

# YOLOV11m

December 21, 2024

```
[1]: from ultralytics import YOLO
from ultralytics.engine.results import Results
from IPython.display import display, Image
```

```
[2]: import torch
torch.cuda.empty_cache()
assert torch.cuda.is_available()
print(torch.cuda.is_available())
print(torch.cuda.get_device_name(0))
```

True  
NVIDIA GeForce RTX 4060 Laptop GPU

```
[3]: model = YOLO('yolo11m.pt');
model.to('cuda');
```

Downloading  
<https://github.com/ultralytics/assets/releases/download/v8.3.0/yolo11m.pt> to  
'yolo11m.pt'...  
100%|  
| 38.8M/38.8M [00:01<00:00, 25.0MB/s]

```
[4]: data = "D:\Academics and University\Python\Intelligent Systems\Project 2\Welding Dataset\data.yaml"
```

```
[5]: results = model.train(data=data,batch=8,epoches=100,imgs=640,workers=0,device=0)
```

New <https://pypi.org/project/ultralytics/8.3.52> available Update with 'pip install -U ultralytics'  
Ultralytics 8.3.40 Python-3.11.11 torch-2.5.1 CUDA:0 (NVIDIA GeForce RTX 4060 Laptop GPU, 8188MiB)  
**engine\trainer:** task=detect, mode=train, model=yolo11m.pt,  
data=D:\Academics and University\Python\Intelligent Systems\Project 2\Welding Dataset\data.yaml, epoches=100, time=None, patience=100, batch=8, imgs=640,  
save=True, save\_period=-1, cache=False, device=0, workers=0, project=None,  
name=train36, exist\_ok=False, pretrained=True, optimizer=auto, verbose=True,  
seed=0, deterministic=True, single\_cls=False, rect=False, cos\_lr=False,  
close\_mosaic=10, resume=False, amp=True, fraction=1.0, profile=False,  
freeze=None, multi\_scale=False, overlap\_mask=True, mask\_ratio=4, dropout=0.0,

```

val=True, split=val, save_json=False, save_hybrid=False, conf=None, iou=0.7,
max_det=300, half=False, dnn=False, plots=True, source=None, vid_stride=1,
stream_buffer=False, visualize=False, augment=False, agnostic_nms=False,
classes=None, retina_masks=False, embed=None, show=False, save_frames=False,
save_txt=False, save_conf=False, save_crop=False, show_labels=True,
show_conf=True, show_boxes=True, line_width=None, format=torchscript,
keras=False, optimize=False, int8=False, dynamic=False, simplify=True,
opset=None, workspace=None, nms=False, 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=7.5, cls=0.5, df1=1.5, pose=12.0, kobj=1.0, nbs=64, 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, filplr=0.5, bgr=0.0, mosaic=1.0, mixup=0.0, copy_paste=0.0,
copy_paste_mode=flip, auto_augment=randaugment, erasing=0.4, crop_fraction=1.0,
cfg=None, tracker=botsort.yaml, save_dir=runs\detect\train36
Overriding model.yaml nc=80 with nc=3

```

	from	n	params	module
arguments				
0		-1 1	1856	ultralytics.nn.modules.conv.Conv
[3, 64, 3, 2]				
1		-1 1	73984	ultralytics.nn.modules.conv.Conv
[64, 128, 3, 2]				
2		-1 1	111872	ultralytics.nn.modules.block.C3k2
[128, 256, 1, True, 0.25]				
3		-1 1	590336	ultralytics.nn.modules.conv.Conv
[256, 256, 3, 2]				
4		-1 1	444928	ultralytics.nn.modules.block.C3k2
[256, 512, 1, True, 0.25]				
5		-1 1	2360320	ultralytics.nn.modules.conv.Conv
[512, 512, 3, 2]				
6		-1 1	1380352	ultralytics.nn.modules.block.C3k2
[512, 512, 1, True]				
7		-1 1	2360320	ultralytics.nn.modules.conv.Conv
[512, 512, 3, 2]				
8		-1 1	1380352	ultralytics.nn.modules.block.C3k2
[512, 512, 1, True]				
9		-1 1	656896	ultralytics.nn.modules.block.SPPF
[512, 512, 5]				
10		-1 1	990976	ultralytics.nn.modules.block.C2PSA
[512, 512, 1]				
11		-1 1	0	torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']				
12		[-1, 6] 1	0	ultralytics.nn.modules.conv.Concat
[1]				
13		-1 1	1642496	ultralytics.nn.modules.block.C3k2
[1024, 512, 1, True]				
14		-1 1	0	torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']				

```

15           [-1, 4]  1          0 ultralytics.nn.modules.conv.Concat
[1]
16           -1  1    542720 ultralytics.nn.modules.block.C3k2
[1024, 256, 1, True]
17           -1  1    590336 ultralytics.nn.modules.conv.Conv
[256, 256, 3, 2]
18           [-1, 13]  1          0 ultralytics.nn.modules.conv.Concat
[1]
19           -1  1   1511424 ultralytics.nn.modules.block.C3k2
[768, 512, 1, True]
20           -1  1   2360320 ultralytics.nn.modules.conv.Conv
[512, 512, 3, 2]
21           [-1, 10]  1          0 ultralytics.nn.modules.conv.Concat
[1]
22           -1  1   1642496 ultralytics.nn.modules.block.C3k2
[1024, 512, 1, True]
23           [16, 19, 22]  1   1413337 ultralytics.nn.modules.head.Detect
[3, [256, 512, 512]]
YOLO11m summary: 409 layers, 20,055,321 parameters, 20,055,305 gradients

```

```

Transferred 643/649 items from pretrained weights
Freezing layer 'model.23.dfl.conv.weight'
AMP: running Automatic Mixed Precision (AMP) checks...
AMP: checks passed

train: Scanning D:\Academics and University\Python\Intelligent
Systems\Project 2\Welding Dataset\train\labels.cache...
val: Scanning D:\Academics and University\Python\Intelligent
Systems\Project 2\Welding Dataset\valid\labels.cache... 28

```

```

Plotting labels to runs\detect\train36\labels.jpg...
optimizer: 'optimizer=auto' found, ignoring 'lr0=0.01' and
'momentum=0.937' and determining best 'optimizer', 'lr0' and 'momentum'
automatically...
optimizer: AdamW(lr=0.001429, momentum=0.9) with parameter groups
106 weight(decay=0.0), 113 weight(decay=0.0005), 112 bias(decay=0.0)
Image sizes 640 train, 640 val
Using 0 dataloader workers
Logging results to runs\detect\train36
Starting training for 100 epochs...

```

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
1/100	4.54G	2.144	2.881	1.919	14	640:
100%	203/203 [02:11<00:00,					
		Class	Images	Instances	Box(P	R
mAP50-95): 100%		18/18 [00:11				mAP50
	all	283	802	0.412	0.177	0.0622
0.0227						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
2/100 100%	4.72G   203/203 [01:43<00:00, mAP50-95): 100%	2.338 Class   18/18 [00:08 all 0.00499	2.934 Images   18/18 [00:08 283	2.117 Instances Box(P R	5	640: mAP50 0.0156

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
3/100 100%	4.71G   203/203 [01:39<00:00, mAP50-95): 100%	2.315 Class   18/18 [00:09 all 0.0183	2.923 Images   18/18 [00:09 283	2.088 Instances Box(P R	14	640: mAP50 0.0503

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
4/100 100%	4.72G   203/203 [01:39<00:00, mAP50-95): 100%	2.184 Class   18/18 [00:08 all 0.0394	2.847 Images   18/18 [00:08 283	2.003 Instances Box(P R	7	640: mAP50 0.103

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
5/100 100%	4.71G   203/203 [01:39<00:00, mAP50-95): 100%	2.144 Class   18/18 [00:08 all 0.0523	2.75 Images   18/18 [00:08 283	1.964 Instances Box(P R	10	640: mAP50 0.142

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
-------	---------	----------	----------	----------	-----------	------

6/100	4.71G	2.093	2.682	1.93	8	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.35	0.248	0.183
0.0775						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
7/100	4.73G	2.028	2.649	1.867	17	640:
100%	203/203 [01:37<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.239	0.287	0.187
0.0854						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
8/100	4.65G	1.977	2.527	1.83	13	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.553	0.316	0.215
0.1						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
9/100	4.72G	1.941	2.455	1.806	17	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.237	0.281	0.211
0.0943						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
10/100	4.72G	1.944	2.46	1.791	17	640:
100%	203/203 [01:40<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.594	0.281	0.235
0.108						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
11/100	4.72G	1.927	2.418	1.782	9	640:
100%	203/203 [01:39<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.568	0.271	0.223
0.0941						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
12/100	4.72G	1.905	2.37	1.767	13	640:
100%	203/203 [01:39<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.576	0.33	0.232
0.105						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
13/100	4.71G	1.878	2.331	1.759	19	640:
100%	203/203 [01:38<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.577	0.356	0.253
0.111						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
14/100	4.73G	1.87	2.341	1.747	19	640:
100%	203/203 [01:38<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.596	0.315	0.256
0.116						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
15/100 100%	4.71G   203/203 [01:38<00:00, mAP50-95): 100%	1.85 Class   18/18 [00:08 0.127	2.274	1.72	13	640:
			Box(P)	R	mAP50	
	all	283	802	0.587	0.339	0.282

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
16/100 100%	4.67G   203/203 [01:40<00:00, mAP50-95): 100%	1.819 Class   18/18 [00:08 0.138	2.241	1.703	19	640:
			Box(P)	R	mAP50	
	all	283	802	0.619	0.345	0.291

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
17/100 100%	4.72G   203/203 [01:37<00:00, mAP50-95): 100%	1.815 Class   18/18 [00:08 0.14	2.225	1.699	4	640:
			Box(P)	R	mAP50	
	all	283	802	0.387	0.352	0.285

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
18/100 100%	4.72G   203/203 [01:38<00:00, mAP50-95): 100%	1.787 Class   18/18 [00:08 0.123	2.147	1.665	14	640:
			Box(P)	R	mAP50	
	all	283	802	0.3	0.406	0.262

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
-------	---------	----------	----------	----------	-----------	------

19/100	4.72G	1.787	2.171	1.689	22	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.317	0.317	0.26
0.121						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
20/100	4.72G	1.803	2.169	1.69	11	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.346	0.381	0.317
0.156						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
21/100	4.73G	1.777	2.161	1.673	14	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.302	0.413	0.316
0.157						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
22/100	4.72G	1.759	2.089	1.654	9	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.405	0.414	0.336
0.163						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
23/100	4.72G	1.762	2.095	1.677	12	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.428	0.41	0.355
0.172						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
24/100	4.67G	1.737	2.068	1.658	9	640:
100%	203/203 [01:38<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.366	0.418	0.362
0.191						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
25/100	4.72G	1.736	2.04	1.635	16	640:
100%	203/203 [01:38<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.366	0.416	0.369
0.191						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
26/100	4.72G	1.708	2.008	1.615	17	640:
100%	203/203 [01:37<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:07					mAP50
	all	283	802	0.388	0.458	0.369
0.19						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
27/100	4.72G	1.698	1.991	1.622	12	640:
100%	203/203 [01:37<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.367	0.468	0.366
0.194						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
28/100 100%	4.72G   203/203 [01:37<00:00, mAP50-95): 100%	1.692 Class   18/18 [00:08 0.184	1.969 Images   18/18 [00:08	1.6 Instances Box(P)	25 R	640: mAP50
	all	283	802	0.459	0.417	0.379

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
29/100 100%	4.72G   203/203 [01:38<00:00, mAP50-95): 100%	1.678 Class   18/18 [00:08 0.19	1.974 Images   18/18 [00:08	1.609 Instances Box(P)	9 R	640: mAP50
	all	283	802	0.446	0.45	0.382

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
30/100 100%	4.72G   203/203 [01:39<00:00, mAP50-95): 100%	1.701 Class   18/18 [00:08 0.214	1.942 Images   18/18 [00:08	1.615 Instances Box(P)	20 R	640: mAP50
	all	283	802	0.413	0.444	0.401

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
31/100 100%	4.72G   203/203 [01:39<00:00, mAP50-95): 100%	1.646 Class   18/18 [00:08 0.203	1.915 Images   18/18 [00:08	1.576 Instances Box(P)	18 R	640: mAP50
	all	283	802	0.378	0.488	0.388

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
-------	---------	----------	----------	----------	-----------	------

