00:23<00:00, 2.98s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.58s/it]						
	all	9	20	0.758	0.786	0.811
0.42						

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
39/99	0G	0.04789	0.02596	0	14	640: 100%
8/8 [00:23<00:00, 2.98s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.57s/it]						
	all	9	20	0.758	0.786	0.811
0.42						

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
40/99	0G	0.0464	0.02522	0	10	640: 100%
8/8 [00:23<00:00, 2.98s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:04<00:00, 2.04s/it]						
	all	9	20	0.61	0.8	0.743 0.
417						

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
41/99	0G	0.04356	0.02362	0	11	640: 100%
8/8 [00:23<00:00, 3.00s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.53s/it]						
	all	9	20	0.61	0.8	0.743 0.
417						

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
42/99	0G	0.0462	0.03233	0	16	640: 100%
8/8 [00:24<00:00, 3.00s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.53s/it]						
	all	9	20	0.809	0.847	0.873 0.
437						

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
43/99	0G	0.04158	0.02939	0	8	640: 100%

8/8 [00:24<00:00, 3.00s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:03<00:00, 1.56s/it]				
	all	9	20	0.809	0.847	0.873	0.
437							
Epoch GPU_mem box_loss obj_loss cls_loss Instances Size							
44/99	0G	0.04195	0.02424	0	7	640:	100%
8/8 [00:24<00:00, 3.01s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:04<00:00, 2.03s/it]				
	all	9	20	0.91	0.8	0.893	0.
554							
Epoch GPU_mem box_loss obj_loss cls_loss Instances Size							
45/99	0G	0.04358	0.03064	0	15	640:	100%
8/8 [00:23<00:00, 2.99s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:03<00:00, 1.55s/it]				
	all	9	20	0.91	0.8	0.893	0.
554							
Epoch GPU_mem box_loss obj_loss cls_loss Instances Size							
46/99	0G	0.04287	0.03004	0	12	640:	100%
8/8 [00:23<00:00, 2.99s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:03<00:00, 1.96s/it]				
	all	9	20	0.548	0.8	0.538	0.
258							
Epoch GPU_mem box_loss obj_loss cls_loss Instances Size							
47/99	0G	0.04454	0.03788	0	39	640:	100%
8/8 [00:27<00:00, 3.42s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:04<00:00, 2.11s/it]				
	all	9	20	0.548	0.8	0.538	0.
258							
Epoch GPU_mem box_loss obj_loss cls_loss Instances Size							
48/99	0G	0.04518	0.02499	0	13	640:	100%
8/8 [00:24<00:00, 3.05s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:03<00:00, 1.58s/it]				
	all	9	20	0.74	0.9	0.829	0.
522							
Epoch GPU_mem box_loss obj_loss cls_loss Instances Size							
49/99	0G	0.0458	0.02943	0	5	640:	100%
8/8 [00:24<00:00, 3.01s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:03<00:00, 1.55s/it]				
	all	9	20	0.74	0.9	0.829	0.
522							
Epoch GPU_mem box_loss obj_loss cls_loss Instances Size							
50/99	0G	0.04389	0.02913	0	12	640:	100%
8/8 [00:24<00:00, 3.02s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:03<00:00, 1.60s/it]				
	all	9	20	0.593	0.9	0.72	0.

369

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
51/99	0G	0.04152	0.03064	0	14	640: 100%
8/8 [00:24<00:00, 3.00s/it]						
				P	R	mAP50 mAP50
-95: 100% 2/2 [00:04<00:00, 2.02s/it]						
				all	9 20	0.72 0.

369

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
52/99	0G	0.03956	0.02453	0	7	640: 100%
8/8 [00:24<00:00, 3.01s/it]						
				P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.53s/it]						
				all	9 20	0.706 0.

398

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
53/99	0G	0.04244	0.02367	0	12	640: 100%
8/8 [00:24<00:00, 3.01s/it]						
				P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.57s/it]						
				all	9 20	0.706 0.

398

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
54/99	0G	0.04078	0.02834	0	12	640: 100%
8/8 [00:24<00:00, 3.06s/it]						
				P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.60s/it]						
				all	9 20	0.787 0.

391

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
55/99	0G	0.04049	0.02594	0	11	640: 100%
8/8 [00:24<00:00, 3.07s/it]						
				P	R	mAP50 mAP50
-95: 100% 2/2 [00:04<00:00, 2.03s/it]						
				all	9 20	0.787 0.

391

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
56/99	0G	0.04024	0.02592	0	12	640: 100%
8/8 [00:24<00:00, 3.03s/it]						
				P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.54s/it]						
				all	9 20	0.765 0.

399

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
57/99	0G	0.03918	0.02621	0	13	640: 100%
8/8 [00:24<00:00, 3.01s/it]						
				P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.57s/it]						
				all	9 20	0.765 0.

399

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
58/99	0G	0.03938	0.02445	0	11	640: 100%

8/8 [00:24<00:00, 3.04s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.53s/it]						
	all	9	20	0.592	0.945	0.752	0.
371							
Epoch 59/99 GPU_mem 0G box_loss 0.03976 obj_loss 0.02499 cls_loss 0 Instances 10 Size 640: 100%							
8/8 [00:24<00:00, 3.06s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:04<00:00, 2.01s/it]						
	all	9	20	0.592	0.945	0.752	0.
371							
Epoch 60/99 GPU_mem 0G box_loss 0.03811 obj_loss 0.0304 cls_loss 0 Instances 21 Size 640: 100%							
8/8 [00:24<00:00, 3.03s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.53s/it]						
	all	9	20	0.735	0.9	0.851	0.
532							
Epoch 61/99 GPU_mem 0G box_loss 0.04258 obj_loss 0.02726 cls_loss 0 Instances 11 Size 640: 100%							
8/8 [00:23<00:00, 2.99s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.51s/it]						
	all	9	20	0.735	0.9	0.851	0.
532							
Epoch 62/99 GPU_mem 0G box_loss 0.04097 obj_loss 0.03369 cls_loss 0 Instances 18 Size 640: 100%							
8/8 [00:24<00:00, 3.01s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.51s/it]						
	all	9	20	0.823	0.931	0.894	0.
579							
Epoch 63/99 GPU_mem 0G box_loss 0.03934 obj_loss 0.02873 cls_loss 0 Instances 16 Size 640: 100%							
8/8 [00:24<00:00, 3.00s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:04<00:00, 2.04s/it]						
	all	9	20	0.823	0.931	0.894	0.
579							
Epoch 64/99 GPU_mem 0G box_loss 0.03777 obj_loss 0.02337 cls_loss 0 Instances 7 Size 640: 100%							
8/8 [00:24<00:00, 3.01s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.52s/it]						
	all	9	20	0.754	0.95	0.872	0.872
0.52							
Epoch 65/99 GPU_mem 0G box_loss 0.0368 obj_loss 0.02841 cls_loss 0 Instances 7 Size 640: 100%							
8/8 [00:24<00:00, 3.00s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.52s/it]						
	all	9	20	0.754	0.95	0.872	0.872

0.52

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
66/99	0G	0.03601	0.02725	0	10	640: 100%
8/8 [00:24<00:00, 3.02s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.55s/it]						
	all	9	20	0.771	0.95	0.892 0.

545

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
67/99	0G	0.03365	0.02711	0	12	640: 100%
8/8 [00:23<00:00, 3.00s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.89s/it]						
	all	9	20	0.771	0.95	0.892 0.

