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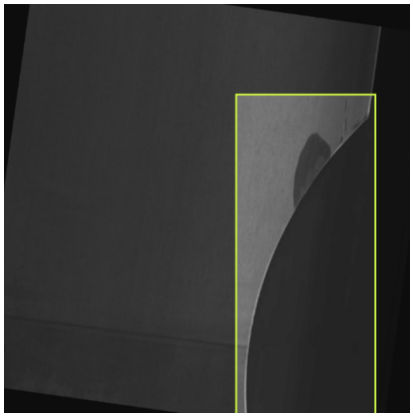
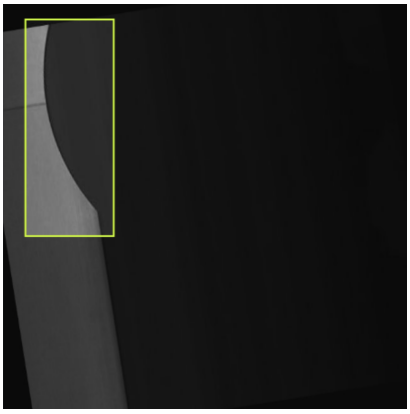
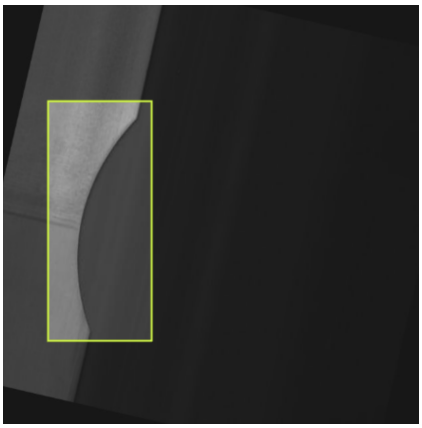
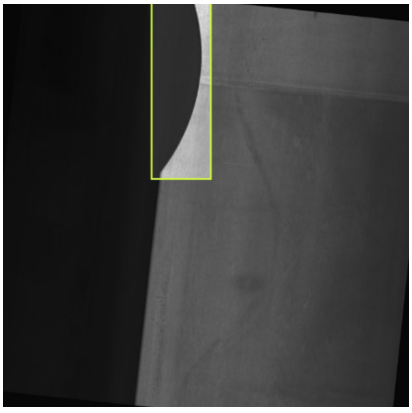
ECE 157A
Lab Report 4

- **Submission: List the augmentations and take screenshots of the augmentation examples. Provide a brief explanation for your choice of augmentations.**

  For augmentations, I chose brightness and rotation. Choosing brightness and rotation augmentations for training a model on crescent shape detection is highly effective for enhancing the robustness and accuracy of the model. Brightness augmentation ensures the model can recognize crescent shapes under various lighting conditions, making it more adaptable to real-world scenarios where illumination can vary significantly. Rotation augmentation, on the other hand, trains the model to recognize crescent shapes at different orientations, crucial for a shape that can appear in multiple angles in practical applications. Together, these augmentations help in building a more versatile and reliable model for crescent shape detection.

- **Submission: Screenshot the terminal training log showing the performance of the last training epoch. State the "--weights" parameter you chose and how many training sam- ples you used.**

```
-- weights: yolov5s.pt, 50 training sampled used.
```

Log:

```
2023-12-07 07:13:06.874924: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_dnn.cc:9342]
Unable to register cuDNN factory: Attempting to register factory for
plugin cuDNN when one has already been registered
2023-12-07 07:13:06.875016: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_fft.cc:609] Unable
to register cuFFT factory: Attempting to register factory for plugin
cuFFT when one has already been registered
2023-12-07 07:13:06.875059: E
tensorflow/compiler/xla/stream_executor/cuda/cuda_blas.cc:1518]
Unable to register cuBLAS factory: Attempting to register factory
for plugin cuBLAS when one has already been registered
train: weights=yolov5s.pt, cfg=, data=yolov5/HW4157A-1/data.yaml,
hyp=yolov5/data/hyps/hyp.scratch-low.yaml, epochs=50, batch_size=16,
imgsz=640, rect=False, resume=False, nosave=False, noval=False,
noautoanchor=False, noplots=False, evolve=None, bucket=, cache=None,
image_weights=False, device=, multi_scale=False, single_cls=False,
optimizer=SGD, sync_bn=False, workers=8, project=yolov5/runs/train,
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 🚀 v7.0-247-g3f02fde Python-3.10.12 torch-2.1.0+cu118 CUDA:0
(Tesla T4, 15102MiB)

hyperparameters: lr0=0.01, lrf=0.01, momentum=0.937,
weight_decay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8,
warmup_bias_lr=0.1, box=0.05, cls=0.5, cls_pw=1.0, obj=1.0,
obj_pw=1.0, iou_t=0.2, anchor_t=4.0, fl_gamma=0.0, hsv_h=0.015,
hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0.1, scale=0.5,
shear=0.0, perspective=0.0, flipud=0.0, fliplr=0.5, mosaic=1.0,
mixup=0.0, copy_paste=0.0
Comet: run 'pip install comet_ml' to automatically track and
visualize YOLOv5 🚀 runs in Comet
TensorBoard: Start with 'tensorboard --logdir yolov5/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, 4.34MB/s]
```

```
Downloading
https://github.com/ultralytics/yolov5/releases/download/v7.0/yolov5s
.pt to yolov5s.pt...