32/100	4.67G	1.665	1.903	1.6	17	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.443	0.461	0.38
0.194						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
33/100	4.73G	1.659	1.905	1.587	13	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.442	0.451	0.398
0.208						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
34/100	4.72G	1.656	1.882	1.581	5	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.412	0.477	0.39
0.208						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
35/100	4.73G	1.631	1.828	1.559	9	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.429	0.496	0.438
0.235						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
36/100	4.72G	1.614	1.848	1.565	13	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.401	0.509	0.405
0.218						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
37/100	4.72G	1.614	1.833	1.564	13	640:
100%	203/203 [01:37<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.449	0.475	0.422
0.227						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
38/100	4.72G	1.607	1.798	1.537	7	640:
100%	203/203 [01:38<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.47	0.494	0.447
0.243						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
39/100	4.72G	1.604	1.811	1.558	18	640:
100%	203/203 [01:38<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.48	0.517	0.477
0.258						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
40/100	4.67G	1.589	1.784	1.528	15	640:
100%	203/203 [01:39<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.444	0.542	0.461
0.248						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
41/100 100%	4.72G   203/203 [01:39<00:00, mAP50-95): 100%	1.598 Class   18/18 [00:08 all 0.247	1.789	1.539	18	640:
			Box(P)	R	mAP50	
		283	802	0.49	0.506	0.457

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
42/100 100%	4.72G   203/203 [01:39<00:00, mAP50-95): 100%	1.563 Class   18/18 [00:08 all 0.266	1.76	1.517	16	640:
			Box(P)	R	mAP50	
		283	802	0.463	0.528	0.475

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
43/100 100%	4.72G   203/203 [01:40<00:00, mAP50-95): 100%	1.567 Class   18/18 [00:08 all 0.268	1.727	1.521	13	640:
			Box(P)	R	mAP50	
		283	802	0.458	0.54	0.485

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
44/100 100%	4.72G   203/203 [01:40<00:00, mAP50-95): 100%	1.571 Class   18/18 [00:08 all 0.266	1.703	1.518	13	640:
			Box(P)	R	mAP50	
		283	802	0.505	0.531	0.489

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
-------	---------	----------	----------	----------	-----------	------

45/100	4.71G	1.561	1.726	1.52	27	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.482	0.514	0.478
0.265						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
46/100	4.72G	1.538	1.696	1.501	4	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.401	0.562	0.451
0.255						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
47/100	4.71G	1.534	1.674	1.494	16	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.512	0.482	0.483
0.269						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
48/100	4.66G	1.536	1.654	1.508	9	640:
100%	203/203 [01:58<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.455	0.552	0.471
0.266						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
49/100	4.72G	1.525	1.643	1.505	11	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.473	0.578	0.51
0.288						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
50/100	4.72G	1.521	1.651	1.492	17	640:
100%	203/203 [01:39<00:00,	Class	Images	Instances	Box(P)	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.438	0.579	0.49
0.279						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
51/100	4.73G	1.522	1.623	1.503	10	640:
100%	203/203 [01:39<00:00,	Class	Images	Instances	Box(P)	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.547	0.526	0.536
0.313						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
52/100	4.72G	1.486	1.594	1.476	23	640:
100%	203/203 [01:39<00:00,	Class	Images	Instances	Box(P)	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.488	0.598	0.509
0.291						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
53/100	4.72G	1.492	1.578	1.461	18	640:
100%	203/203 [01:38<00:00,	Class	Images	Instances	Box(P)	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.444	0.564	0.485
0.279						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
54/100 100%	4.73G   203/203 [01:39<00:00, mAP50-95): 100%	1.472 Class   18/18 [00:08 all 0.309	1.581	1.47	13	640:
			Box(P)	R	mAP50	
		283	802	0.549	0.547	0.544

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
55/100 100%	4.71G   203/203 [01:38<00:00, mAP50-95): 100%	1.481 Class   18/18 [00:07 all 0.316	1.588	1.473	11	640:
			Box(P)	R	mAP50	
		283	802	0.537	0.571	0.54

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
56/100 100%	4.67G   203/203 [01:37<00:00, mAP50-95): 100%	1.463 Class   18/18 [00:07 all 0.311	1.557	1.468	26	640:
			Box(P)	R	mAP50	
		283	802	0.563	0.527	0.533

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
57/100 100%	4.72G   203/203 [01:38<00:00, mAP50-95): 100%	1.452 Class   18/18 [00:08 all 0.325	1.555	1.45	18	640:
			Box(P)	R	mAP50	
		283	802	0.526	0.581	0.569

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
-------	---------	----------	----------	----------	-----------	------

58/100	4.71G	1.46	1.543	1.462	11	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.52	0.595	0.568
0.328						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
59/100	4.73G	1.473	1.537	1.469	28	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.503	0.603	0.545
0.321						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
60/100	4.71G	1.443	1.523	1.446	16	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.547	0.569	0.572
0.324						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
61/100	4.71G	1.438	1.485	1.444	20	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.506	0.592	0.566
0.329						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
62/100	4.72G	1.413	1.461	1.417	12	640:
100%	203/203 [01:37<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.517	0.579	0.555
0.323						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
63/100	4.71G	1.442	1.463	1.438	19	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%		18/18 [00:07				
	all	283	802	0.489	0.607	0.545
0.323						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
64/100	4.67G	1.419	1.493	1.431	23	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%		18/18 [00:08				
	all	283	802	0.602	0.563	0.576
0.349						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
65/100	4.71G	1.403	1.435	1.417	20	640:
100%	203/203 [01:40<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%		18/18 [00:08				
	all	283	802	0.565	0.555	0.578
0.344						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
66/100	4.71G	1.39	1.446	1.405	8	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%		18/18 [00:08				
	all	283	802	0.608	0.577	0.575
0.339						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
67/100 100%	4.72G   203/203 [01:37<00:00, mAP50-95): 100%	1.389 Class   18/18 [00:08 0.332	1.413 Images   18/18 [00:08	1.407 Instances all	17 Box(P R	640: mAP50 0.569

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
68/100 100%	4.71G   203/203 [01:38<00:00, mAP50-95): 100%	1.377 Class   18/18 [00:08 0.348	1.41 Images   18/18 [00:08	1.402 Instances all	12 Box(P R	640: mAP50 0.581

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
69/100 100%	4.75G   203/203 [01:39<00:00, mAP50-95): 100%	1.372 Class   18/18 [00:08 0.351	1.378 Images   18/18 [00:08	1.398 Instances all	12 Box(P R	640: mAP50 0.586

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
70/100 100%	4.73G   203/203 [01:38<00:00, mAP50-95): 100%	1.357 Class   18/18 [00:07 0.349	1.381 Images   18/18 [00:07	1.385 Instances all	12 Box(P R	640: mAP50 0.591

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
-------	---------	----------	----------	----------	-----------	------

71/100	4.72G	1.322	1.343	1.36	8	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.585	0.613	0.61
0.365						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
72/100	4.67G	1.34	1.344	1.379	23	640:
100%	203/203 [01:40<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.558	0.595	0.605
0.367						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
73/100	4.72G	1.33	1.329	1.373	6	640:
100%	203/203 [01:40<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.614	0.591	0.624
0.372						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
74/100	4.72G	1.35	1.359	1.384	13	640:
100%	203/203 [01:41<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.611	0.612	0.628
0.375						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
75/100	4.72G	1.304	1.302	1.353	6	640:
100%	203/203 [01:40<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.61	0.598	0.612
0.376						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
76/100 100%	4.72G   203/203 [01:39<00:00,	1.309	1.299	1.35	5	640: mAP50-95): 100%   18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.589	0.62	0.616
0.385						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
77/100 100%	4.72G   203/203 [01:38<00:00,	1.317	1.305	1.369	20	640: mAP50-95): 100%   18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.545	0.649	0.599
0.368						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
78/100 100%	4.71G   203/203 [01:39<00:00,	1.305	1.264	1.343	13	640: mAP50-95): 100%   18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.561	0.645	0.603
0.367						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
79/100 100%	4.71G   203/203 [01:39<00:00,	1.293	1.255	1.332	10	640: mAP50-95): 100%   18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.634	0.626	0.644
0.392						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
80/100 100%	4.66G   203/203 [01:38<00:00, mAP50-95): 100%	1.272 Class   18/18 [00:07 all 0.387	1.258 Images   18/18 [00:07 283	1.328 Instances Box(P R	10 mAP50 0.624	640: mAP50 0.634
			802	0.623		

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
81/100 100%	4.73G   203/203 [01:39<00:00, mAP50-95): 100%	1.284 Class   18/18 [00:08 all 0.383	1.249 Images   18/18 [00:08 283	1.336 Instances Box(P R	18 mAP50 0.631	640: mAP50 0.626
			802	0.576		

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
82/100 100%	4.72G   203/203 [01:40<00:00, mAP50-95): 100%	1.271 Class   18/18 [00:08 all 0.386	1.246 Images   18/18 [00:08 283	1.338 Instances Box(P R	14 mAP50 0.621	640: mAP50 0.63
			802	0.6		

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
83/100 100%	4.72G   203/203 [01:39<00:00, mAP50-95): 100%	1.252 Class   18/18 [00:08 all 0.39	1.201 Images   18/18 [00:08 283	1.317 Instances Box(P R	11 mAP50 0.648	640: mAP50 0.634
			802	0.609		

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
-------	---------	----------	----------	----------	-----------	------

84/100	4.71G	1.246	1.185	1.319	11	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.632	0.622	0.641
0.392						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
85/100	4.72G	1.24	1.195	1.317	15	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.642	0.61	0.636
0.392						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
86/100	4.71G	1.236	1.173	1.305	24	640:
100%	203/203 [01:40<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.629	0.628	0.648
0.401						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
87/100	4.71G	1.217	1.162	1.299	7	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.577	0.656	0.636
0.392						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
88/100	4.66G	1.208	1.152	1.299	18	640:
100%	203/203 [01:38<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.599	0.658	0.661
0.41						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
89/100	4.71G	1.195	1.152	1.291	14	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances		Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.615	0.654	0.662
0.419						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
90/100	4.71G	1.205	1.148	1.289	4	640:
100%	203/203 [01:39<00:00,					
	Class	Images	Instances		Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.657	0.639	0.669
0.419						

Closing dataloader mosaic

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
91/100	4.72G	1.164	1.06	1.31	16	640:
100%	203/203 [01:36<00:00,					
	Class	Images	Instances		Box(P	R
mAP50-95): 100%	18/18 [00:07					mAP50
	all	283	802	0.595	0.678	0.657
0.407						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
92/100	4.71G	1.147	1.015	1.301	4	640:
100%	203/203 [01:36<00:00,					
	Class	Images	Instances		Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.613	0.668	0.657
0.414						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
93/100 100%	4.71G   203/203 [01:37<00:00, mAP50-95): 100%	1.126 Class   18/18 [00:08 all 0.414	0.9969	1.289	6	640: R mAP50
		283	802	0.648	0.629	0.657

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
94/100 100%	4.71G   203/203 [01:38<00:00, mAP50-95): 100%	1.11 Class   18/18 [00:08 all 0.423	0.9774	1.276	7	640: R mAP50
		283	802	0.657	0.647	0.673

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
95/100 100%	4.71G   203/203 [01:37<00:00, mAP50-95): 100%	1.101 Class   18/18 [00:08 all 0.429	0.9853	1.27	6	640: R mAP50
		283	802	0.652	0.671	0.679

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
96/100 100%	4.67G   203/203 [01:36<00:00, mAP50-95): 100%	1.101 Class   18/18 [00:08 all 0.432	0.958	1.274	4	640: R mAP50
		283	802	0.684	0.654	0.686

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
-------	---------	----------	----------	----------	-----------	------

97/100	4.72G	1.08	0.9409	1.261	10	640:
100%	203/203 [01:37<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.667	0.657	0.679
0.435						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
98/100	4.72G	1.087	0.9387	1.267	6	640:
100%	203/203 [01:36<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:07					
	all	283	802	0.678	0.649	0.684
0.438						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
99/100	4.72G	1.07	0.9269	1.254	9	640:
100%	203/203 [01:36<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.679	0.654	0.685
0.434						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
100/100	4.71G	1.073	0.9387	1.258	5	640:
100%	203/203 [01:35<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:07					
	all	283	802	0.676	0.657	0.685
0.435						

100 epochs completed in 3.041 hours.