545

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
68/99	0G	0.03516	0.03051	0	15	640: 100%
8/8 [00:27<00:00, 3.46s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.68s/it]						
	all	9	20	0.811	0.86	0.885 0.

578

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
69/99	0G	0.03495	0.02417	0	10	640: 100%
8/8 [00:24<00:00, 3.03s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.58s/it]						
	all	9	20	0.811	0.86	0.885 0.

578

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
70/99	0G	0.03525	0.02295	0	7	640: 100%
8/8 [00:24<00:00, 3.04s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:04<00:00, 2.06s/it]						
	all	9	20	0.86	0.919	0.9 0.

619

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
71/99	0G	0.03343	0.02375	0	17	640: 100%
8/8 [00:24<00:00, 3.02s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.58s/it]						
	all	9	20	0.86	0.919	0.9 0.

619

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
72/99	0G	0.036	0.02451	0	14	640: 100%
8/8 [00:23<00:00, 3.00s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.59s/it]						
	all	9	20	0.863	0.947	0.874 0.

593

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
73/99	0G	0.03476	0.02824	0	9	640: 100%

8/8 [00:24<00:00, 3.00s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.55s/it]					
	all	9	20	0.863	0.947	640:	100%	0.
593								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	74/99	0G	0.03557	0.02649	0	19	640:	100%
8/8 [00:24<00:00, 3.01s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.99s/it]					
	all	9	20	0.904	0.938	640:	100%	0.
647								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	75/99	0G	0.03389	0.02696	0	12	640:	100%
8/8 [00:23<00:00, 2.99s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.62s/it]					
	all	9	20	0.904	0.938	640:	100%	0.
647								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	76/99	0G	0.03212	0.02387	0	8	640:	100%
8/8 [00:24<00:00, 3.02s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:04<00:00, 2.06s/it]					
	all	9	20	0.862	0.938	640:	100%	0.
647								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	77/99	0G	0.03443	0.02462	0	11	640:	100%
8/8 [00:23<00:00, 2.98s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.52s/it]					
	all	9	20	0.862	0.938	640:	100%	0.
647								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	78/99	0G	0.03296	0.02348	0	12	640:	100%
8/8 [00:23<00:00, 2.98s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.95s/it]					
	all	9	20	0.897	0.95	640:	100%	0.
673								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	79/99	0G	0.03153	0.02352	0	7	640:	100%
8/8 [00:23<00:00, 2.99s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.56s/it]					
	all	9	20	0.897	0.95	640:	100%	0.
673								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	80/99	0G	0.03116	0.02481	0	11	640:	100%
8/8 [00:24<00:00, 3.01s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.56s/it]					
	all	9	20	0.863	0.95	640:	100%	0.

671

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
81/99	0G	0.03346	0.02295	0	8	640: 100%
8/8 [00:23<00:00, 2.99s/it]						
Class	Images	Instances		P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.52s/it]						
all	9	20	0.863	0.95	0.905	0.

671

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
82/99	0G	0.03164	0.02239	0	7	640: 100%
8/8 [00:24<00:00, 3.02s/it]						
Class	Images	Instances		P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.94s/it]						
all	9	20	0.895	0.95	0.905	0.

681

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
83/99	0G	0.03076	0.02505	0	20	640: 100%
8/8 [00:23<00:00, 2.97s/it]						
Class	Images	Instances		P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.70s/it]						
all	9	20	0.895	0.95	0.905	0.

681

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
84/99	0G	0.02921	0.02374	0	11	640: 100%
8/8 [00:24<00:00, 3.03s/it]						
Class	Images	Instances		P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.58s/it]						
all	9	20	0.893	0.95	0.914	0.

696

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
85/99	0G	0.0323	0.02745	0	15	640: 100%
8/8 [00:24<00:00, 3.01s/it]						
Class	Images	Instances		P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.56s/it]						
all	9	20	0.893	0.95	0.914	0.

696

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
86/99	0G	0.03205	0.02598	0	17	640: 100%
8/8 [00:24<00:00, 3.08s/it]						
Class	Images	Instances		P	R	mAP50 mAP50
-95: 100% 2/2 [00:04<00:00, 2.01s/it]						
all	9	20	0.894	0.95	0.917	0.

702

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
87/99	0G	0.03451	0.02429	0	12	640: 100%
8/8 [00:25<00:00, 3.16s/it]						
Class	Images	Instances		P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.54s/it]						
all	9	20	0.894	0.95	0.917	0.

702

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
88/99	0G	0.02858	0.02114	0	11	640: 100%

8/8 [00:24<00:00, 3.00s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Instances	Size	
-95:	100%	2/2	[00:03<00:00, 1.55s/it]				640:	100%
	all	9	20	0.902	0.95	9	0.921	0.
704								
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
89/99	0G	0.03097	0.02458	0	9	640:	100%	
8/8 [00:24<00:00, 3.01s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Instances	Size	
-95:	100%	2/2	[00:02<00:00, 1.50s/it]				640:	100%
	all	9	20	0.902	0.95	9	0.921	0.
704								
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
90/99	0G	0.03058	0.0279	0	17	640:	100%	
8/8 [00:29<00:00, 3.65s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Instances	Size	
-95:	100%	2/2	[00:03<00:00, 1.62s/it]				640:	100%
	all	9	20	0.896	0.95	9	0.917	0.
702								
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
91/99	0G	0.03347	0.02811	0	14	640:	100%	
8/8 [00:24<00:00, 3.07s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Instances	Size	
-95:	100%	2/2	[00:03<00:00, 1.62s/it]				640:	100%
	all	9	20	0.896	0.95	9	0.917	0.
702								
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
92/99	0G	0.02961	0.02818	0	16	640:	100%	
8/8 [00:24<00:00, 3.05s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Instances	Size	
-95:	100%	2/2	[00:03<00:00, 1.72s/it]				640:	100%
	all	9	20	0.898	0.95	9	0.918	0.
703								
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
93/99	0G	0.03029	0.02327	0	9	640:	100%	
8/8 [00:24<00:00, 3.01s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Instances	Size	
-95:	100%	2/2	[00:03<00:00, 1.90s/it]				640:	100%
	all	9	20	0.898	0.95	9	0.918	0.
703								
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
94/99	0G	0.03297	0.02904	0	10	640:	100%	
8/8 [00:24<00:00, 3.06s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Instances	Size	
-95:	100%	2/2	[00:03<00:00, 1.56s/it]				640:	100%
	all	9	20	0.9	0.95	9	0.918	0.
707								
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
95/99	0G	0.0315	0.02746	0	16	640:	100%	
8/8 [00:24<00:00, 3.06s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Instances	Size	
-95:	100%	2/2	[00:03<00:00, 1.61s/it]				640:	100%
	all	9	20	0.9	0.95	9	0.918	0.

707

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
96/99	0G	0.03297	0.03032	0	23	640: 100%
8/8 [00:24<00:00, 3.05s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:04<00:00, 2.33s/it]						
	all	9	20	0.898	0.95	0.917 0.

708

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
97/99	0G	0.03351	0.02499	0	9	640: 100%
8/8 [00:24<00:00, 3.03s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.57s/it]						
	all	9	20	0.898	0.95	0.917 0.