100% 14.1M/14.1M [00:00<00:00, 41.4MB/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, 128, 2]
  5                -1  1    295424  models.common.Conv
[128, 256, 3, 2]
  6                -1  3    625152  models.common.C3
[256, 256, 3]
  7                -1  1   1180672  models.common.Conv
[256, 512, 3, 2]
  8                -1  1   1182720  models.common.C3
[512, 512, 1]
  9                -1  1    656896  models.common.SPPF
[512, 512, 5]
 10                -1  1    131584  models.common.Conv
[512, 256, 1, 1]
 11                -1  1         0
torch.nn.modules.upsampling.Upsample    [None, 2, 'nearest']
 12           [-1, 6]  1         0  models.common.Concat
[1]
 13                -1  1    361984  models.common.C3
[512, 256, 1, False]
 14                -1  1     33024  models.common.Conv
[256, 128, 1, 1]
 15                -1  1         0
torch.nn.modules.upsampling.Upsample    [None, 2, 'nearest']
 16           [-1, 4]  1         0  models.common.Concat
[1]
 17                -1  1     90880  models.common.C3
[256, 128, 1, False]
 18                -1  1    147712  models.common.Conv
[128, 128, 3, 2]
```

```
 19          [-1, 14]  1         0  models.common.Concat
[1]
 20                -1  1    296448  models.common.C3
[256, 256, 1, False]
 21                -1  1    590336  models.common.Conv
[256, 256, 3, 2]
 22          [-1, 10]  1         0  models.common.Concat
[1]
 23                -1  1   1182720  models.common.C3
[512, 512, 1, False]
 24      [17, 20, 23]  1     16182  models.yolo.Detect
[1, [[10, 13, 16, 30, 33, 23], [30, 61, 62, 45, 59, 119], [116, 90,
156, 198, 373, 326]], [128, 256, 512]]
Model summary: 214 layers, 7022326 parameters, 7022326 gradients,
15.9 GFLOPs

Transferred 343/349 items from yolov5s.pt
AMP: checks passed ✅
optimizer: SGD(lr=0.01) with parameter groups 57 weight(decay=0.0),
60 weight(decay=0.0005), 60 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/yolov5/HW4157A-1/train/labels... 150
images, 0 backgrounds, 0 corrupt: 100% 150/150 [00:00<00:00,
1637.62it/s]
train: New cache created:
/content/yolov5/HW4157A-1/train/labels.cache
val: Scanning /content/yolov5/HW4157A-1/valid/labels... 36 images, 0
backgrounds, 0 corrupt: 100% 36/36 [00:00<00:00, 515.01it/s]
val: New cache created: /content/yolov5/HW4157A-1/valid/labels.cache

AutoAnchor: 3.68 anchors/target, 1.000 Best Possible Recall (BPR).
Current anchors are a good fit to dataset ✅
Plotting labels to yolov5/runs/train/exp/labels.jpg...
Image sizes 640 train, 640 val
Using 2 dataloader workers
Logging results to yolov5/runs/train/exp
Starting training for 50 epochs...