Optimizer stripped from runs\detect\train36\weights\last.pt, 40.5MB  
 Optimizer stripped from runs\detect\train36\weights\best.pt, 40.5MB

Validating runs\detect\train36\weights\best.pt...

```

Ultralytics 8.3.40 Python-3.11.11 torch-2.5.1 CUDA:0 (NVIDIA GeForce RTX 4060
Laptop GPU, 8188MiB)
YOLOv1m summary (fused): 303 layers, 20,032,345 parameters, 0 gradients

      Class    Images Instances     Box(P)      R    mAP50
mAP50-95): 100% | 18/18 [00:09

          all       283      802     0.673     0.659     0.684
0.438
          Bad Weld   141      194     0.69      0.792     0.771
0.533
          Good Weld  175      335     0.753     0.761     0.807
0.559
          Defect     128      273     0.576     0.423     0.475
0.22

Speed: 0.2ms preprocess, 8.1ms inference, 0.0ms loss, 2.2ms postprocess per
image
Results saved to runs\detect\train36

```

[6]: model.val(data=data)

```

Ultralytics 8.3.40 Python-3.11.11 torch-2.5.1 CUDA:0 (NVIDIA GeForce RTX 4060
Laptop GPU, 8188MiB)
YOLOv1m summary (fused): 303 layers, 20,032,345 parameters, 0 gradients

val: Scanning D:\Academics and University\Python\Intelligent
Systems\Project 2\Welding Dataset\valid\labels.cache... 28
      Class    Images Instances     Box(P)      R    mAP50
mAP50-95): 100% | 36/36 [00:10

          all       283      802     0.68      0.649     0.685
0.439
          Bad Weld   141      194     0.688     0.784     0.771
0.537
          Good Weld  175      335     0.758     0.755     0.807
0.561
          Defect     128      273     0.594     0.407     0.478
0.219

Speed: 0.6ms preprocess, 14.3ms inference, 0.0ms loss, 2.0ms postprocess per
image
Results saved to runs\detect\train362

```

[6]: ultralytics.utils.metrics.DetMetrics object with attributes:

```

ap_class_index: array([0, 1, 2])
box: ultralytics.utils.metrics.Metric object
confusion_matrix: <ultralytics.utils.metrics.ConfusionMatrix object at
0x0000023A8B03D690>
curves: ['Precision-Recall(B)', 'F1-Confidence(B)', 'Precision-Confidence(B)', 'Recall-Confidence(B)']

```

```

curves_results: [[array([
    0,      0.001001,      0.002002,      0.003003,
0.004004,      0.005005,      0.006006,      0.007007,      0.008008,      0.009009,
0.01001,      0.011011,      0.012012,      0.013013,      0.014014,      0.015015,
0.016016,      0.017017,      0.018018,      0.019019,      0.02002,      0.021021,
0.022022,      0.023023,
    0.024024,      0.025025,      0.026026,      0.027027,      0.028028,
0.029029,      0.03003,      0.031031,      0.032032,      0.033033,      0.034034,
0.035035,      0.036036,      0.037037,      0.038038,      0.039039,      0.04004,
0.041041,      0.042042,      0.043043,      0.044044,      0.045045,      0.046046,
0.047047,
    0.048048,      0.049049,      0.05005,      0.051051,      0.052052,
0.053053,      0.054054,      0.055055,      0.056056,      0.057057,      0.058058,
0.059059,      0.06006,      0.061061,      0.062062,      0.063063,      0.064064,
0.065065,      0.066066,      0.067067,      0.068068,      0.069069,      0.07007,
0.071071,
    0.072072,      0.073073,      0.074074,      0.075075,      0.076076,
0.077077,      0.078078,      0.079079,      0.08008,      0.081081,      0.082082,
0.083083,      0.084084,      0.085085,      0.086086,      0.087087,      0.088088,
0.089089,      0.09009,      0.091091,      0.092092,      0.093093,      0.094094,
0.095095,
    0.096096,      0.097097,      0.098098,      0.099099,      0.1001,
0.1011,      0.1021,      0.1031,      0.1041,      0.10511,      0.10611,
0.10711,      0.10811,      0.10911,      0.11011,      0.11111,      0.11211,
0.11311,      0.11411,      0.11512,      0.11612,      0.11712,      0.11812,
0.11912,
    0.12012,      0.12112,      0.12212,      0.12312,      0.12412,
0.12513,      0.12613,      0.12713,      0.12813,      0.12913,      0.13013,
0.13113,      0.13213,      0.13313,      0.13413,      0.13514,      0.13614,
0.13714,      0.13814,      0.13914,      0.14014,      0.14114,      0.14214,
0.14314,
    0.14414,      0.14515,      0.14615,      0.14715,      0.14815,
0.14915,      0.15015,      0.15115,      0.15215,      0.15315,      0.15415,
0.15516,      0.15616,      0.15716,      0.15816,      0.15916,      0.16016,
0.16116,      0.16216,      0.16316,      0.16416,      0.16517,      0.16617,
0.16717,
    0.16817,      0.16917,      0.17017,      0.17117,      0.17217,
0.17317,      0.17417,      0.17518,      0.17618,      0.17718,      0.17818,
0.17918,      0.18018,      0.18118,      0.18218,      0.18318,      0.18418,
0.18519,      0.18619,      0.18719,      0.18819,      0.18919,      0.19019,
0.19119,
    0.19219,      0.19319,      0.19419,      0.1952,      0.1962,
0.1972,      0.1982,      0.1992,      0.2002,      0.2012,      0.2022,
0.2032,      0.2042,      0.20521,      0.20621,      0.20721,      0.20821,
0.20921,      0.21021,      0.21121,      0.21221,      0.21321,      0.21421,
0.21522,
    0.21622,      0.21722,      0.21822,      0.21922,      0.22022,
0.22122,      0.22222,      0.22322,      0.22422,      0.22523,      0.22623,
])
])

```

0.22723,	0.22823,	0.22923,	0.23023,	0.23123,	0.23223,
0.23323,	0.23423,	0.23524,	0.23624,	0.23724,	0.23824,
0.23924,					
	0.24024,	0.24124,	0.24224,	0.24324,	0.24424,
0.24525,	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,
0.25125,	0.25225,	0.25325,	0.25425,	0.25526,	0.25626,
0.25726,	0.25826,	0.25926,	0.26026,	0.26126,	0.26226,
0.26326,					
	0.26426,	0.26527,	0.26627,	0.26727,	0.26827,
0.26927,	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,
0.27528,	0.27628,	0.27728,	0.27828,	0.27928,	0.28028,
0.28128,	0.28228,	0.28328,	0.28428,	0.28529,	0.28629,
0.28729,					
	0.28829,	0.28929,	0.29029,	0.29129,	0.29229,
0.29329,	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,
0.2993,	0.3003,	0.3013,	0.3023,	0.3033,	0.3043,
0.30531,	0.30631,	0.30731,	0.30831,	0.30931,	0.31031,
0.31131,					
	0.31231,	0.31331,	0.31431,	0.31532,	0.31632,
0.31732,	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,
0.32332,	0.32432,	0.32533,	0.32633,	0.32733,	0.32833,
0.32933,	0.33033,	0.33133,	0.33233,	0.33333,	0.33433,
0.33534,					
	0.33634,	0.33734,	0.33834,	0.33934,	0.34034,
0.34134,	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,
0.34735,	0.34835,	0.34935,	0.35035,	0.35135,	0.35235,
0.35335,	0.35435,	0.35536,	0.35636,	0.35736,	0.35836,
0.35936,					
	0.36036,	0.36136,	0.36236,	0.36336,	0.36436,
0.36537,	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,
0.37137,	0.37237,	0.37337,	0.37437,	0.37538,	0.37638,
0.37738,	0.37838,	0.37938,	0.38038,	0.38138,	0.38238,
0.38338,					
	0.38438,	0.38539,	0.38639,	0.38739,	0.38839,
0.38939,	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,
0.3954,	0.3964,	0.3974,	0.3984,	0.3994,	0.4004,
0.4014,	0.4024,	0.4034,	0.4044,	0.40541,	0.40641,
0.40741,					
	0.40841,	0.40941,	0.41041,	0.41141,	0.41241,
0.41341,	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,
0.41942,	0.42042,	0.42142,	0.42242,	0.42342,	0.42442,
0.42543,	0.42643,	0.42743,	0.42843,	0.42943,	0.43043,
0.43143,					
	0.43243,	0.43343,	0.43443,	0.43544,	0.43644,
0.43744,	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,
0.44344,	0.44444,	0.44545,	0.44645,	0.44745,	0.44845,
0.44945,	0.45045,	0.45145,	0.45245,	0.45345,	0.45445,

0.45546,					
	0.45646,	0.45746,	0.45846,	0.45946,	0.46046,
0.46146,	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,
0.46747,	0.46847,	0.46947,	0.47047,	0.47147,	0.47247,
0.47347,	0.47447,	0.47548,	0.47648,	0.47748,	0.47848,
0.47948,					
	0.48048,	0.48148,	0.48248,	0.48348,	0.48448,
0.48549,	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,
0.49149,	0.49249,	0.49349,	0.49449,	0.4955,	0.4965,
0.4975,	0.4985,	0.4995,	0.5005,	0.5015,	0.5025,
0.5035,					
	0.5045,	0.50551,	0.50651,	0.50751,	0.50851,
0.50951,	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,
0.51552,	0.51652,	0.51752,	0.51852,	0.51952,	0.52052,
0.52152,	0.52252,	0.52352,	0.52452,	0.52553,	0.52653,
0.52753,					
	0.52853,	0.52953,	0.53053,	0.53153,	0.53253,
0.53353,	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,
0.53954,	0.54054,	0.54154,	0.54254,	0.54354,	0.54454,
0.54555,	0.54655,	0.54755,	0.54855,	0.54955,	0.55055,
0.55155,					
	0.55255,	0.55355,	0.55455,	0.55556,	0.55656,
0.55756,	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,
0.56356,	0.56456,	0.56557,	0.56657,	0.56757,	0.56857,
0.56957,	0.57057,	0.57157,	0.57257,	0.57357,	0.57457,
0.57558,					
	0.57658,	0.57758,	0.57858,	0.57958,	0.58058,
0.58158,	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,
0.58759,	0.58859,	0.58959,	0.59059,	0.59159,	0.59259,
0.59359,	0.59459,	0.59556,	0.5966,	0.5976,	0.5986,
0.5996,					
	0.6006,	0.6016,	0.6026,	0.6036,	0.6046,
0.60561,	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,
0.61161,	0.61261,	0.61361,	0.61461,	0.61562,	0.61662,
0.61762,	0.61862,	0.61962,	0.62062,	0.62162,	0.62262,
0.62362,					
	0.62462,	0.62563,	0.62663,	0.62763,	0.62863,
0.62963,	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,
0.63564,	0.63664,	0.63764,	0.63864,	0.63964,	0.64064,
0.64164,	0.64264,	0.64364,	0.64464,	0.64565,	0.64665,
0.64765,					
	0.64865,	0.64965,	0.65065,	0.65165,	0.65265,
0.65365,	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,
0.65966,	0.66066,	0.66166,	0.66266,	0.66366,	0.66466,
0.66567,	0.66667,	0.66767,	0.66867,	0.66967,	0.67067,
0.67167,					
	0.67267,	0.67367,	0.67467,	0.67568,	0.67668,