708

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
98/99	0G	0.02915	0.02296	0	5	640: 100%
8/8 [00:25<00:00, 3.17s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.52s/it]						
	all	9	20	0.896	0.95	0.917 0.

719

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
99/99	0G	0.03437	0.02621	0	5	640: 100%
8/8 [00:24<00:00, 3.01s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.57s/it]						
	all	9	20	0.896	0.95	0.917 0.

719

100 epochs completed in 0.791 hours.

Optimizer stripped from runs/train/exp/weights/last.pt, 25.1MB

Optimizer stripped from runs/train/exp/weights/best.pt, 25.1MB

Validating runs/train/exp/weights/best.pt...

Fusing layers...

Model summary: 206 layers, 12308200 parameters, 0 gradients, 16.1 GFLOPs	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:03<00:00, 1.73s/it]							
	all	9	20	0.896	0.95	0.917	0.

719

Results saved to **runs/train/exp**

6. Display Results

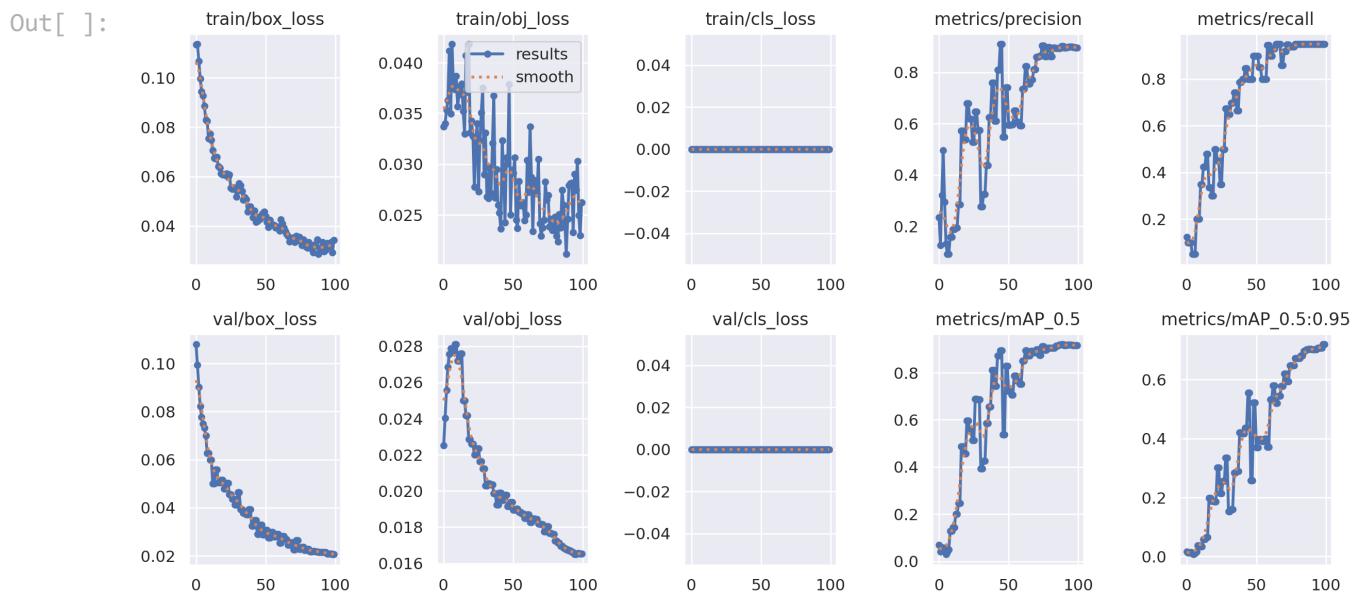
Results are automatically saved to 'runs/train' directory.

Display results.png to view the metrics and losses

The results can be saved in custom folder by using 'project' and 'name' argument.

```
In [ ]: from IPython import display
display.Image(f"runs/train/exp/results.png")
```

Hen_detection_using_Yolov5_Transfer_Learning



7. Fine Tuning

This step is optional. Fine tuning is done using the hyperparameters saved in the inbuilt hyp.VOC.yaml file.

It means un-freezing the entire model we obtained above, and re-training it on our data with a very low learning rate.

The weights will be initialized with the weights saved on the previous step.

```
In [ ]: !python train.py --hyp 'hyp.VOC.yaml' --batch 4 --epochs 80 --data 'data/hen_custom.yaml'
```

train: weights=runs/train/exp/weights/best.pt, cfg=, data=data/hen_custom.yaml, hyp=hyp.VOC.yaml, epochs=80, batch_size=4, 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=Fine_tuning, name=exp, 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 🚀 v7.0-187-g0004c74 Python-3.10.12 torch-2.0.1+cu118 CPU

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 Fine_tuning', view at <http://localhost:6006/>

Overriding model.yaml anchors with anchors=3.412

	from	n	params	module	arguments
0		-1	1	3520	models.common.Conv
6, 2, 2]					[3, 32,
1		-1	1	18560	models.common.Conv
3, 2]					[32, 64,
2		-1	1	18816	models.common.C3
1]					[64, 64,
3		-1	1	73984	models.common.Conv
3, 2]					[64, 128,
4		-1	2	115712	models.common.C3
8, 2]					[128, 12
5		-1	1	295424	models.common.Conv
6, 3, 2]					[128, 25
6		-1	3	625152	models.common.C3
6, 3]					[256, 25
7		-1	1	885504	models.common.Conv
4, 3, 2]					[256, 38
8		-1	1	665856	models.common.C3
4, 1]					[384, 38
9		-1	1	1770496	models.common.Conv
2, 3, 2]					[384, 51
10		-1	1	1182720	models.common.C3
2, 1]					[512, 51
11		-1	1	656896	models.common.SPPF
2, 5]					[512, 51
12		-1	1	197376	models.common.Conv
4, 1, 1]					[512, 38
13		-1	1	0	torch.nn.modules.upsampling.Upsample
'nearest'					[None, 2,
14	[-1, 8]	1		0	models.common.Concat
15		-1	1	813312	models.common.C3
4, 1, False]					[1]
16		-1	1	98816	models.common.Conv
6, 1, 1]					[384, 25
17		-1	1	0	torch.nn.modules.upsampling.Upsample
'nearest'					[None, 2,
18	[-1, 6]	1		0	models.common.Concat
					[1]

Hen_detection_using_Yolov5_Transfer_Learning

```

19          -1  1    361984  models.common.C3           [512, 25
6, 1, False]
20          -1  1    33024   models.common.Conv        [256, 12
8, 1, 1]
21          -1  1      0  torch.nn.modules.upsampling.Upsample [None, 2,
'nearest']
22          [-1, 4] 1      0  models.common.Concat     [1]
23          -1  1    90880   models.common.C3           [256, 12
8, 1, False]
24          -1  1   147712  models.common.Conv        [128, 12
8, 3, 2]
25          [-1, 20] 1      0  models.common.Concat     [1]
26          -1  1   296448  models.common.C3           [256, 25
6, 1, False]
27          -1  1   590336  models.common.Conv        [256, 25
6, 3, 2]
28          [-1, 16] 1      0  models.common.Concat     [1]
29          -1  1   715008  models.common.C3           [512, 38
4, 1, False]
30          -1  1   1327872 models.common.Conv        [384, 38
4, 3, 2]
31          [-1, 12] 1      0  models.common.Concat     [1]
32          -1  1   1313792 models.common.C3           [768, 51
2, 1, False]
33 [23, 26, 29, 32] 1   23112   models.yolo.Detect [1, [[0,
1, 2, 3, 4, 5], [0, 1, 2, 3, 4, 5], [0, 1, 2, 3, 4, 5], [0, 1, 2, 3, 4, 5]], [128, 25
6, 384, 512]]
Model summary: 281 layers, 12322312 parameters, 12322312 gradients, 16.3 GFLOPs