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       0/49      3.46G     0.1198    0.02984          0          9
640: 100% 10/10 [00:09<00:00,  1.03it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:04<00:00,  2.06s/it]
```

```
                   all         36         36   0.000741      0.222
0.000602   0.000141

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       1/49      4.27G     0.1071    0.02881          0         18
640: 100% 10/10 [00:02<00:00,  3.78it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.12it/s]
                   all         36         36    0.00287      0.861
0.0176    0.00325

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       2/49      4.27G    0.09269    0.02632          0          9
640: 100% 10/10 [00:03<00:00,  2.82it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:02<00:00,  1.11s/it]
                   all         36         36    0.00278      0.833
0.00977     0.0022

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       3/49      4.27G    0.08398    0.02687          0         13
640: 100% 10/10 [00:03<00:00,  3.06it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.84it/s]
                   all         36         36    0.00269      0.806
0.00381    0.00117

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       4/49      4.27G    0.07657     0.0236          0          8
640: 100% 10/10 [00:03<00:00,  3.06it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.81it/s]
                   all         36         36    0.00333          1
0.0479     0.0118

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       5/49      4.27G    0.06922     0.0224          0          8
640: 100% 10/10 [00:03<00:00,  2.88it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.41it/s]
                   all         36         36    0.00333          1
0.276     0.0721
```

```
      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       6/49      4.27G    0.06513    0.02236          0          9
640: 100% 10/10 [00:03<00:00,  2.88it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  2.00it/s]
                   all         36         36     0.0866          1
0.252     0.0791

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       7/49      4.27G    0.06257    0.02283          0         14
640: 100% 10/10 [00:02<00:00,  3.52it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.59it/s]
                   all         36         36     0.0645      0.472
0.0625     0.0139

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       8/49      4.27G    0.06579    0.01949          0         12
640: 100% 10/10 [00:03<00:00,  3.16it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.49it/s]
                   all         36         36       0.28      0.639
0.405      0.105

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
       9/49      4.27G    0.06311    0.02187          0         14
640: 100% 10/10 [00:04<00:00,  2.43it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.46it/s]
                   all         36         36      0.244      0.667
0.4      0.158

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      10/49      4.27G    0.05996    0.02026          0          9
640: 100% 10/10 [00:02<00:00,  3.67it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.61it/s]
                   all         36         36      0.147      0.806
0.248     0.0812
```

```
      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      11/49      4.27G    0.06046    0.01862          0          9
640: 100% 10/10 [00:02<00:00,  3.46it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.61it/s]
                   all         36         36      0.339      0.667
0.604      0.265

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      12/49      4.27G     0.0558    0.01861          0         11
640: 100% 10/10 [00:03<00:00,  2.50it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  3.51it/s]
                   all         36         36      0.448        0.5
0.479      0.182

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      13/49      4.27G    0.05731     0.0194          0          9
640: 100% 10/10 [00:03<00:00,  3.28it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.82it/s]
                   all         36         36      0.607      0.771
0.779       0.32

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      14/49      4.27G    0.05534    0.01746          0         11
640: 100% 10/10 [00:02<00:00,  3.50it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.90it/s]
                   all         36         36      0.585      0.694
0.645      0.286

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      15/49      4.27G    0.05453    0.01538          0          9
640: 100% 10/10 [00:04<00:00,  2.16it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.89it/s]
                   all         36         36      0.614      0.833
0.709      0.293

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
```

```
      16/49      4.27G    0.05162    0.01652          0         13
640: 100% 10/10 [00:02<00:00,  3.38it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.48it/s]
                   all         36         36       0.63       0.75
0.732      0.363

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      17/49      4.27G    0.05282     0.0168          0         13