0.67768,	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,
0.68368,	0.68468,	0.68569,	0.68669,	0.68769,	0.68869,
0.68969,	0.69069,	0.69169,	0.69269,	0.69369,	0.69469,
0.6957,					
	0.6967,	0.6977,	0.6987,	0.6997,	0.7007,
0.7017,	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,
0.70771,	0.70871,	0.70971,	0.71071,	0.71171,	0.71271,
0.71371,	0.71471,	0.71572,	0.71672,	0.71772,	0.71872,
0.71972,					
	0.72072,	0.72172,	0.72272,	0.72372,	0.72472,
0.72573,	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,
0.73173,	0.73273,	0.73373,	0.73473,	0.73574,	0.73674,
0.73774,	0.73874,	0.73974,	0.74074,	0.74174,	0.74274,
0.74374,					
	0.74474,	0.74575,	0.74675,	0.74775,	0.74875,
0.74975,	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,
0.75576,	0.75676,	0.75776,	0.75876,	0.75976,	0.76076,
0.76176,	0.76276,	0.76376,	0.76476,	0.76577,	0.76677,
0.76777,					
	0.76877,	0.76977,	0.77077,	0.77177,	0.77277,
0.77377,	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,
0.77978,	0.78078,	0.78178,	0.78278,	0.78378,	0.78478,
0.78579,	0.78679,	0.78779,	0.78879,	0.78979,	0.79079,
0.79179,					
	0.79279,	0.79379,	0.79479,	0.7958,	0.7968,
0.7978,	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,
0.8038,	0.8048,	0.80581,	0.80681,	0.80781,	0.80881,
0.80981,	0.81081,	0.81181,	0.81281,	0.81381,	0.81481,
0.81582,					
	0.81682,	0.81782,	0.81882,	0.81982,	0.82082,
0.82182,	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,
0.82783,	0.82883,	0.82983,	0.83083,	0.83183,	0.83283,
0.83383,	0.83483,	0.83584,	0.83684,	0.83784,	0.83884,
0.83984,					
	0.84084,	0.84184,	0.84284,	0.84384,	0.84484,
0.84585,	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,
0.85185,	0.85285,	0.85385,	0.85485,	0.85586,	0.85686,
0.85786,	0.85886,	0.85986,	0.86086,	0.86186,	0.86286,
0.86386,					
	0.86486,	0.86587,	0.86687,	0.86787,	0.86887,
0.86987,	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,
0.87588,	0.87688,	0.87788,	0.87888,	0.87988,	0.88088,
0.88188,	0.88288,	0.88388,	0.88488,	0.88589,	0.88689,
0.88789,					
	0.88889,	0.88989,	0.89089,	0.89189,	0.89289,
0.89389,	0.89489,	0.8959,	0.8969,	0.8979,	0.8989,
0.8999,	0.9009,	0.9019,	0.9029,	0.9039,	0.9049,

```

0.90591,      0.90691,      0.90791,      0.90891,      0.90991,      0.91091,
0.91191,
0.91291,      0.91391,      0.91491,      0.91592,      0.91692,
0.91792,      0.91892,      0.91992,      0.92092,      0.92192,      0.92292,
0.92392,      0.92492,      0.92593,      0.92693,      0.92793,      0.92893,
0.92993,      0.93093,      0.93193,      0.93293,      0.93393,      0.93493,
0.93594,
0.93694,      0.93794,      0.93894,      0.93994,      0.94094,
0.94194,      0.94294,      0.94394,      0.94494,      0.94595,      0.94695,
0.94795,      0.94895,      0.94995,      0.95095,      0.95195,      0.95295,
0.95395,      0.95495,      0.95596,      0.95696,      0.95796,      0.95896,
0.95996,
0.96096,      0.96196,      0.96296,      0.96396,      0.96496,
0.96597,      0.96697,      0.96797,      0.96897,      0.96997,      0.97097,
0.97197,      0.97297,      0.97397,      0.97497,      0.97598,      0.97698,
0.97798,      0.97898,      0.97998,      0.98098,      0.98198,      0.98298,
0.98398,
0.98498,      0.98599,      0.98699,      0.98799,      0.98899,
0.98999,      0.99099,      0.99199,      0.99299,      0.99399,      0.99499,
0.996,
0.997,        0.998,        0.999,        1], array([
1,           1,           1, ..., 0.02196,    0.01098,    0],
[            1,           1,           1, ..., 0.0056535, 0.0028268,
0],
[            1,           1,           1, ..., 0.00040921, 0.0002046,
0]),
'Recall', 'Precision'], [array([
0,           0.001001,   0.002002,
0.003003,    0.004004,    0.005005,    0.006006,    0.007007,    0.008008,
0.009009,    0.01001,     0.011011,    0.012012,    0.013013,    0.014014,
0.015015,    0.016016,    0.017017,    0.018018,    0.019019,    0.02002,
0.021021,    0.022022,    0.023023,
0.024024,    0.025025,    0.026026,    0.027027,    0.028028,
0.029029,    0.03003,     0.031031,    0.032032,    0.033033,    0.034034,
0.035035,    0.036036,    0.037037,    0.038038,    0.039039,    0.04004,
0.041041,    0.042042,    0.043043,    0.044044,    0.045045,    0.046046,
0.047047,
0.048048,    0.049049,    0.05005,     0.051051,    0.052052,
0.053053,    0.054054,    0.055055,    0.056056,    0.057057,    0.058058,
0.059059,    0.06006,     0.061061,    0.062062,    0.063063,    0.064064,
0.065065,    0.066066,    0.067067,    0.068068,    0.069069,    0.07007,
0.071071,
0.072072,    0.073073,    0.074074,    0.075075,    0.076076,
0.077077,    0.078078,    0.079079,    0.08008,     0.081081,    0.082082,
0.083083,    0.084084,    0.085085,    0.086086,    0.087087,    0.088088,
0.089089,    0.09009,     0.091091,    0.092092,    0.093093,    0.094094,
0.095095,
0.096096,    0.097097,    0.098098,    0.099099,    0.1001,
0.1011,      0.1021,      0.1031,      0.1041,      0.10511,    0.10611,
0.10711,     0.10811,     0.10911,     0.11011,     0.11111,    0.11211,

```

0.11311,	0.11411,	0.11512,	0.11612,	0.11712,	0.11812,
0.11912,	0.12012,	0.12112,	0.12212,	0.12312,	0.12412,
0.12513,	0.12613,	0.12713,	0.12813,	0.12913,	0.13013,
0.13113,	0.13213,	0.13313,	0.13413,	0.13514,	0.13614,
0.13714,	0.13814,	0.13914,	0.14014,	0.14114,	0.14214,
0.14314,	0.14414,	0.14515,	0.14615,	0.14715,	0.14815,
0.14915,	0.15015,	0.15115,	0.15215,	0.15315,	0.15415,
0.15516,	0.15616,	0.15716,	0.15816,	0.15916,	0.16016,
0.16116,	0.16216,	0.16316,	0.16416,	0.16517,	0.16617,
0.16717,	0.16817,	0.16917,	0.17017,	0.17117,	0.17217,
0.17317,	0.17417,	0.17518,	0.17618,	0.17718,	0.17818,
0.17918,	0.18018,	0.18118,	0.18218,	0.18318,	0.18418,
0.18519,	0.18619,	0.18719,	0.18819,	0.18919,	0.19019,
0.19119,	0.19219,	0.19319,	0.19419,	0.1952,	0.1962,
0.1972,	0.1982,	0.1992,	0.2002,	0.2012,	0.2022,
0.2032,	0.2042,	0.20521,	0.20621,	0.20721,	0.20821,
0.20921,	0.21021,	0.21121,	0.21221,	0.21321,	0.21421,
0.21522,	0.21622,	0.21722,	0.21822,	0.21922,	0.22022,
0.22122,	0.22222,	0.22322,	0.22422,	0.22523,	0.22623,
0.22723,	0.22823,	0.22923,	0.23023,	0.23123,	0.23223,
0.23323,	0.23423,	0.23524,	0.23624,	0.23724,	0.23824,
0.23924,	0.24024,	0.24124,	0.24224,	0.24324,	0.24424,
0.24525,	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,
0.25125,	0.25225,	0.25325,	0.25425,	0.25526,	0.25626,
0.25726,	0.25826,	0.25926,	0.26026,	0.26126,	0.26226,
0.26326,	0.26426,	0.26527,	0.26627,	0.26727,	0.26827,
0.26927,	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,
0.27528,	0.27628,	0.27728,	0.27828,	0.27928,	0.28028,
0.28128,	0.28228,	0.28328,	0.28428,	0.28529,	0.28629,
0.28729,	0.28829,	0.28929,	0.29029,	0.29129,	0.29229,
0.29329,	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,
0.2993,	0.3003,	0.3013,	0.3023,	0.3033,	0.3043,
0.30531,	0.30631,	0.30731,	0.30831,	0.30931,	0.31031,
0.31131,	0.31231,	0.31331,	0.31431,	0.31532,	0.31632,
0.31732,	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,
0.32332,	0.32432,	0.32533,	0.32633,	0.32733,	0.32833,
0.32933,	0.33033,	0.33133,	0.33233,	0.33333,	0.33433,
0.33534,					

	0.33634,	0.33734,	0.33834,	0.33934,	0.34034,
0.34134,	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,
0.34735,	0.34835,	0.34935,	0.35035,	0.35135,	0.35235,
0.35335,	0.35435,	0.35536,	0.35636,	0.35736,	0.35836,
0.35936,					
	0.36036,	0.36136,	0.36236,	0.36336,	0.36436,
0.36537,	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,
0.37137,	0.37237,	0.37337,	0.37437,	0.37538,	0.37638,
0.37738,	0.37838,	0.37938,	0.38038,	0.38138,	0.38238,
0.38338,					
	0.38438,	0.38539,	0.38639,	0.38739,	0.38839,
0.38939,	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,
0.3954,	0.3964,	0.3974,	0.3984,	0.3994,	0.4004,
0.4014,	0.4024,	0.4034,	0.4044,	0.40541,	0.40641,
0.40741,					
	0.40841,	0.40941,	0.41041,	0.41141,	0.41241,
0.41341,	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,
0.41942,	0.42042,	0.42142,	0.42242,	0.42342,	0.42442,
0.42543,	0.42643,	0.42743,	0.42843,	0.42943,	0.43043,
0.43143,					
	0.43243,	0.43343,	0.43443,	0.43544,	0.43644,
0.43744,	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,
0.44344,	0.44444,	0.44545,	0.44645,	0.44745,	0.44845,
0.44945,	0.45045,	0.45145,	0.45245,	0.45345,	0.45445,
0.45546,					
	0.45646,	0.45746,	0.45846,	0.45946,	0.46046,
0.46146,	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,
0.46747,	0.46847,	0.46947,	0.47047,	0.47147,	0.47247,
0.47347,	0.47447,	0.47548,	0.47648,	0.47748,	0.47848,
0.47948,					
	0.48048,	0.48148,	0.48248,	0.48348,	0.48448,
0.48549,	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,
0.49149,	0.49249,	0.49349,	0.49449,	0.4955,	0.4965,
0.4975,	0.4985,	0.4995,	0.5005,	0.5015,	0.5025,
0.5035,					
	0.5045,	0.50551,	0.50651,	0.50751,	0.50851,
0.50951,	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,
0.51552,	0.51652,	0.51752,	0.51852,	0.51952,	0.52052,
0.52152,	0.52252,	0.52352,	0.52452,	0.52553,	0.52653,
0.52753,					
	0.52853,	0.52953,	0.53053,	0.53153,	0.53253,
0.53353,	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,
0.53954,	0.54054,	0.54154,	0.54254,	0.54354,	0.54454,
0.54555,	0.54655,	0.54755,	0.54855,	0.54955,	0.55055,
0.55155,					
	0.55255,	0.55355,	0.55455,	0.55556,	0.55656,
0.55756,	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,

0.56356,	0.56456,	0.56557,	0.56657,	0.56757,	0.56857,
0.56957,	0.57057,	0.57157,	0.57257,	0.57357,	0.57457,
0.57558,					
	0.57658,	0.57758,	0.57858,	0.57958,	0.58058,
0.58158,	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,
0.58759,	0.58859,	0.58959,	0.59059,	0.59159,	0.59259,
0.59359,	0.59459,	0.59556,	0.5966,	0.5976,	0.5986,
0.5996,					
	0.6006,	0.6016,	0.6026,	0.6036,	0.6046,
0.60561,	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,
0.61161,	0.61261,	0.61361,	0.61461,	0.61562,	0.61662,
0.61762,	0.61862,	0.61962,	0.62062,	0.62162,	0.62262,
0.62362,					
	0.62462,	0.62563,	0.62663,	0.62763,	0.62863,
0.62963,	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,
0.63564,	0.63664,	0.63764,	0.63864,	0.63964,	0.64064,
0.64164,	0.64264,	0.64364,	0.64464,	0.64565,	0.64665,
0.64765,					
	0.64865,	0.64965,	0.65065,	0.65165,	0.65265,
0.65365,	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,
0.65966,	0.66066,	0.66166,	0.66266,	0.66366,	0.66466,
0.66567,	0.66667,	0.66767,	0.66867,	0.66967,	0.67067,
0.67167,					
	0.67267,	0.67367,	0.67467,	0.67568,	0.67668,
0.67768,	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,
0.68368,	0.68468,	0.68569,	0.68669,	0.68769,	0.68869,
0.68969,	0.69069,	0.69169,	0.69269,	0.69369,	0.69469,
0.6957,					
	0.6967,	0.6977,	0.6987,	0.6997,	0.7007,
0.7017,	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,
0.70771,	0.70871,	0.70971,	0.71071,	0.71171,	0.71271,
0.71371,	0.71471,	0.71572,	0.71672,	0.71772,	0.71872,
0.71972,					
	0.72072,	0.72172,	0.72272,	0.72372,	0.72472,
0.72573,	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,
0.73173,	0.73273,	0.73373,	0.73473,	0.73574,	0.73674,
0.73774,	0.73874,	0.73974,	0.74074,	0.74174,	0.74274,
0.74374,					
	0.74474,	0.74575,	0.74675,	0.74775,	0.74875,
0.74975,	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,
0.75576,	0.75676,	0.75776,	0.75876,	0.75976,	0.76076,
0.76176,	0.76276,	0.76376,	0.76476,	0.76577,	0.76677,
0.76777,					
	0.76877,	0.76977,	0.77077,	0.77177,	0.77277,
0.77377,	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,
0.77978,	0.78078,	0.78178,	0.78278,	0.78378,	0.78478,
0.78579,	0.78679,	0.78779,	0.78879,	0.78979,	0.79079,