```

Transferred 458/459 items from runs/train/exp/weights/best.pt
optimizer: SGD(lr=0.00334) with parameter groups 75 weight(decay=0.0), 79 weight(deca
y=0.00025), 79 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/hen_dataset/labels/train.cache... 31 images, 0 backgrounds,
0 corrupt: 100% 31/31 [00:00<?, ?it/s]
train: Caching images (0.0GB ram): 100% 31/31 [00:00<00:00, 194.44it/s]
val: Scanning /content/hen_dataset/labels/val.cache... 9 images, 0 backgrounds, 0 cor
rupt: 100% 9/9 [00:00<?, ?it/s]
val: Caching images (0.0GB ram): 100% 9/9 [00:00<00:00, 174.07it/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 12 anchors on 57 points...

AutoAnchor: Evolving anchors with Genetic Algorithm: fitness = 0.8930: 100% 1000/1000
[00:00<00:00, 1121.35it/s]

AutoAnchor: thr=0.30: 1.0000 best possible recall, 9.58 anchors past thr

AutoAnchor: n=12, img_size=640, metric_all=0.494/0.893-mean/best, past_thr=0.563-me
n: 53,96, 88,135, 166,164, 97,322, 139,235, 296,159, 233,242, 237,359, 329,336, 282,4
99, 436,383, 410,483

AutoAnchor: Done (optional: update model *.yaml to use these anchors in the futur
e)

Plotting labels to Fine_tuning/exp/labels.jpg...

Image sizes 640 train, 640 val

Using 2 dataloader workers

Logging results to Fine_tuning/exp

Starting training for 80 epochs...

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
0/79	0G	0.03549	0.01073	0	13	640: 100%

	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	P	R	mAP50	mAP50
118	1/79	0G	0.03362	0.009434	0	5			640: 100%	
118	8/8 [00:44<00:00, 5.56s/it]	Class	Images	Instances			P	R	mAP50	mAP50
118	-95: 100% 2/2 [00:03<00:00, 1.76s/it]	all	9	20	0.365		0.9		0.407	0.
163	2/79	0G	0.03193	0.0101	0	11			640: 100%	
163	8/8 [00:40<00:00, 5.01s/it]	Class	Images	Instances			P	R	mAP50	mAP50
163	-95: 100% 2/2 [00:02<00:00, 1.40s/it]	all	9	20	0.387		0.9		0.48	
0.24	3/79	0G	0.02946	0.01005	0	9			640: 100%	
0.24	8/8 [00:41<00:00, 5.20s/it]	Class	Images	Instances			P	R	mAP50	mAP50
0.24	-95: 100% 2/2 [00:03<00:00, 1.68s/it]	all	9	20	0.49		0.9		0.626	0.
295	4/79	0G	0.03012	0.009886	0	10			640: 100%	
295	8/8 [00:41<00:00, 5.23s/it]	Class	Images	Instances			P	R	mAP50	mAP50
295	-95: 100% 2/2 [00:03<00:00, 1.51s/it]	all	9	20	0.538		0.9		0.67	0.
319	5/79	0G	0.02812	0.01058	0	13			640: 100%	
319	8/8 [00:41<00:00, 5.13s/it]	Class	Images	Instances			P	R	mAP50	mAP50
319	-95: 100% 2/2 [00:02<00:00, 1.46s/it]	all	9	20	0.557		0.9		0.691	0.
327	6/79	0G	0.02738	0.009727	0	7			640: 100%	
327	8/8 [00:41<00:00, 5.13s/it]	Class	Images	Instances			P	R	mAP50	mAP50
327	-95: 100% 2/2 [00:03<00:00, 1.88s/it]	all	9	20	0.601		0.9		0.718	0.
369	7/79	0G	0.02793	0.01018	0	10			640: 100%	
369	8/8 [00:40<00:00, 5.08s/it]	Class	Images	Instances			P	R	mAP50	mAP50
369	-95: 100% 2/2 [00:02<00:00, 1.46s/it]	all	9	20	0.649		0.9		0.76	0.

449

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
8/79	0G	0.02605	0.01094	0	12	640: 100%
8/8 [00:41<00:00, 5.25s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.44s/it]						
	all	9	20	0.673	0.9	0.786 0.

508

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
9/79	0G	0.02589	0.01147	0	26	640: 100%
8/8 [00:41<00:00, 5.23s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.82s/it]						
	all	9	20	0.673	0.9	0.786 0.

508

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
10/79	0G	0.02577	0.01045	0	8	640: 100%
8/8 [00:41<00:00, 5.16s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.43s/it]						
	all	9	20	0.749	0.9	0.848 0.

504

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
11/79	0G	0.0258	0.01119	0	13	640: 100%
8/8 [00:41<00:00, 5.17s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.42s/it]						
	all	9	20	0.749	0.9	0.848 0.

504

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
12/79	0G	0.02493	0.008963	0	7	640: 100%
8/8 [00:41<00:00, 5.23s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.802	0.9	0.865 0.

524

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
13/79	0G	0.02406	0.009606	0	16	640: 100%
8/8 [00:40<00:00, 5.09s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.68s/it]						
	all	9	20	0.802	0.9	0.865 0.

524

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
14/79	0G	0.02434	0.01083	0	14	640: 100%
8/8 [00:44<00:00, 5.60s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.67s/it]						
	all	9	20	0.784	0.9	0.861 0.

571

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
15/79	0G	0.02519	0.011	0	14	640: 100%

8/8 [00:41<00:00, 5.17s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:02<00:00, 1.47s/it]				
	all	9	20	0.784	0.9	0.861	0.
571							
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	16/79	0G	0.025	0.01066	0	12	640: 100%
8/8 [00:42<00:00, 5.29s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:02<00:00, 1.46s/it]				
	all	9	20	0.842	0.85	0.872	0.
572							
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	17/79	0G	0.02441	0.01076	0	15	640: 100%
8/8 [00:40<00:00, 5.02s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:03<00:00, 1.91s/it]				
	all	9	20	0.842	0.85	0.872	0.
572							
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	18/79	0G	0.02442	0.0101	0	16	640: 100%
8/8 [00:40<00:00, 5.06s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:02<00:00, 1.42s/it]				
	all	9	20	0.811	0.85	0.887	0.
617							
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	19/79	0G	0.02391	0.01067	0	8	640: 100%
8/8 [00:40<00:00, 5.09s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:02<00:00, 1.44s/it]				
	all	9	20	0.811	0.85	0.887	0.
617							
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	20/79	0G	0.02404	0.009652	0	3	640: 100%
8/8 [00:40<00:00, 5.03s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:03<00:00, 1.81s/it]				
	all	9	20	0.815	0.882	0.905	0.
668							
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	21/79	0G	0.02385	0.01029	0	7	640: 100%
8/8 [00:40<00:00, 5.03s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:02<00:00, 1.44s/it]				
	all	9	20	0.815	0.882	0.905	0.
668							
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	22/79	0G	0.02232	0.01042	0	16	640: 100%
8/8 [00:41<00:00, 5.17s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100%	2/2	[00:02<00:00, 1.44s/it]				
	all	9	20	0.853	0.9	0.903	0.