640: 100% 10/10 [00:02<00:00,  3.52it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.84it/s]
                   all         36         36      0.689      0.864
0.813      0.373

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      18/49      4.27G     0.0511    0.01451          0          8
640: 100% 10/10 [00:04<00:00,  2.16it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.74it/s]
                   all         36         36      0.575      0.714
0.625      0.152

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      19/49      4.27G    0.05021    0.01673          0         12
640: 100% 10/10 [00:03<00:00,  2.96it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.51it/s]
                   all         36         36      0.728      0.722
0.823      0.372

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      20/49      4.27G    0.04654    0.01437          0          9
640: 100% 10/10 [00:02<00:00,  3.66it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.56it/s]
                   all         36         36      0.765      0.917
0.903      0.443

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      21/49      4.27G    0.04595    0.01311          0          8
640: 100% 10/10 [00:04<00:00,  2.28it/s]
```

```
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.70it/s]
                   all         36         36      0.892      0.806
0.885      0.285

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      22/49      4.27G    0.04816    0.01437          0         13
640: 100% 10/10 [00:03<00:00,  3.23it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.71it/s]
                   all         36         36      0.505      0.681
0.386      0.125

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      23/49      4.27G    0.04131    0.01221          0          7
640: 100% 10/10 [00:02<00:00,  3.50it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.51it/s]
                   all         36         36      0.849      0.806
0.734      0.259

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      24/49      4.27G    0.04639    0.01421          0         13
640: 100% 10/10 [00:03<00:00,  2.94it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.71it/s]
                   all         36         36       0.92      0.956
0.954      0.468

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      25/49      4.27G    0.04299    0.01186          0          9
640: 100% 10/10 [00:04<00:00,  2.30it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.68it/s]
                   all         36         36      0.992          1
0.995      0.496

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      26/49      4.27G    0.04497    0.01239          0         11
640: 100% 10/10 [00:02<00:00,  3.75it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.64it/s]
```

```
                 all         36         36      0.989          1
0.995      0.614

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      27/49      4.27G    0.04269    0.01248          0         10
640: 100% 10/10 [00:02<00:00,  3.61it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.87it/s]
                 all         36         36          1      0.996
0.995      0.611

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      28/49      4.27G    0.04277    0.01156          0          6
640: 100% 10/10 [00:04<00:00,  2.14it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.42it/s]
                 all         36         36      0.993          1
0.995      0.586

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      29/49      4.27G    0.03668    0.01131          0          8
640: 100% 10/10 [00:03<00:00,  3.03it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.64it/s]
                 all         36         36      0.937      0.917
0.91      0.332

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      30/49      4.27G     0.0397    0.01162          0          5
640: 100% 10/10 [00:03<00:00,  3.21it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.55it/s]
                 all         36         36      0.996      0.972
0.98      0.484

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      31/49      4.27G    0.03805    0.01112          0         12
640: 100% 10/10 [00:05<00:00,  1.97it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.79it/s]
                 all         36         36      0.999          1
0.995      0.563
```

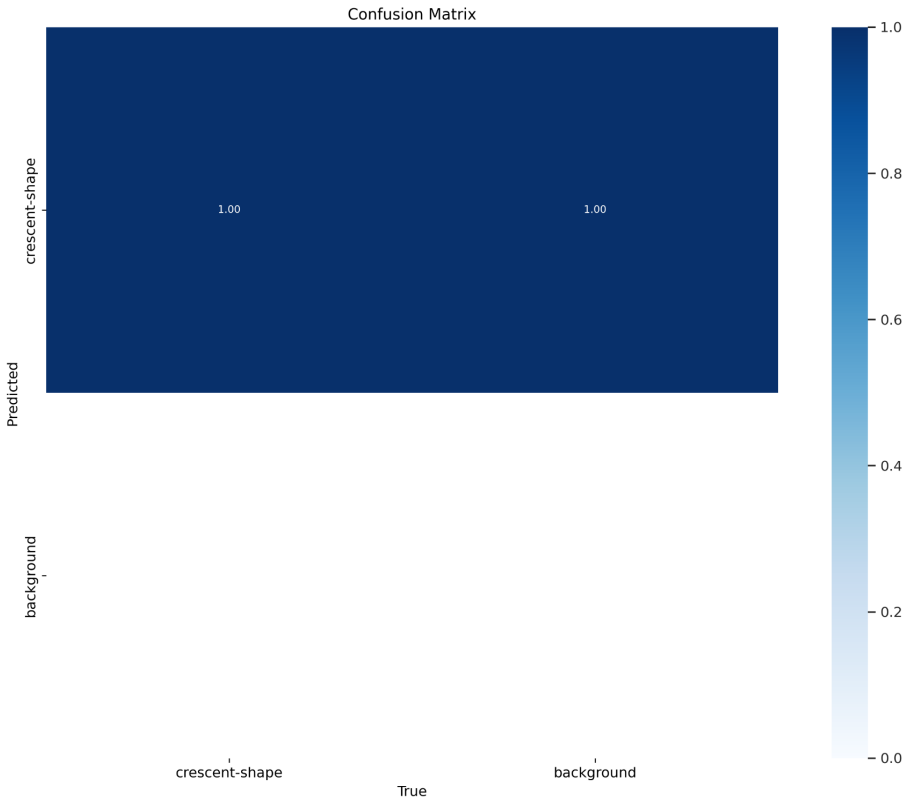
```
      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      32/49      4.27G    0.03941    0.01065          0         12
640: 100% 10/10 [00:02<00:00,  3.49it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.66it/s]
                   all         36         36      0.992          1
0.995      0.637

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      33/49      4.27G    0.03762    0.01013          0         12
640: 100% 10/10 [00:02<00:00,  3.54it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.49it/s]
                   all         36         36      0.999          1
0.995      0.501

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      34/49      4.27G    0.03782    0.01144          0         13
640: 100% 10/10 [00:04<00:00,  2.28it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.74it/s]
                   all         36         36          1      0.996
0.995      0.581