0.79179,					
	0.79279,	0.79379,	0.79479,	0.7958,	0.7968,
0.7978,	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,
0.8038,	0.8048,	0.80581,	0.80681,	0.80781,	0.80881,
0.80981,	0.81081,	0.81181,	0.81281,	0.81381,	0.81481,
0.81582,					
	0.81682,	0.81782,	0.81882,	0.81982,	0.82082,
0.82182,	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,
0.82783,	0.82883,	0.82983,	0.83083,	0.83183,	0.83283,
0.83383,	0.83483,	0.83584,	0.83684,	0.83784,	0.83884,
0.83984,					
	0.84084,	0.84184,	0.84284,	0.84384,	0.84484,
0.84585,	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,
0.85185,	0.85285,	0.85385,	0.85485,	0.85586,	0.85686,
0.85786,	0.85886,	0.85986,	0.86086,	0.86186,	0.86286,
0.86386,					
	0.86486,	0.86587,	0.86687,	0.86787,	0.86887,
0.86987,	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,
0.87588,	0.87688,	0.87788,	0.87888,	0.87988,	0.88088,
0.88188,	0.88288,	0.88388,	0.88488,	0.88589,	0.88689,
0.88789,					
	0.88889,	0.88989,	0.89089,	0.89189,	0.89289,
0.89389,	0.89489,	0.8959,	0.8969,	0.8979,	0.8989,
0.8999,	0.9009,	0.9019,	0.9029,	0.9039,	0.9049,
0.90591,	0.90691,	0.90791,	0.90891,	0.90991,	0.91091,
0.91191,					
	0.91291,	0.91391,	0.91491,	0.91592,	0.91692,
0.91792,	0.91892,	0.91992,	0.92092,	0.92192,	0.92292,
0.92392,	0.92492,	0.92593,	0.92693,	0.92793,	0.92893,
0.92993,	0.93093,	0.93193,	0.93293,	0.93393,	0.93493,
0.93594,					
	0.93694,	0.93794,	0.93894,	0.93994,	0.94094,
0.94194,	0.94294,	0.94394,	0.94494,	0.94595,	0.94695,
0.94795,	0.94895,	0.94995,	0.95095,	0.95195,	0.95295,
0.95395,	0.95495,	0.95596,	0.95696,	0.95796,	0.95896,
0.95996,					
	0.96096,	0.96196,	0.96296,	0.96396,	0.96496,
0.96597,	0.96697,	0.96797,	0.96897,	0.96997,	0.97097,
0.97197,	0.97297,	0.97397,	0.97497,	0.97598,	0.97698,
0.97798,	0.97898,	0.97998,	0.98098,	0.98198,	0.98298,
0.98398,					
	0.98498,	0.98599,	0.98699,	0.98799,	0.98899,
0.98999,	0.99099,	0.99199,	0.99299,	0.99399,	0.99499,
0.996,	0.997,	0.998,	0.999,	1]), array([[	
0.28939,	0.28939,	0.34097, ...,	0,	0,	0],
[	0.14076,	0.14081,	0.185, ...,	0,	0,
0],					

	0.06202,	0.062041,	0.0836,	...,	0,	0,
0]]),	'Confidence',	'F1']],	[array([	0,	0.001001,	0.002002,
0.003003,	0.004004,	0.005005,	0.006006,	0.007007,	0.008008,	
0.009009,	0.01001,	0.011011,	0.012012,	0.013013,	0.014014,	
0.015015,	0.016016,	0.017017,	0.018018,	0.019019,	0.02002,	
0.021021,	0.022022,	0.023023,				
	0.024024,	0.025025,	0.026026,	0.027027,	0.028028,	
0.029029,	0.03003,	0.031031,	0.032032,	0.033033,	0.034034,	
0.035035,	0.036036,	0.037037,	0.038038,	0.039039,	0.04004,	
0.041041,	0.042042,	0.043043,	0.044044,	0.045045,	0.046046,	
0.047047,						
	0.048048,	0.049049,	0.05005,	0.051051,	0.052052,	
0.053053,	0.054054,	0.055055,	0.056056,	0.057057,	0.058058,	
0.059059,	0.06006,	0.061061,	0.062062,	0.063063,	0.064064,	
0.065065,	0.066066,	0.067067,	0.068068,	0.069069,	0.07007,	
0.071071,						
	0.072072,	0.073073,	0.074074,	0.075075,	0.076076,	
0.077077,	0.078078,	0.079079,	0.08008,	0.081081,	0.082082,	
0.083083,	0.084084,	0.085085,	0.086086,	0.087087,	0.088088,	
0.089089,	0.09009,	0.091091,	0.092092,	0.093093,	0.094094,	
0.095095,						
	0.096096,	0.097097,	0.098098,	0.099099,	0.1001,	
0.1011,	0.1021,	0.1031,	0.1041,	0.10511,	0.10611,	
0.10711,	0.10811,	0.10911,	0.11011,	0.11111,	0.11211,	
0.11311,	0.11411,	0.11512,	0.11612,	0.11712,	0.11812,	
0.11912,						
	0.12012,	0.12112,	0.12212,	0.12312,	0.12412,	
0.12513,	0.12613,	0.12713,	0.12813,	0.12913,	0.13013,	
0.13113,	0.13213,	0.13313,	0.13413,	0.13514,	0.13614,	
0.13714,	0.13814,	0.13914,	0.14014,	0.14114,	0.14214,	
0.14314,						
	0.14414,	0.14515,	0.14615,	0.14715,	0.14815,	
0.14915,	0.15015,	0.15115,	0.15215,	0.15315,	0.15415,	
0.15516,	0.15616,	0.15716,	0.15816,	0.15916,	0.16016,	
0.16116,	0.16216,	0.16316,	0.16416,	0.16517,	0.16617,	
0.16717,						
	0.16817,	0.16917,	0.17017,	0.17117,	0.17217,	
0.17317,	0.17417,	0.17518,	0.17618,	0.17718,	0.17818,	
0.17918,	0.18018,	0.18118,	0.18218,	0.18318,	0.18418,	
0.18519,	0.18619,	0.18719,	0.18819,	0.18919,	0.19019,	
0.19119,						
	0.19219,	0.19319,	0.19419,	0.1952,	0.1962,	
0.1972,	0.1982,	0.1992,	0.2002,	0.2012,	0.2022,	
0.2032,	0.2042,	0.20521,	0.20621,	0.20721,	0.20821,	
0.20921,	0.21021,	0.21121,	0.21221,	0.21321,	0.21421,	
0.21522,						
	0.21622,	0.21722,	0.21822,	0.21922,	0.22022,	

0.22122,	0.22222,	0.22322,	0.22422,	0.22523,	0.22623,
0.22723,	0.22823,	0.22923,	0.23023,	0.23123,	0.23223,
0.23323,	0.23423,	0.23524,	0.23624,	0.23724,	0.23824,
0.23924,					
	0.24024,	0.24124,	0.24224,	0.24324,	0.24424,
0.24525,	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,
0.25125,	0.25225,	0.25325,	0.25425,	0.25526,	0.25626,
0.25726,	0.25826,	0.25926,	0.26026,	0.26126,	0.26226,
0.26326,					
	0.26426,	0.26527,	0.26627,	0.26727,	0.26827,
0.26927,	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,
0.27528,	0.27628,	0.27728,	0.27828,	0.27928,	0.28028,
0.28128,	0.28228,	0.28328,	0.28428,	0.28529,	0.28629,
0.28729,					
	0.28829,	0.28929,	0.29029,	0.29129,	0.29229,
0.29329,	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,
0.2993,	0.3003,	0.3013,	0.3023,	0.3033,	0.3043,
0.30531,	0.30631,	0.30731,	0.30831,	0.30931,	0.31031,
0.31131,					
	0.31231,	0.31331,	0.31431,	0.31532,	0.31632,
0.31732,	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,
0.32332,	0.32432,	0.32533,	0.32633,	0.32733,	0.32833,
0.32933,	0.33033,	0.33133,	0.33233,	0.33333,	0.33433,
0.33534,					
	0.33634,	0.33734,	0.33834,	0.33934,	0.34034,
0.34134,	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,
0.34735,	0.34835,	0.34935,	0.35035,	0.35135,	0.35235,
0.35335,	0.35435,	0.35536,	0.35636,	0.35736,	0.35836,
0.35936,					
	0.36036,	0.36136,	0.36236,	0.36336,	0.36436,
0.36537,	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,
0.37137,	0.37237,	0.37337,	0.37437,	0.37538,	0.37638,
0.37738,	0.37838,	0.37938,	0.38038,	0.38138,	0.38238,
0.38338,					
	0.38438,	0.38539,	0.38639,	0.38739,	0.38839,
0.38939,	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,
0.3954,	0.3964,	0.3974,	0.3984,	0.3994,	0.4004,
0.4014,	0.4024,	0.4034,	0.4044,	0.40541,	0.40641,
0.40741,					
	0.40841,	0.40941,	0.41041,	0.41141,	0.41241,
0.41341,	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,
0.41942,	0.42042,	0.42142,	0.42242,	0.42342,	0.42442,
0.42543,	0.42643,	0.42743,	0.42843,	0.42943,	0.43043,
0.43143,					
	0.43243,	0.43343,	0.43443,	0.43544,	0.43644,
0.43744,	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,
0.44344,	0.44444,	0.44545,	0.44645,	0.44745,	0.44845,

0.44945,	0.45045,	0.45145,	0.45245,	0.45345,	0.45445,
0.45546,	0.45646,	0.45746,	0.45846,	0.45946,	0.46046,
0.46146,	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,
0.46747,	0.46847,	0.46947,	0.47047,	0.47147,	0.47247,
0.47347,	0.47447,	0.47548,	0.47648,	0.47748,	0.47848,
0.47948,	0.48048,	0.48148,	0.48248,	0.48348,	0.48448,
0.48549,	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,
0.49149,	0.49249,	0.49349,	0.49449,	0.4955,	0.4965,
0.4975,	0.4985,	0.4995,	0.5005,	0.5015,	0.5025,
0.5035,	0.5045,	0.50551,	0.50651,	0.50751,	0.50851,
0.50951,	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,
0.51552,	0.51652,	0.51752,	0.51852,	0.51952,	0.52052,
0.52152,	0.52252,	0.52352,	0.52452,	0.52553,	0.52653,
0.52753,	0.52853,	0.52953,	0.53053,	0.53153,	0.53253,
0.53353,	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,
0.53954,	0.54054,	0.54154,	0.54254,	0.54354,	0.54454,
0.54555,	0.54655,	0.54755,	0.54855,	0.54955,	0.55055,
0.55155,	0.55255,	0.55355,	0.55455,	0.55556,	0.55656,
0.55756,	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,
0.56356,	0.56456,	0.56557,	0.56657,	0.56757,	0.56857,
0.56957,	0.57057,	0.57157,	0.57257,	0.57357,	0.57457,
0.57558,	0.57658,	0.57758,	0.57858,	0.57958,	0.58058,
0.58158,	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,
0.58759,	0.58859,	0.58959,	0.59059,	0.59159,	0.59259,
0.59359,	0.59459,	0.5956,	0.5966,	0.5976,	0.5986,
0.5996,	0.6006,	0.6016,	0.6026,	0.6036,	0.6046,
0.60561,	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,
0.61161,	0.61261,	0.61361,	0.61461,	0.61562,	0.61662,
0.61762,	0.61862,	0.61962,	0.62062,	0.62162,	0.62262,
0.62362,	0.62462,	0.62563,	0.62663,	0.62763,	0.62863,
0.62963,	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,
0.63564,	0.63664,	0.63764,	0.63864,	0.63964,	0.64064,
0.64164,	0.64264,	0.64364,	0.64464,	0.64565,	0.64665,
0.64765,	0.64865,	0.64965,	0.65065,	0.65165,	0.65265,
0.65365,	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,
0.65966,	0.66066,	0.66166,	0.66266,	0.66366,	0.66466,
0.66567,	0.66667,	0.66767,	0.66867,	0.66967,	0.67067,
0.67167,					