677

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
23/79	0G	0.02418	0.009997	0	8	640: 100%
8/8 [00:41<00:00, 5.19s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.73s/it]						
	all	9	20	0.853	0.9	0.903 0.

677

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
24/79	0G	0.02306	0.008422	0	10	640: 100%
8/8 [00:40<00:00, 5.06s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.898	0.877	0.907 0.

657

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
25/79	0G	0.02363	0.01186	0	9	640: 100%
8/8 [00:41<00:00, 5.15s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.44s/it]						
	all	9	20	0.898	0.877	0.907 0.

657

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
26/79	0G	0.02311	0.01065	0	15	640: 100%
8/8 [00:40<00:00, 5.03s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.54s/it]						
	all	9	20	0.896	0.867	0.907 0.

633

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
27/79	0G	0.02233	0.01092	0	9	640: 100%
8/8 [00:40<00:00, 5.11s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:05<00:00, 2.76s/it]						
	all	9	20	0.896	0.867	0.907 0.

633

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
28/79	0G	0.02322	0.01101	0	8	640: 100%
8/8 [00:44<00:00, 5.52s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.861	0.9	0.903 0.

617

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
29/79	0G	0.02167	0.0103	0	19	640: 100%
8/8 [00:40<00:00, 5.11s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.75s/it]						
	all	9	20	0.861	0.9	0.903 0.

617

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
30/79	0G	0.02136	0.01053	0	9	640: 100%

8/8 [00:42<00:00, 5.26s/it]							mAP50	mAP50
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:02<00:00, 1.45s/it]					
	all	9	20	0.899	0.892	0.903	0.	
651								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	31/79	0G	0.02162	0.01008	0	7	640:	100%
8/8	[00:41<00:00, 5.16s/it]							
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.52s/it]					
	all	9	20	0.899	0.892	0.903	0.	
651								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	32/79	0G	0.02209	0.011	0	18	640:	100%
8/8	[00:40<00:00, 5.12s/it]							
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:02<00:00, 1.46s/it]					
	all	9	20	0.898	0.878	0.907	0.	
659								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	33/79	0G	0.0231	0.01233	0	13	640:	100%
8/8	[00:41<00:00, 5.19s/it]							
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:02<00:00, 1.46s/it]					
	all	9	20	0.898	0.878	0.907	0.	
659								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	34/79	0G	0.02168	0.009216	0	12	640:	100%
8/8	[00:41<00:00, 5.17s/it]							
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.92s/it]					
	all	9	20	0.893	0.9	0.906	0.	
634								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	35/79	0G	0.02136	0.01046	0	7	640:	100%
8/8	[00:40<00:00, 5.04s/it]							
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:02<00:00, 1.43s/it]					
	all	9	20	0.893	0.9	0.906	0.	
634								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	36/79	0G	0.02203	0.01163	0	12	640:	100%
8/8	[00:40<00:00, 5.08s/it]							
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:03<00:00, 1.77s/it]					
	all	9	20	0.894	0.9	0.904	0.	
666								
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
	37/79	0G	0.02084	0.01055	0	14	640:	100%
8/8	[00:40<00:00, 5.06s/it]							
	Class	Images	Instances	P	R	Size		
-95:	100%	2/2	[00:02<00:00, 1.44s/it]					
	all	9	20	0.894	0.9	0.904	0.	

666

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
38/79	0G	0.02136	0.0118	0	6	640: 100%
8/8 [00:41<00:00, 5.18s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.44s/it]						
	all	9	20	0.892	0.9	0.902

0.66

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
39/79	0G	0.01991	0.009749	0	13	640: 100%
8/8 [00:40<00:00, 5.02s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.44s/it]						
	all	9	20	0.892	0.9	0.902

0.66

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
40/79	0G	0.02114	0.01062	0	11	640: 100%
8/8 [00:42<00:00, 5.31s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.892	0.9	0.902

0.65

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
41/79	0G	0.01977	0.01037	0	14	640: 100%
8/8 [00:44<00:00, 5.61s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.42s/it]						
	all	9	20	0.892	0.9	0.902

0.65

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
42/79	0G	0.01969	0.00922	0	20	640: 100%
8/8 [00:41<00:00, 5.19s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.88s/it]						
	all	9	20	0.945	0.86	0.908 0.

662

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
43/79	0G	0.02016	0.01097	0	9	640: 100%
8/8 [00:41<00:00, 5.13s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.945	0.86	0.908 0.

662

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
44/79	0G	0.0197	0.009801	0	21	640: 100%
8/8 [00:41<00:00, 5.17s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.67s/it]						
	all	9	20	0.898	0.9	0.907 0.

671

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
45/79	0G	0.02034	0.01013	0	10	640: 100%

8/8 [00:40<00:00, 5.07s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.898	0.9	0.907	0.
671							
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
46/79	0G	0.0202	0.01108	0	7	640:	100%
8/8 [00:42<00:00, 5.34s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.947	0.891	0.905	0.
681							
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
47/79	0G	0.02014	0.01163	0	17	640:	100%
8/8 [00:42<00:00, 5.27s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:02<00:00, 1.45s/it]						
	all	9	20	0.947	0.891	0.905	0.
681							
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
48/79	0G	0.02005	0.01201	0	19	640:	100%
8/8 [00:40<00:00, 5.11s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.93s/it]						
	all	9	20	0.946	0.884	0.907	0.
665							
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
49/79	0G	0.01938	0.01082	0	10	640:	100%
8/8 [00:40<00:00, 5.04s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:02<00:00, 1.44s/it]						
	all	9	20	0.946	0.884	0.907	0.
665							
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
50/79	0G	0.01867	0.01095	0	6	640:	100%
8/8 [00:41<00:00, 5.14s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:03<00:00, 1.67s/it]						
	all	9	20	0.902	0.85	0.91	0.
622							
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
51/79	0G	0.01911	0.0114	0	16	640:	100%
8/8 [00:41<00:00, 5.13s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:02<00:00, 1.45s/it]						
	all	9	20	0.902	0.85	0.91	0.
622							
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	
52/79	0G	0.01932	0.0129	0	9	640:	100%
8/8 [00:42<00:00, 5.32s/it]							
	Class	Images	Instances	P	R	mAP50	mAP50
-95:	100% 2/2 [00:02<00:00, 1.45s/it]						
	all	9	20	0.901	0.85	0.909	0.

645

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
53/79	0G	0.01928	0.01307	0	16	640: 100%
8/8 [00:40<00:00, 5.06s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.93s/it]						
	all	9	20	0.901	0.85	0.909 0.

645

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
54/79	0G	0.01816	0.01091	0	7	640: 100%
8/8 [00:43<00:00, 5.39s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.56s/it]						
	all	9	20	0.893	0.9	0.912 0.

663

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
55/79	0G	0.01901	0.01115	0	13	640: 100%
8/8 [00:40<00:00, 5.11s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.893	0.9	0.912 0.

663

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
56/79	0G	0.01783	0.009483	0	7	640: 100%
8/8 [00:40<00:00, 5.00s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.47s/it]						
	all	9	20	0.847	0.9	0.91 0.