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      35/49      4.27G    0.03702    0.01108          0          8
640: 100% 10/10 [00:03<00:00,  3.13it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.86it/s]
                   all         36         36          1       0.97
0.993      0.656

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      36/49      4.27G    0.03522    0.01179          0         12
640: 100% 10/10 [00:02<00:00,  3.62it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.59it/s]
                   all         36         36      0.996          1
0.995      0.604
```

```
      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      37/49      4.27G    0.03668    0.01132          0          7
640: 100% 10/10 [00:04<00:00,  2.44it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.61it/s]
                   all         36         36      0.993          1
0.995      0.655

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      38/49      4.27G    0.03485    0.01077          0         13
640: 100% 10/10 [00:03<00:00,  2.59it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.65it/s]
                   all         36         36          1      0.964
0.99      0.654

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      39/49      4.27G    0.03562    0.01119          0         16
640: 100% 10/10 [00:03<00:00,  3.31it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.71it/s]
                   all         36         36      0.973      0.995
0.994      0.502

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      40/49      4.27G    0.03623    0.01184          0         11
640: 100% 10/10 [00:02<00:00,  3.52it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.62it/s]
                   all         36         36       0.97          1
0.994      0.657

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      41/49      4.27G    0.03578     0.0106          0          8
640: 100% 10/10 [00:04<00:00,  2.37it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.50it/s]
                   all         36         36      0.995          1
0.995      0.548

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
```

```
      42/49      4.27G    0.03296    0.01119          0         13
640: 100% 10/10 [00:02<00:00,  3.75it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.47it/s]
                   all         36         36      0.998          1
0.995      0.645

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      43/49      4.27G    0.03234    0.01113          0         15
640: 100% 10/10 [00:03<00:00,  3.23it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.03it/s]
                   all         36         36      0.996          1
0.995      0.681

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      44/49      4.27G    0.03206    0.01081          0         10
640: 100% 10/10 [00:04<00:00,  2.30it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.69it/s]
                   all         36         36      0.993          1
0.995      0.673

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      45/49      4.27G    0.03458    0.01073          0         12
640: 100% 10/10 [00:03<00:00,  3.26it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.73it/s]
                   all         36         36      0.997          1
0.995      0.625

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      46/49      4.27G    0.03016    0.01043          0          8
640: 100% 10/10 [00:02<00:00,  3.54it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.34it/s]
                   all         36         36      0.993          1
0.995      0.674

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      47/49      4.27G    0.03227    0.01019          0         12
640: 100% 10/10 [00:04<00:00,  2.30it/s]
```

```
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:01<00:00,  1.75it/s]
                   all         36         36      0.995          1
0.995      0.729

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      48/49      4.27G    0.03133    0.01079          0          4
640: 100% 10/10 [00:02<00:00,  3.34it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.39it/s]
                   all         36         36      0.995          1
0.995      0.721

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances
Size
      49/49      4.27G    0.03346    0.01027          0         10
640: 100% 10/10 [00:03<00:00,  3.30it/s]
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  2.48it/s]
                   all         36         36      0.996          1
0.995      0.699

50 epochs completed in 0.077 hours.
Optimizer stripped from yolov5/runs/train/exp/weights/last.pt,
14.4MB
Optimizer stripped from yolov5/runs/train/exp/weights/best.pt,
14.4MB

Validating yolov5/runs/train/exp/weights/best.pt...
Fusing layers...
Model summary: 157 layers, 7012822 parameters, 0 gradients, 15.8
GFLOPs
                 Class     Images  Instances          P          R
mAP50   mAP50-95: 100% 2/2 [00:00<00:00,  3.26it/s]
                   all         36         36      0.995          1
0.995      0.731
Results saved to yolov5/runs/train/exp
```

- **Submission: The confusion matrix image and the “val batch# pred.jpg” images.**



- **Submission: all test images with bounding boxes around all crescent defect and only around crescent defects.**