	0.67267,	0.67367,	0.67467,	0.67568,	0.67668,
0.67768,	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,
0.68368,	0.68468,	0.68569,	0.68669,	0.68769,	0.68869,
0.68969,	0.69069,	0.69169,	0.69269,	0.69369,	0.69469,
0.6957,					
	0.6967,	0.6977,	0.6987,	0.6997,	0.7007,
0.7017,	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,
0.70771,	0.70871,	0.70971,	0.71071,	0.71171,	0.71271,
0.71371,	0.71471,	0.71572,	0.71672,	0.71772,	0.71872,
0.71972,					
	0.72072,	0.72172,	0.72272,	0.72372,	0.72472,
0.72573,	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,
0.73173,	0.73273,	0.73373,	0.73473,	0.73574,	0.73674,
0.73774,	0.73874,	0.73974,	0.74074,	0.74174,	0.74274,
0.74374,					
	0.74474,	0.74575,	0.74675,	0.74775,	0.74875,
0.74975,	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,
0.75576,	0.75676,	0.75776,	0.75876,	0.75976,	0.76076,
0.76176,	0.76276,	0.76376,	0.76476,	0.76577,	0.76677,
0.76777,					
	0.76877,	0.76977,	0.77077,	0.77177,	0.77277,
0.77377,	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,
0.77978,	0.78078,	0.78178,	0.78278,	0.78378,	0.78478,
0.78579,	0.78679,	0.78779,	0.78879,	0.78979,	0.79079,
0.79179,					
	0.79279,	0.79379,	0.79479,	0.7958,	0.7968,
0.7978,	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,
0.8038,	0.8048,	0.80581,	0.80681,	0.80781,	0.80881,
0.80981,	0.81081,	0.81181,	0.81281,	0.81381,	0.81481,
0.81582,					
	0.81682,	0.81782,	0.81882,	0.81982,	0.82082,
0.82182,	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,
0.82783,	0.82883,	0.82983,	0.83083,	0.83183,	0.83283,
0.83383,	0.83483,	0.83584,	0.83684,	0.83784,	0.83884,
0.83984,					
	0.84084,	0.84184,	0.84284,	0.84384,	0.84484,
0.84585,	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,
0.85185,	0.85285,	0.85385,	0.85485,	0.85586,	0.85686,
0.85786,	0.85886,	0.85986,	0.86086,	0.86186,	0.86286,
0.86386,					
	0.86486,	0.86587,	0.86687,	0.86787,	0.86887,
0.86987,	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,
0.87588,	0.87688,	0.87788,	0.87888,	0.87988,	0.88088,
0.88188,	0.88288,	0.88388,	0.88488,	0.88589,	0.88689,
0.88789,					
	0.88889,	0.88989,	0.89089,	0.89189,	0.89289,
0.89389,	0.89489,	0.8959,	0.8969,	0.8979,	0.8989,

```

0.8999,      0.9009,      0.9019,      0.9029,      0.9039,      0.9049,
0.90591,     0.90691,     0.90791,     0.90891,     0.90991,     0.91091,
0.91191,
0.91291,     0.91391,     0.91491,     0.91592,     0.91692,
0.91792,     0.91892,     0.91992,     0.92092,     0.92192,     0.92292,
0.92392,     0.92492,     0.92593,     0.92693,     0.92793,     0.92893,
0.92993,     0.93093,     0.93193,     0.93293,     0.93393,     0.93493,
0.93594,
0.93694,     0.93794,     0.93894,     0.93994,     0.94094,
0.94194,     0.94294,     0.94394,     0.94494,     0.94595,     0.94695,
0.94795,     0.94895,     0.94995,     0.95095,     0.95195,     0.95295,
0.95395,     0.95495,     0.95596,     0.95696,     0.95796,     0.95896,
0.95996,
0.96096,     0.96196,     0.96296,     0.96396,     0.96496,
0.96597,     0.96697,     0.96797,     0.96897,     0.96997,     0.97097,
0.97197,     0.97297,     0.97397,     0.97497,     0.97598,     0.97698,
0.97798,     0.97898,     0.97998,     0.98098,     0.98198,     0.98298,
0.98398,
0.98498,     0.98599,     0.98699,     0.98799,     0.98899,
0.98999,     0.99099,     0.99199,     0.99299,     0.99399,     0.99499,
0.996,       0.997,       0.998,       0.999,       1], array([[[
0.16963,     0.16963,     0.20665, ..., 1, 1, 1,
[ 0.075867,   0.075895,   0.10225, ..., 1, 1,
1,
[ 0.032195,   0.032207,   0.044033, ..., 1, 1,
1]), 'Confidence', 'Precision'], [array([
0.003003,     0.004004,     0.005005,     0.006006,     0.007007,     0.008008,
0.009009,     0.01001,      0.011011,     0.012012,     0.013013,     0.014014,
0.015015,     0.016016,     0.017017,     0.018018,     0.019019,     0.02002,
0.021021,     0.022022,     0.023023,
0.024024,     0.025025,     0.026026,     0.027027,     0.028028,
0.029029,     0.03003,      0.031031,     0.032032,     0.033033,     0.034034,
0.035035,     0.036036,     0.037037,     0.038038,     0.039039,     0.04004,
0.041041,     0.042042,     0.043043,     0.044044,     0.045045,     0.046046,
0.047047,
0.048048,     0.049049,     0.05005,      0.051051,     0.052052,
0.053053,     0.054054,     0.055055,     0.056056,     0.057057,     0.058058,
0.059059,     0.06006,      0.061061,     0.062062,     0.063063,     0.064064,
0.065065,     0.066066,     0.067067,     0.068068,     0.069069,     0.07007,
0.071071,
0.072072,     0.073073,     0.074074,     0.075075,     0.076076,
0.077077,     0.078078,     0.079079,     0.08008,      0.081081,     0.082082,
0.083083,     0.084084,     0.085085,     0.086086,     0.087087,     0.088088,
0.089089,     0.09009,      0.091091,     0.092092,     0.093093,     0.094094,
0.095095,
0.096096,     0.097097,     0.098098,     0.099099,     0.1001,
0.1011,       0.1021,       0.1031,       0.1041,       0.10511,     0.10611,

```

0.10711,	0.10811,	0.10911,	0.11011,	0.11111,	0.11211,
0.11311,	0.11411,	0.11512,	0.11612,	0.11712,	0.11812,
0.11912,					
	0.12012,	0.12112,	0.12212,	0.12312,	0.12412,
0.12513,	0.12613,	0.12713,	0.12813,	0.12913,	0.13013,
0.13113,	0.13213,	0.13313,	0.13413,	0.13514,	0.13614,
0.13714,	0.13814,	0.13914,	0.14014,	0.14114,	0.14214,
0.14314,					
	0.14414,	0.14515,	0.14615,	0.14715,	0.14815,
0.14915,	0.15015,	0.15115,	0.15215,	0.15315,	0.15415,
0.15516,	0.15616,	0.15716,	0.15816,	0.15916,	0.16016,
0.16116,	0.16216,	0.16316,	0.16416,	0.16517,	0.16617,
0.16717,					
	0.16817,	0.16917,	0.17017,	0.17117,	0.17217,
0.17317,	0.17417,	0.17518,	0.17618,	0.17718,	0.17818,
0.17918,	0.18018,	0.18118,	0.18218,	0.18318,	0.18418,
0.18519,	0.18619,	0.18719,	0.18819,	0.18919,	0.19019,
0.19119,					
	0.19219,	0.19319,	0.19419,	0.1952,	0.1962,
0.1972,	0.1982,	0.1992,	0.2002,	0.2012,	0.2022,
0.2032,	0.2042,	0.20521,	0.20621,	0.20721,	0.20821,
0.20921,	0.21021,	0.21121,	0.21221,	0.21321,	0.21421,
0.21522,					
	0.21622,	0.21722,	0.21822,	0.21922,	0.22022,
0.22122,	0.22222,	0.22322,	0.22422,	0.22523,	0.22623,
0.22723,	0.22823,	0.22923,	0.23023,	0.23123,	0.23223,
0.23323,	0.23423,	0.23524,	0.23624,	0.23724,	0.23824,
0.23924,					
	0.24024,	0.24124,	0.24224,	0.24324,	0.24424,
0.24525,	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,
0.25125,	0.25225,	0.25325,	0.25425,	0.25526,	0.25626,
0.25726,	0.25826,	0.25926,	0.26026,	0.26126,	0.26226,
0.26326,					
	0.26426,	0.26527,	0.26627,	0.26727,	0.26827,
0.26927,	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,
0.27528,	0.27628,	0.27728,	0.27828,	0.27928,	0.28028,
0.28128,	0.28228,	0.28328,	0.28428,	0.28529,	0.28629,
0.28729,					
	0.28829,	0.28929,	0.29029,	0.29129,	0.29229,
0.29329,	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,
0.2993,	0.3003,	0.3013,	0.3023,	0.3033,	0.3043,
0.30531,	0.30631,	0.30731,	0.30831,	0.30931,	0.31031,
0.31131,					
	0.31231,	0.31331,	0.31431,	0.31532,	0.31632,
0.31732,	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,
0.32332,	0.32432,	0.32533,	0.32633,	0.32733,	0.32833,
0.32933,	0.33033,	0.33133,	0.33233,	0.33333,	0.33433,

0.33534,					
	0.33634,	0.33734,	0.33834,	0.33934,	0.34034,
0.34134,	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,
0.34735,	0.34835,	0.34935,	0.35035,	0.35135,	0.35235,
0.35335,	0.35435,	0.35536,	0.35636,	0.35736,	0.35836,
0.35936,					
	0.36036,	0.36136,	0.36236,	0.36336,	0.36436,
0.36537,	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,
0.37137,	0.37237,	0.37337,	0.37437,	0.37538,	0.37638,
0.37738,	0.37838,	0.37938,	0.38038,	0.38138,	0.38238,
0.38338,					
	0.38438,	0.38539,	0.38639,	0.38739,	0.38839,
0.38939,	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,
0.3954,	0.3964,	0.3974,	0.3984,	0.3994,	0.4004,
0.4014,	0.4024,	0.4034,	0.4044,	0.40541,	0.40641,
0.40741,					
	0.40841,	0.40941,	0.41041,	0.41141,	0.41241,
0.41341,	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,
0.41942,	0.42042,	0.42142,	0.42242,	0.42342,	0.42442,
0.42543,	0.42643,	0.42743,	0.42843,	0.42943,	0.43043,
0.43143,					
	0.43243,	0.43343,	0.43443,	0.43544,	0.43644,
0.43744,	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,
0.44344,	0.44444,	0.44545,	0.44645,	0.44745,	0.44845,
0.44945,	0.45045,	0.45145,	0.45245,	0.45345,	0.45445,
0.45546,					
	0.45646,	0.45746,	0.45846,	0.45946,	0.46046,
0.46146,	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,
0.46747,	0.46847,	0.46947,	0.47047,	0.47147,	0.47247,
0.47347,	0.47447,	0.47548,	0.47648,	0.47748,	0.47848,
0.47948,					
	0.48048,	0.48148,	0.48248,	0.48348,	0.48448,
0.48549,	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,
0.49149,	0.49249,	0.49349,	0.49449,	0.4955,	0.4965,
0.4975,	0.4985,	0.4995,	0.5005,	0.5015,	0.5025,
0.5035,					
	0.5045,	0.50551,	0.50651,	0.50751,	0.50851,
0.50951,	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,
0.51552,	0.51652,	0.51752,	0.51852,	0.51952,	0.52052,
0.52152,	0.52252,	0.52352,	0.52452,	0.52553,	0.52653,
0.52753,					
	0.52853,	0.52953,	0.53053,	0.53153,	0.53253,
0.53353,	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,
0.53954,	0.54054,	0.54154,	0.54254,	0.54354,	0.54454,
0.54555,	0.54655,	0.54755,	0.54855,	0.54955,	0.55055,
0.55155,					
	0.55255,	0.55355,	0.55455,	0.55556,	0.55656,

0.55756,	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,
0.56356,	0.56456,	0.56557,	0.56657,	0.56757,	0.56857,
0.56957,	0.57057,	0.57157,	0.57257,	0.57357,	0.57457,
0.57558,	0.57658,	0.57758,	0.57858,	0.57958,	0.58058,
0.58158,	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,
0.58759,	0.58859,	0.58959,	0.59059,	0.59159,	0.59259,
0.59359,	0.59459,	0.59556,	0.5966,	0.5976,	0.5986,
0.5996,	0.6006,	0.6016,	0.6026,	0.6036,	0.6046,
0.60561,	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,
0.61161,	0.61261,	0.61361,	0.61461,	0.61562,	0.61662,
0.61762,	0.61862,	0.61962,	0.62062,	0.62162,	0.62262,
0.62362,	0.62462,	0.62563,	0.62663,	0.62763,	0.62863,
0.62963,	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,
0.63564,	0.63664,	0.63764,	0.63864,	0.63964,	0.64064,
0.64164,	0.64264,	0.64364,	0.64464,	0.64565,	0.64665,
0.64765,	0.64865,	0.64965,	0.65065,	0.65165,	0.65265,
0.65365,	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,
0.65966,	0.66066,	0.66166,	0.66266,	0.66366,	0.66466,
0.66567,	0.66667,	0.66767,	0.66867,	0.66967,	0.67067,
0.67167,	0.67267,	0.67367,	0.67467,	0.67568,	0.67668,
0.67768,	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,
0.68368,	0.68468,	0.68569,	0.68669,	0.68769,	0.68869,
0.68969,	0.69069,	0.69169,	0.69269,	0.69369,	0.69469,
0.6957,	0.6967,	0.6977,	0.6987,	0.6997,	0.7007,
0.7017,	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,
0.70771,	0.70871,	0.70971,	0.71071,	0.71171,	0.71271,
0.71371,	0.71471,	0.71572,	0.71672,	0.71772,	0.71872,
0.71972,	0.72072,	0.72172,	0.72272,	0.72372,	0.72472,
0.72573,	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,
0.73173,	0.73273,	0.73373,	0.73473,	0.73574,	0.73674,
0.73774,	0.73874,	0.73974,	0.74074,	0.74174,	0.74274,
0.74374,	0.74474,	0.74575,	0.74675,	0.74775,	0.74875,
0.74975,	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,
0.75576,	0.75676,	0.75776,	0.75876,	0.75976,	0.76076,
0.76176,	0.76276,	0.76376,	0.76476,	0.76577,	0.76677,
0.76777,	0.76877,	0.76977,	0.77077,	0.77177,	0.77277,
0.77377,	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,
0.77978,	0.78078,	0.78178,	0.78278,	0.78378,	0.78478,