659

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
57/79	0G	0.01835	0.009463	0	8	640: 100%
8/8 [00:41<00:00, 5.21s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.49s/it]						
	all	9	20	0.847	0.9	0.91 0.

659

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
58/79	0G	0.01756	0.008811	0	14	640: 100%
8/8 [00:40<00:00, 5.05s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.85s/it]						
	all	9	20	0.858	0.908	0.913 0.

659

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
59/79	0G	0.01872	0.01195	0	15	640: 100%
8/8 [00:41<00:00, 5.19s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.44s/it]						
	all	9	20	0.858	0.908	0.913 0.

659

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
60/79	0G	0.01783	0.009889	0	20	640: 100%

8/8 [00:40<00:00, 5.05s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:03<00:00, 1.76s/it]	all	9	20	0.881	0.85	0.905	0.
658	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	61/79	0G	0.0182	0.01148	0	17	640: 100%
8/8 [00:40<00:00, 5.03s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:02<00:00, 1.43s/it]	all	9	20	0.881	0.85	0.905	0.
658	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	62/79	0G	0.0187	0.01025	0	12	640: 100%
8/8 [00:41<00:00, 5.15s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:02<00:00, 1.47s/it]	all	9	20	0.875	0.85	0.908	0.
667	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	63/79	0G	0.01796	0.01135	0	11	640: 100%
8/8 [00:40<00:00, 5.02s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:02<00:00, 1.39s/it]	all	9	20	0.875	0.85	0.908	0.
667	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	64/79	0G	0.01753	0.01153	0	16	640: 100%
8/8 [00:41<00:00, 5.20s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:02<00:00, 1.44s/it]	all	9	20	0.896	0.864	0.907	0.
677	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	65/79	0G	0.01741	0.009931	0	7	640: 100%
8/8 [00:40<00:00, 5.02s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:02<00:00, 1.43s/it]	all	9	20	0.896	0.864	0.907	0.
677	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	66/79	0G	0.01716	0.008981	0	8	640: 100%
8/8 [00:42<00:00, 5.25s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]	all	9	20	0.898	0.9	0.911	0.
668	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
	67/79	0G	0.01712	0.01186	0	19	640: 100%
8/8 [00:40<00:00, 5.02s/it]	Class	Images	Instances	P	R	mAP50	mAP50
-95: 100% 2/2 [00:02<00:00, 1.45s/it]	all	9	20	0.898	0.9	0.911	0.

668

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
68/79	0G	0.01707	0.01135	0	12	640: 100%
8/8 [00:45<00:00, 5.65s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.49s/it]						
	all	9	20	0.837	0.9	0.907 0.

669

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
69/79	0G	0.01738	0.008841	0	11	640: 100%
8/8 [00:40<00:00, 5.12s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.97s/it]						
	all	9	20	0.837	0.9	0.907 0.

669

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
70/79	0G	0.01805	0.01203	0	23	640: 100%
8/8 [00:40<00:00, 5.11s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.42s/it]						
	all	9	20	0.851	0.9	0.903 0.

671

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
71/79	0G	0.01579	0.009344	0	4	640: 100%
8/8 [00:40<00:00, 5.10s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.65s/it]						
	all	9	20	0.851	0.9	0.903 0.

671

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
72/79	0G	0.0183	0.01144	0	12	640: 100%
8/8 [00:40<00:00, 5.11s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.896	0.858	0.91 0.

654

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
73/79	0G	0.01722	0.013	0	19	640: 100%
8/8 [00:42<00:00, 5.29s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:02<00:00, 1.46s/it]						
	all	9	20	0.896	0.858	0.91 0.

654

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
74/79	0G	0.01622	0.01134	0	13	640: 100%
8/8 [00:40<00:00, 5.08s/it]						
	Class	Images	Instances	P	R	mAP50 mAP50
-95: 100% 2/2 [00:03<00:00, 1.92s/it]						
	all	9	20	0.895	0.852	0.91 0.

667

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
75/79	0G	0.01688	0.01165	0	11	640: 100%

8/8 [00:40<00:00, 5.05s/it]
 Class Images Instances P R mAP50 mAP50
 -95: 100% 2/2 [00:02<00:00, 1.46s/it]
 all 9 20 0.895 0.852 0.91 0.
 667

Epoch GPU_mem box_loss obj_loss cls_loss Instances Size
 76/79 0G 0.01627 0.01021 0 9 640: 100%

8/8 [00:41<00:00, 5.13s/it]
 Class Images Instances P R mAP50 mAP50
 -95: 100% 2/2 [00:03<00:00, 1.74s/it]
 all 9 20 0.858 0.903 0.912 0.
 673

Epoch GPU_mem box_loss obj_loss cls_loss Instances Size
 77/79 0G 0.01558 0.009437 0 6 640: 100%

8/8 [00:40<00:00, 5.07s/it]
 Class Images Instances P R mAP50 mAP50
 -95: 100% 2/2 [00:02<00:00, 1.44s/it]
 all 9 20 0.858 0.903 0.912 0.
 673

Epoch GPU_mem box_loss obj_loss cls_loss Instances Size
 78/79 0G 0.01607 0.01111 0 14 640: 100%

8/8 [00:41<00:00, 5.17s/it]
 Class Images Instances P R mAP50 mAP50
 -95: 100% 2/2 [00:02<00:00, 1.46s/it]
 all 9 20 0.859 0.913 0.912 0.66

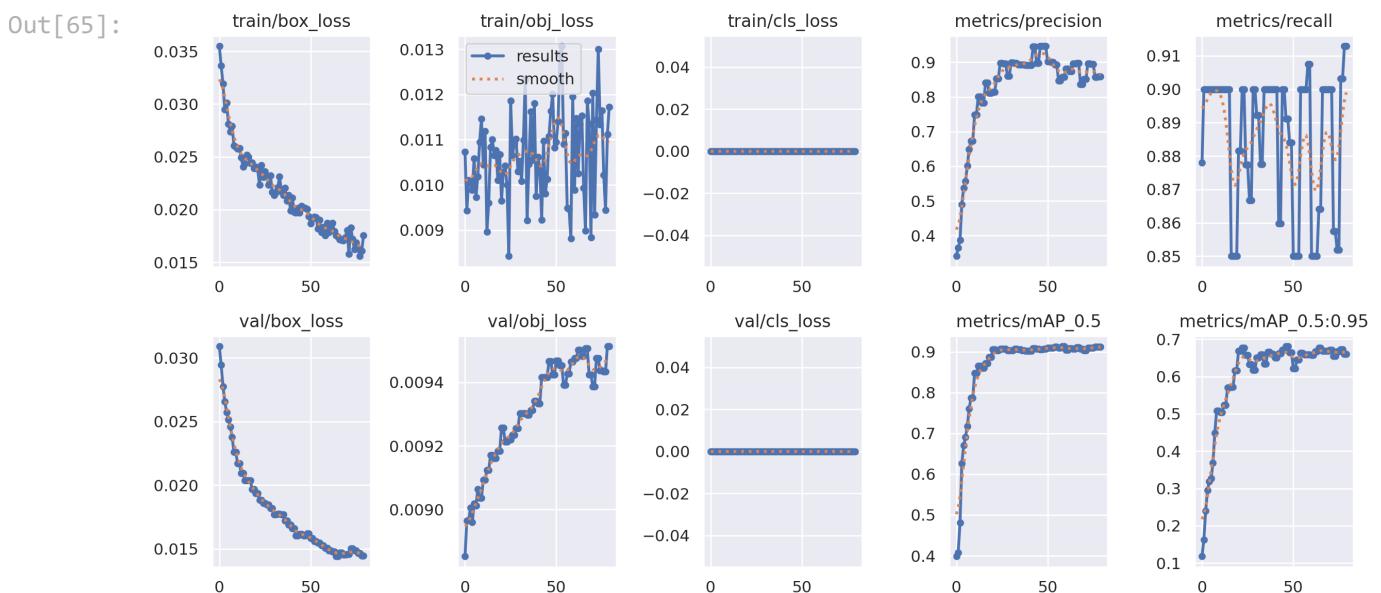
Epoch GPU_mem box_loss obj_loss cls_loss Instances Size
 79/79 0G 0.01756 0.01173 0 13 640: 100%

8/8 [00:40<00:00, 5.05s/it]
 Class Images Instances P R mAP50 mAP50
 -95: 100% 2/2 [00:02<00:00, 1.45s/it]
 all 9 20 0.859 0.913 0.912 0.66

80 epochs completed in 1.009 hours.
 Optimizer stripped from Fine_tuning/exp/weights/last.pt, 25.1MB
 Optimizer stripped from Fine_tuning/exp/weights/best.pt, 25.1MB

Validating Fine_tuning/exp/weights/best.pt...
 Fusing layers...
 Model summary: 206 layers, 12308200 parameters, 0 gradients, 16.1 GFLOPs
 Class Images Instances P R mAP50 mAP50
 -95: 100% 2/2 [00:03<00:00, 1.68s/it]
 all 9 20 0.947 0.9 0.906 0.
 681
 Results saved to Fine_tuning/exp

In [65]: `display.Image(f"Fine_tuning/exp/results.png")`



7.Validation

After fine tuning, the performance is improved.

To validate the model, use val.py script.

We can use train, test or val dataset.

This can be selected using 'task' argument.

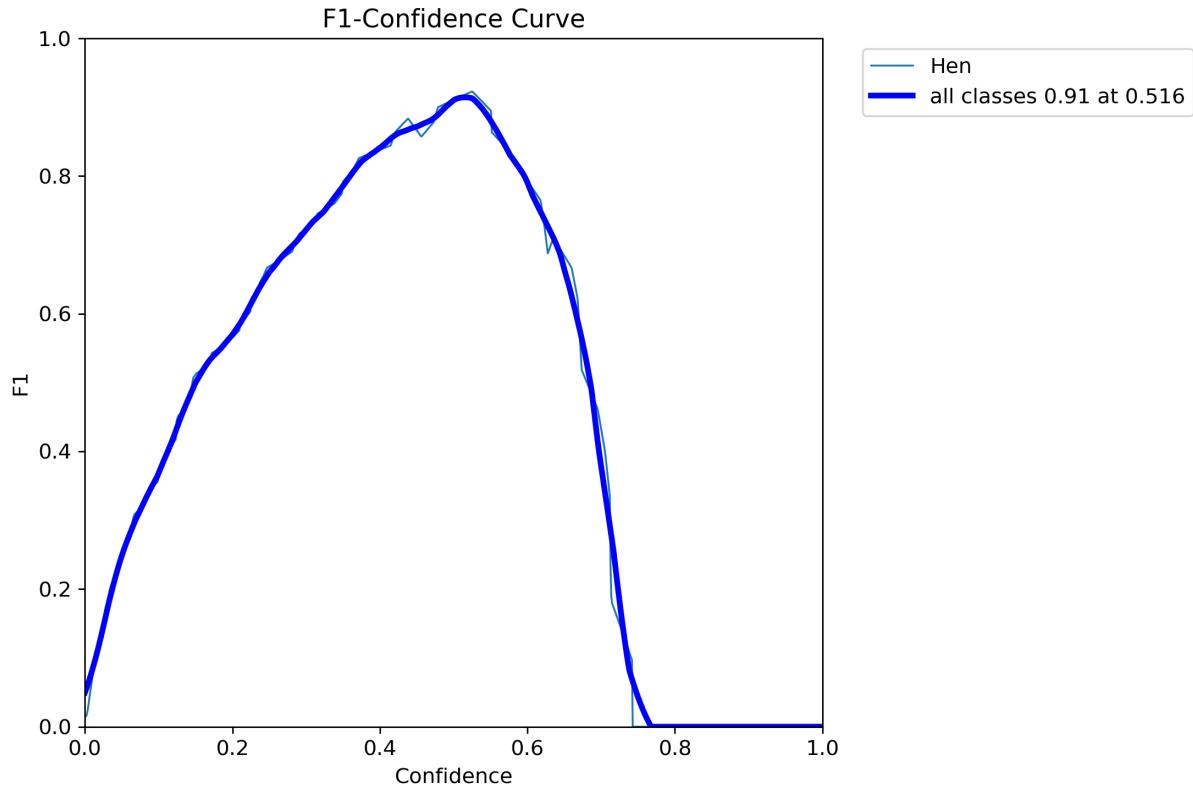
```
In [66]: !python val.py --weights 'Fine_tuning/exp/weights/best.pt' --batch 8 --data 'data/hen_
val: data=data/hen_custom.yaml, weights=['Fine_tuning/exp/weights/best.pt'], batch_si
ze=8, imgsz=640, conf_thres=0.001, iou_thres=0.6, max_det=300, task=val, device=,
wor
kers=8, single_cls=False, augment=True, verbose=False, save_txt=False, save_hybrid=Fa
lse, save_conf=False, save_json=False, project=runs/val, name=exp, exist_ok=False, ha
lf=False, dnn=False
YOLOv5 🚀 v7.0-187-g0004c74 Python-3.10.12 torch-2.0.1+cu118 CPU

Fusing layers...
Model summary: 206 layers, 12308200 parameters, 0 gradients, 16.1 GFLOPs
val: Scanning /content/hen_dataset/labels/val.cache... 9 images, 0 backgrounds, 0 cor
rupt: 100% 9/9 [00:00<?, ?it/s]
          Class      Images   Instances       P       R    mAP50    mAP50
-95: 100% 2/2 [00:09<00:00,  4.70s/it]
                  all        9        20     0.922      0.9    0.918      0.
691
Speed: 8.2ms pre-process, 1014.2ms inference, 7.1ms NMS per image at shape (8, 3, 64
0, 640)
Results saved to runs/val/exp2
```

Display F1-Confidence Curve

```
In [67]: display.Image(f"runs/val/exp2/F1_curve.png")
```