0.78579,	0.78679,	0.78779,	0.78879,	0.78979,	0.79079,
0.79179,					
	0.79279,	0.79379,	0.79479,	0.7958,	0.7968,
0.7978,	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,
0.8038,	0.8048,	0.80581,	0.80681,	0.80781,	0.80881,
0.80981,	0.81081,	0.81181,	0.81281,	0.81381,	0.81481,
0.81582,					
	0.81682,	0.81782,	0.81882,	0.81982,	0.82082,
0.82182,	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,
0.82783,	0.82883,	0.82983,	0.83083,	0.83183,	0.83283,
0.83383,	0.83483,	0.83584,	0.83684,	0.83784,	0.83884,
0.83984,					
	0.84084,	0.84184,	0.84284,	0.84384,	0.84484,
0.84585,	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,
0.85185,	0.85285,	0.85385,	0.85485,	0.85586,	0.85686,
0.85786,	0.85886,	0.85986,	0.86086,	0.86186,	0.86286,
0.86386,					
	0.86486,	0.86587,	0.86687,	0.86787,	0.86887,
0.86987,	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,
0.87588,	0.87688,	0.87788,	0.87888,	0.87988,	0.88088,
0.88188,	0.88288,	0.88388,	0.88488,	0.88589,	0.88689,
0.88789,					
	0.88889,	0.88989,	0.89089,	0.89189,	0.89289,
0.89389,	0.89489,	0.8959,	0.8969,	0.8979,	0.8989,
0.8999,	0.9009,	0.9019,	0.9029,	0.9039,	0.9049,
0.90591,	0.90691,	0.90791,	0.90891,	0.90991,	0.91091,
0.91191,					
	0.91291,	0.91391,	0.91491,	0.91592,	0.91692,
0.91792,	0.91892,	0.91992,	0.92092,	0.92192,	0.92292,
0.92392,	0.92492,	0.92593,	0.92693,	0.92793,	0.92893,
0.92993,	0.93093,	0.93193,	0.93293,	0.93393,	0.93493,
0.93594,					
	0.93694,	0.93794,	0.93894,	0.93994,	0.94094,
0.94194,	0.94294,	0.94394,	0.94494,	0.94595,	0.94695,
0.94795,	0.94895,	0.94995,	0.95095,	0.95195,	0.95295,
0.95395,	0.95495,	0.95596,	0.95696,	0.95796,	0.95896,
0.95996,					
	0.96096,	0.96196,	0.96296,	0.96396,	0.96496,
0.96597,	0.96697,	0.96797,	0.96897,	0.96997,	0.97097,
0.97197,	0.97297,	0.97397,	0.97497,	0.97598,	0.97698,
0.97798,	0.97898,	0.97998,	0.98098,	0.98198,	0.98298,
0.98398,					
	0.98498,	0.98599,	0.98699,	0.98799,	0.98899,
0.98999,	0.99099,	0.99199,	0.99299,	0.99399,	0.99499,
0.996,	0.997,	0.998,	0.999,	1]), array([[	
0.98454,	0.98454,	0.97423,	...,	0,	0,
[	0.97313,	0.97313,	0.97015,	...,	0,
					0,

```

0],
      [    0.84249,      0.84249,      0.82418, ...,
0]], 'Confidence', 'Recall']]  

fitness: 0.46349041194836754  

keys: ['metrics/precision(B)', 'metrics/recall(B)', 'metrics/mAP50(B)',  

'metrics/mAP50-95(B)']  

maps: array([    0.53686,      0.56084,      0.21885])  

names: {0: 'Bad Weld', 1: 'Good Weld', 2: 'Defect'}  

plot: True  

results_dict: {'metrics/precision(B)': 0.6797621534408912, 'metrics/recall(B)':  

0.6487672083944513, 'metrics/mAP50(B)': 0.6852623162342892,  

'metrics/mAP50-95(B)': 0.4388490892499318, 'fitness': 0.46349041194836754}  

save_dir: WindowsPath('runs/detect/train362')  

speed: {'preprocess': 0.6262556824161812, 'inference': 14.349683855953149,  

'loss': 0.0, 'postprocess': 1.9790907209416582}  

task: 'detect'

```

[10]: # Save the trained model  
model\_path = "D:\Academics and University\Python\Intelligent Systems\Project\_2\my\_yolov11m.pt"  
model.save(model\_path)

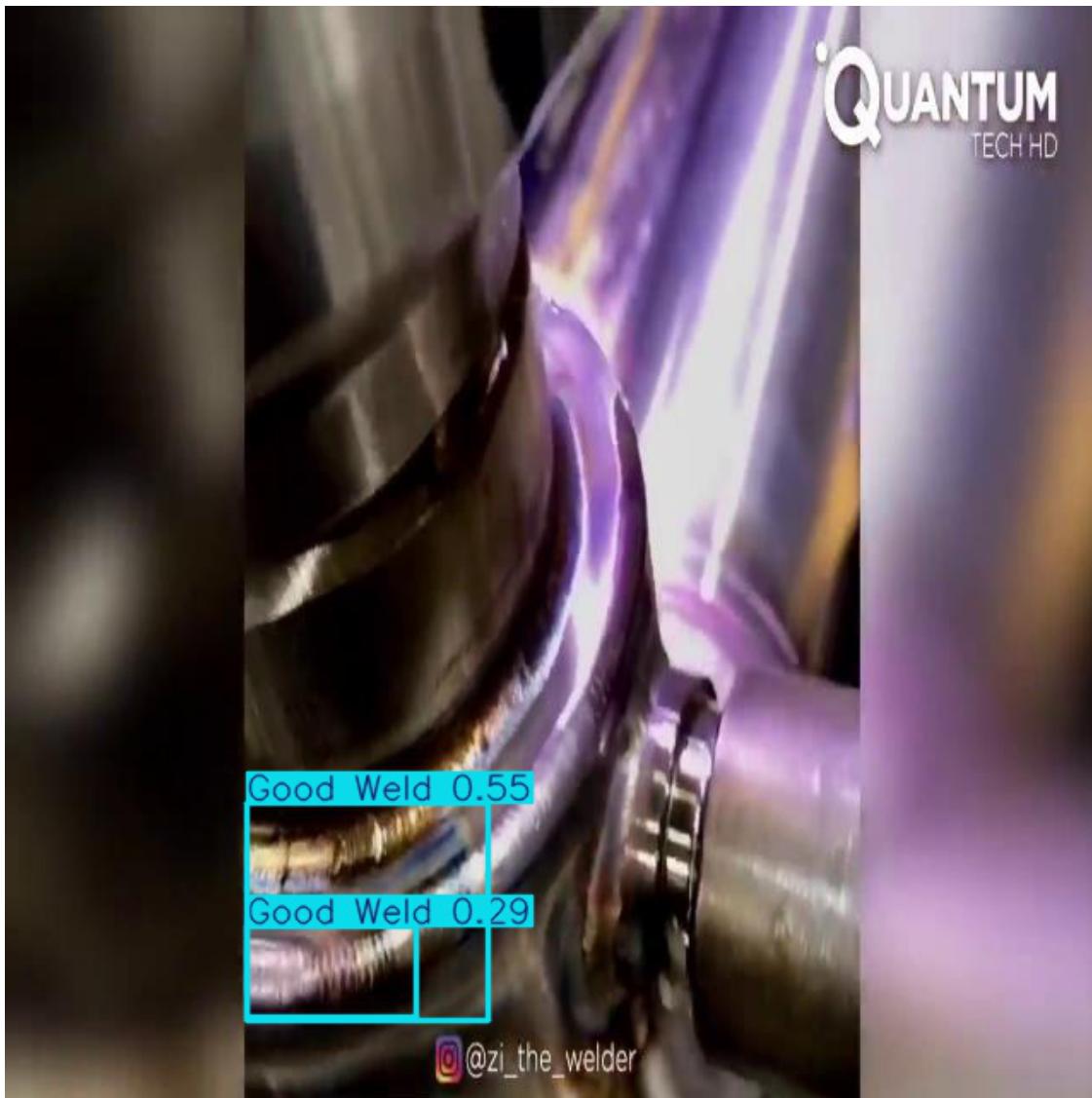
[11]: import os  
import random  
from PIL import Image  
  
# Function to display results  
def display\_results(model, img\_dir, num\_images=10):  
 images = os.listdir(img\_dir)  
 sample\_images = random.sample(images, num\_images)  
 save\_dir = 'runs/detect/exp'  
 os.makedirs(save\_dir, exist\_ok=True)  
  
 for image\_name in sample\_images:  
 image\_path = os.path.join(img\_dir, image\_name)  
 results = model(image\_path)  
 for result in results:  
 result.plot(save=True, filename=os.path.join(save\_dir, os.path.basename(image\_path)))  
 result\_image\_path = os.path.join(save\_dir, os.path.basename(image\_path))  
 display(Image.open(result\_image\_path))

[12]: # Load the trained model for inference  
model = YOLO(model\_path)  
  
print("Displaying results from model trained on version 2 with augmentation:")

```
img_dir = "D:/Academics and University/Python/Intelligent Systems/Project 2/  
↳Welding Dataset/test/images"  
display_results(model, img_dir)
```

Displaying results from model trained on version 2 with augmentation:

```
image 1/1 D:\Academics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\good_weld_vid1266_jpeg.rf.cb9d92f6b9be101524092b92  
229f3df9.jpg: 640x640 2 Good Welds, 111.5ms  
Speed: 6.3ms preprocess, 111.5ms inference, 8.0ms postprocess per image at shape  
(1, 3, 640, 640)
```



```
image 1/1 D:\Academics and University\Python\Intelligent Systems\Project
```

```
2\\Welding Dataset\\test\\images\\bad_weld_vid277_jpeg.jpg.rf.0e6aafa2605c842edfaeda  
ba06ded02c.jpg: 640x640 1 Bad Weld, 1 Good Weld, 1 Defect, 29.7ms  
Speed: 3.4ms preprocess, 29.7ms inference, 2.0ms postprocess per image at shape  
(1, 3, 640, 640)
```



```
image 1/1 D:\\Acadamics and University\\Python\\Intelligent Systems\\Project  
2\\Welding Dataset\\test\\images\\crack-welding-  
images_11.jpeg.jpg.rf.5174724ff08d893dc926840b5d3a3e22.jpg: 640x640 1 Bad Weld,  
1 Defect, 41.9ms  
Speed: 4.0ms preprocess, 41.9ms inference, 2.0ms postprocess per image at shape  
(1, 3, 640, 640)
```



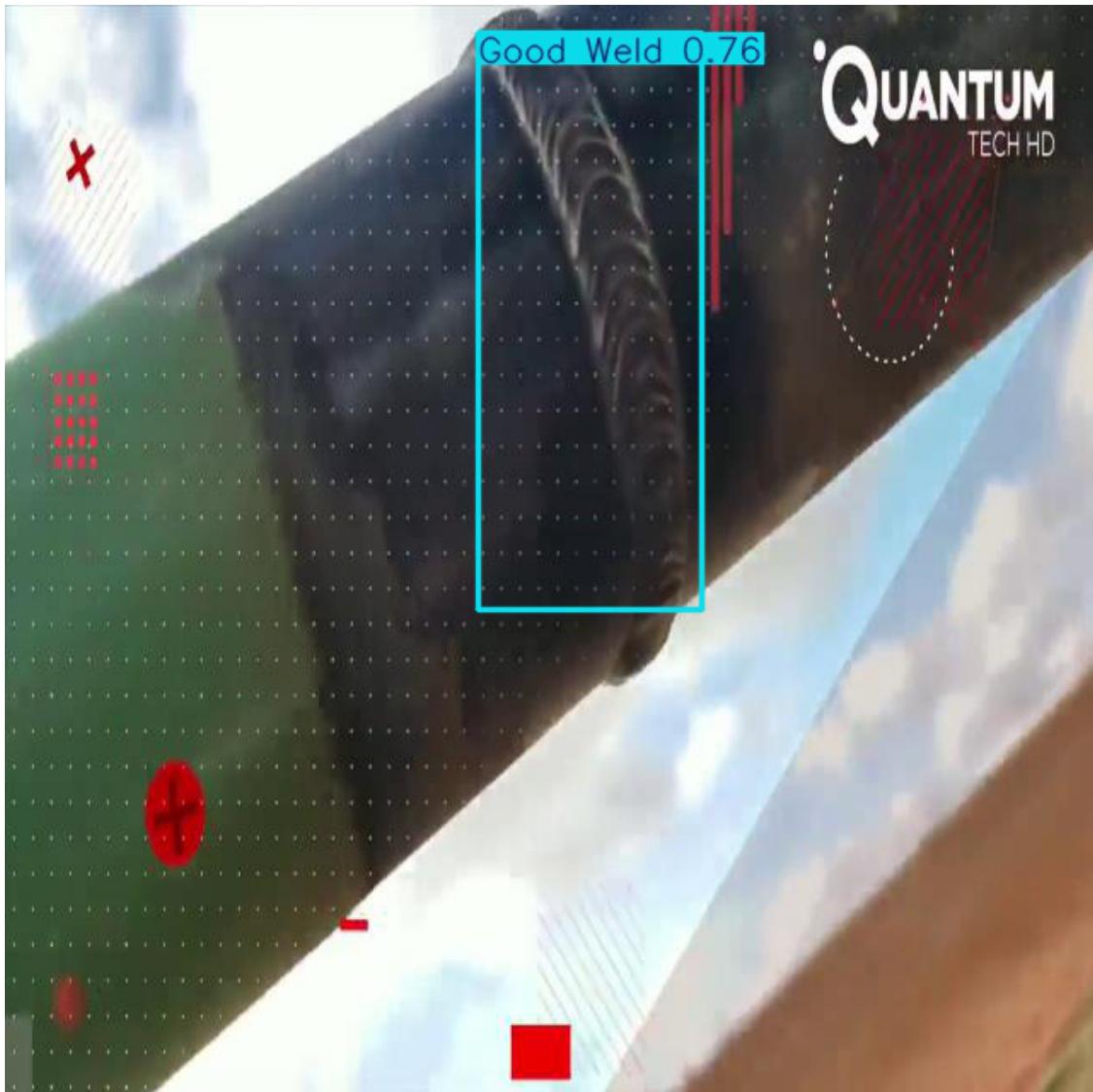
image 1/1 D:\Acadamics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\SampleV2\_2\_mp4-  
59.jpg.rf.5e6543b79b7abac05cf8005d24f61eb5.jpg: 640x640 1 Bad Weld, 1 Good Weld,  
2 Defects, 34.3ms  
Speed: 3.1ms preprocess, 34.3ms inference, 4.1ms postprocess per image at shape  
(1, 3, 640, 640)



image 1/1 D:\Acadamics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\good\_weld\_vid274.jpeg.rf.b6f11d0f012275ef3823e747c  
05bb460.jpg: 640x640 3 Good Welds, 40.6ms  
Speed: 4.1ms preprocess, 40.6ms inference, 2.9ms postprocess per image at shape  
(1, 3, 640, 640)



image 1/1 D:\Academics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\good\_weld\_vid780.jpeg.rf.f7e0a7a13d7a9d95291d104a3  
6e20c4c.jpg: 640x640 1 Good Weld, 76.2ms  
Speed: 2.9ms preprocess, 76.2ms inference, 3.4ms postprocess per image at shape  
(1, 3, 640, 640)



```
image 1/1 D:\Academics and University\Python\Intelligent Systems\Project  
2\Welding  
Dataset\test\images\bad_weld_vid92.jpeg.rf.a3a1a6b5570c15b43fe91e402bb3e4d4.jpg:  
640x640 1 Bad Weld, 28.3ms  
Speed: 4.2ms preprocess, 28.3ms inference, 3.5ms postprocess per image at shape  
(1, 3, 640, 640)
```



image 1/1 D:\Academics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\good\_weld\_vid1098.jpeg.jpg.rf.9237cce5d77a8a1c3a6d  
da6c976ca7d5.jpg: 640x640 (no detections), 38.3ms  
Speed: 3.4ms preprocess, 38.3ms inference, 2.4ms postprocess per image at shape  
(1, 3, 640, 640)



image 1/1 D:\Acadamics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\good-stick-  
welds\_19\_png\_jpg.rf.dc807e5b52e58b41c2c3c1dd6b833ec8.jpg: 640x640 4 Bad Welds,  
12 Good Welds, 35.7ms  
Speed: 4.0ms preprocess, 35.7ms inference, 12.7ms postprocess per image at shape  
(1, 3, 640, 640)

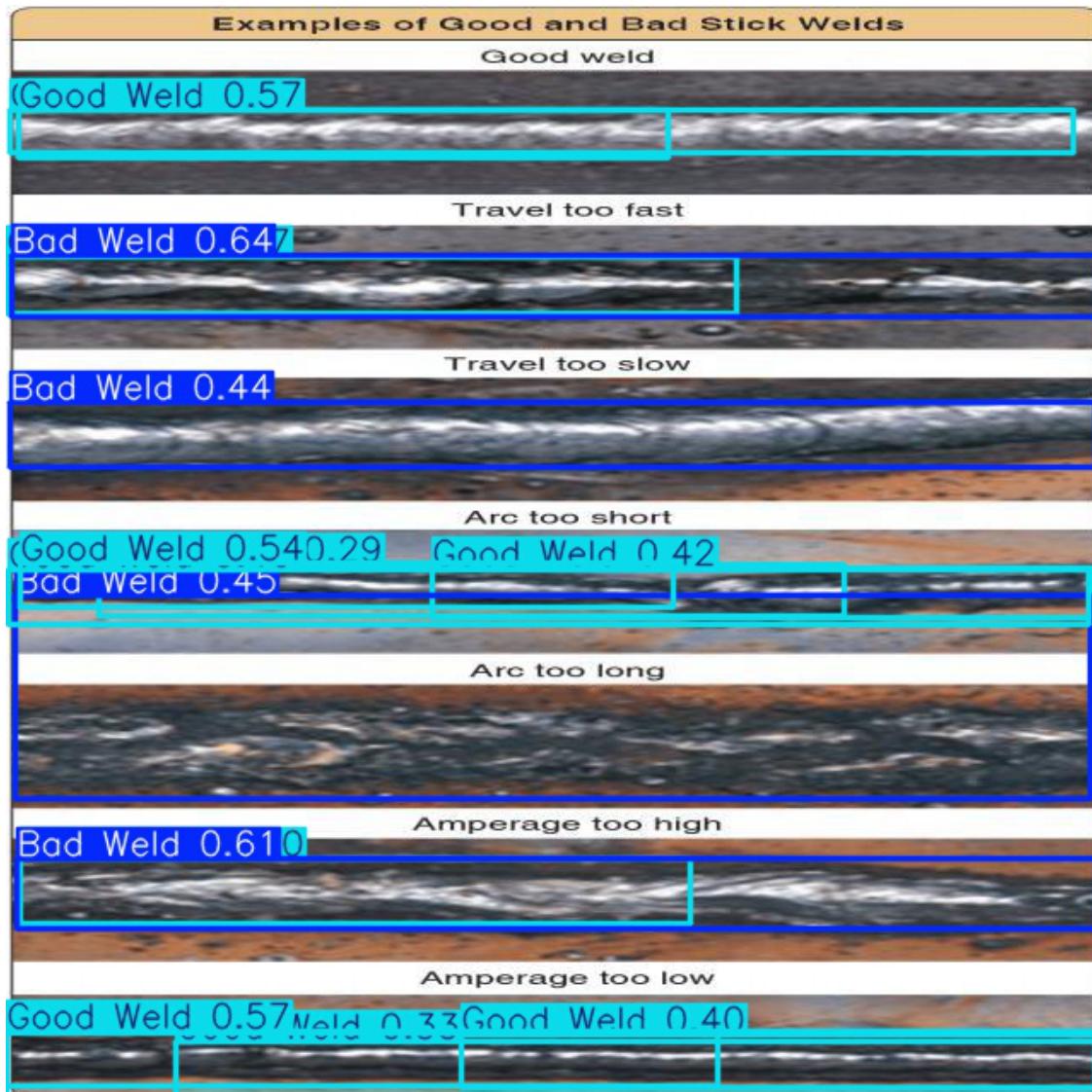
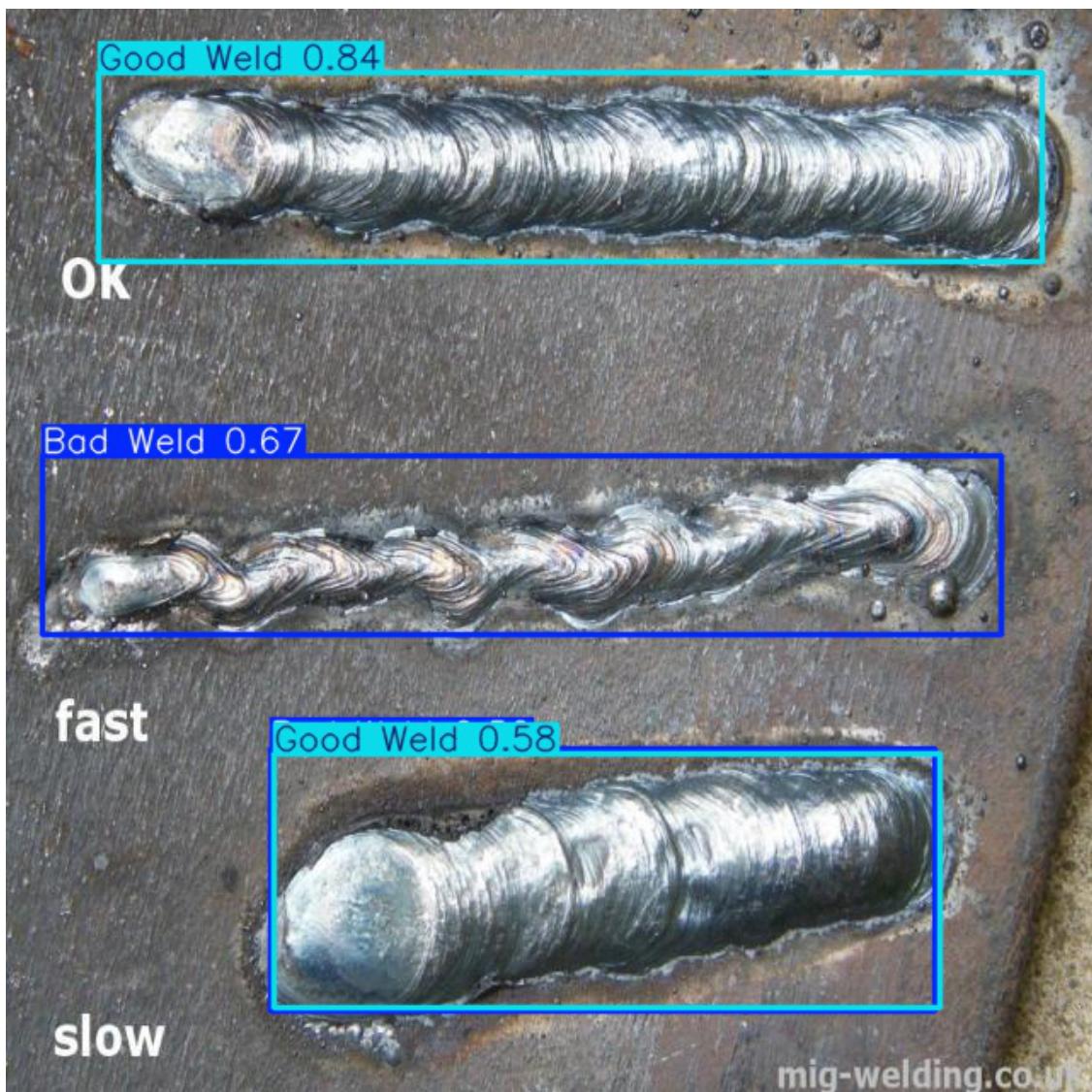


image 1/1 D:\Academics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\poor-Welding-  
Images\_22.jpeg.jpg.rf.3706f7e9a367ae053abfee4902a78288.jpg: 640x640 2 Bad Welds,  
2 Good Welds, 45.8ms  
Speed: 4.4ms preprocess, 45.8ms inference, 2.2ms postprocess per image at shape  
(1, 3, 640, 640)



[ ]:	
[ ]:	
[ ]:	