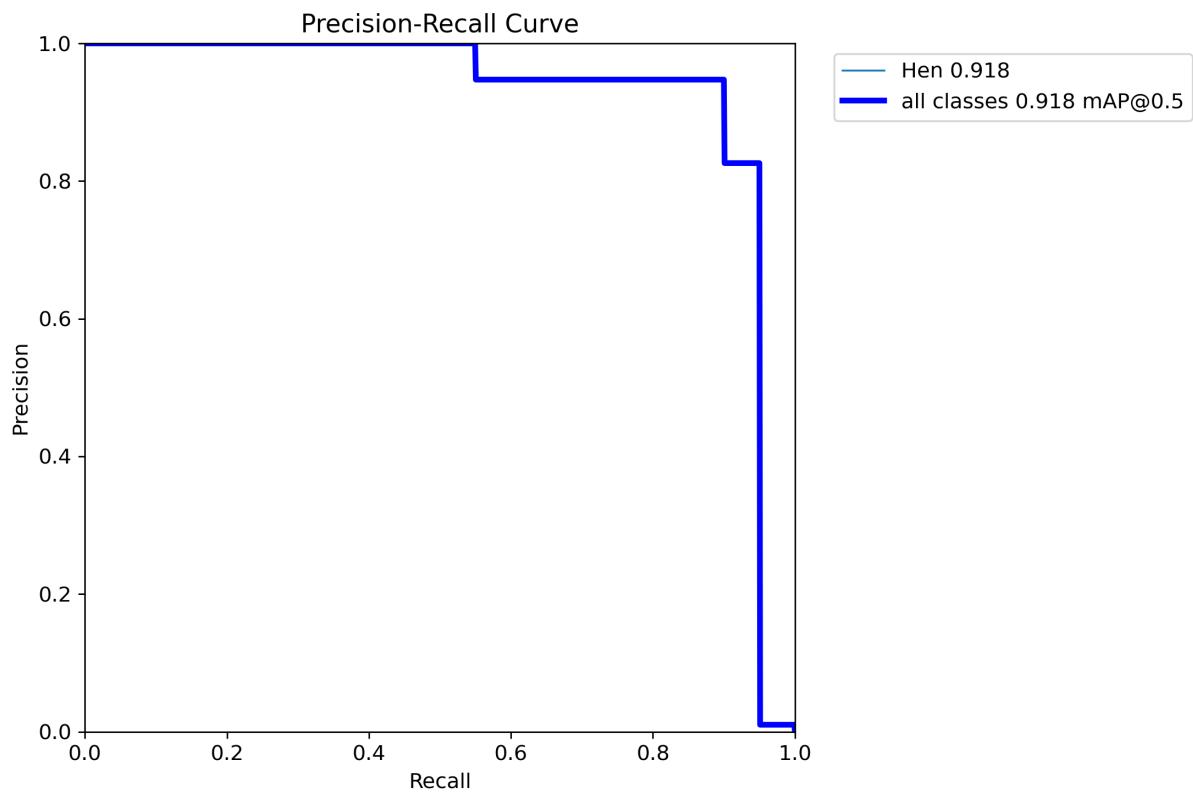
Out[67]:



Display Precision-Recall Curve

In [69]: `display.Image(f"runs/val/exp2/PR_curve.png")`

Out[69]:



8. Inference

Since the training performance are satisfactory, the model is now ready for inference. The input for inference can be an image, a video, a directory, a webcam, or a stream. The 'detect.py' script is used for inference. The input images for inference are uploaded in 'inference_images.zip' folder. The following code is used to unzip and display the inference input images

```
In [ ]: !unzip /content/Inference_images.zip -d /content
```

```
In [74]: import glob
import cv2

path = r'/content/Inference_images'
images = []

for img in glob.glob("/content/Inference_images/*.png"):
    image= cv2.imread(img, cv2.IMREAD_COLOR)
    image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
    images.append(image)

#images = [cv2.imread(file) for file in glob.glob("/content/Inference_images/*.png")]
```

```
In [75]: import matplotlib.pyplot as plt

plt.figure(figsize=(20,10))
for i, image in enumerate(images):
    plt.subplot(3,3,i+1)
    plt.imshow(image)
    plt.xticks([])
    plt.yticks([])
```



In the following detection command the test data is used for inference.

- source — input path (0 for webcam)
- weights — weights path
- img — image size for inference, in pixels

- conf — confidence threshold
- iou — IoU threshold for NMS (Non Max Supression)
- augment — augmented inference (TTA)

The predictions accuracy can be further boost by applying test-time augmentations (TTA): each image is being augmented (horizontal flip and 3 different resolutions), and the final prediction is an ensemble of all these augmentation.

```
In [79]: !python detect.py --weights Fine_tuning/exp/weights/best.pt --conf 0.45 --source /cor
```

```
detect: weights=['Fine_tuning/exp/weights/best.pt'], source=/content/Inference_images, data=data/coco128.yaml, imgsz=[640, 640], conf_thres=0.45, iou_thres=0.45, max_det=1000, device=, view_img=False, save_txt=False, save_conf=False, save_crop=False, nosave=False, classes=None, agnostic_nms=False, augment=False, visualize=False, update=False, project=runs/detect, name=infer_test, exist_ok=False, line_thickness=3, hide_labels=False, hide_conf=False, half=False, dnn=False, vid_stride=1
YOLOv5 🚀 v7.0-187-g0004c74 Python-3.10.12 torch-2.0.1+cu118 CPU
```

Fusing layers...

```
Model summary: 206 layers, 12308200 parameters, 0 gradients, 16.1 GFLOPs
image 1/9 /content/Inference_images/hen1.png: 448x640 4 Hens, 300.8ms
image 2/9 /content/Inference_images/hen2.png: 448x640 1 Hen, 253.1ms
image 3/9 /content/Inference_images/hen3.png: 640x640 1 Hen, 404.3ms
image 4/9 /content/Inference_images/hen4.png: 384x640 2 Hens, 244.7ms
image 5/9 /content/Inference_images/hen5.png: 448x640 3 Hens, 272.6ms
image 6/9 /content/Inference_images/hen6.png: 448x640 1 Hen, 256.6ms
image 7/9 /content/Inference_images/hen7.png: 320x640 1 Hen, 195.4ms
image 8/9 /content/Inference_images/hen8.png: 448x640 3 Hens, 292.1ms
image 9/9 /content/Inference_images/hen9.png: 640x512 2 Hens, 489.9ms
Speed: 1.5ms pre-process, 301.0ms inference, 0.9ms NMS per image at shape (1, 3, 640, 640)
Results saved to runs/detect/infer_test2
```

9. Display Predictions

```
In [80]: display.Image(f"/content/yolov5/runs/detect/infer_test2/hen1.png")
```

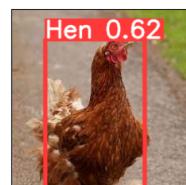
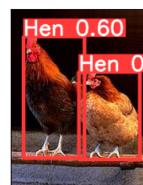
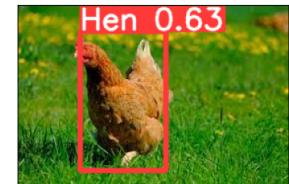
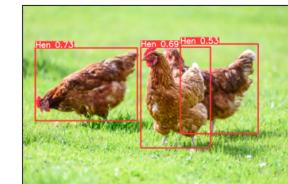
Out[80]:



```
In [83]: infer_images = []
for img in glob.glob("/content/yolov5/runs/detect/infer_test2/*.png"):
    image= cv2.imread(img, cv2.IMREAD_COLOR)
    image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
    infer_images.append(image)
```

```
In [84]: plt.figure(figsize=(20,10))
for i, image in enumerate(infer_images):
```

```
plt.subplot(3,3,i+1)
plt.imshow(image)
plt.xticks([])
plt.yticks([])
```



Reference

- <https://github.com/ultralytics/yolov5>
- <https://towardsdatascience.com/the-practical-guide-for-object-detection-with-yolov5-algorithm-74c04aac4843>
- <https://www.makesense.ai/>