

YOLO_1

December 18, 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()) # Should return True
print(torch.cuda.get_device_name(0)) # Confirm your GPU name
```

True
NVIDIA GeForce RTX 4060 Laptop GPU

```
[3]: model = YOLO('yolov8n.pt');
model.to('cuda');
```

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

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

New https://pypi.org/project/ultralytics/8.3.51 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=yolov8n.pt, data=D:\Academics and University\Python\Intelligent Systems\Project 2\Welding Dataset\data.yaml, epochs=100, time=None, patience=100, batch=8, imgsz=640, save=True, save_period=-1, cache=False, device=0, workers=0, project=None, name=train33, 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, dfl=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, fliplr=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\train33

```

	from	n	params	module
arguments				
0	-1	1	1392	ultralytics.nn.modules.conv.Conv
[3, 48, 3, 2]				
1	-1	1	41664	ultralytics.nn.modules.conv.Conv
[48, 96, 3, 2]				
2	-1	2	111360	ultralytics.nn.modules.block.C2f
[96, 96, 2, True]				
3	-1	1	166272	ultralytics.nn.modules.conv.Conv
[96, 192, 3, 2]				
4	-1	4	813312	ultralytics.nn.modules.block.C2f
[192, 192, 4, True]				
5	-1	1	664320	ultralytics.nn.modules.conv.Conv
[192, 384, 3, 2]				
6	-1	4	3248640	ultralytics.nn.modules.block.C2f
[384, 384, 4, True]				
7	-1	1	1991808	ultralytics.nn.modules.conv.Conv
[384, 576, 3, 2]				
8	-1	2	3985920	ultralytics.nn.modules.block.C2f
[576, 576, 2, True]				
9	-1	1	831168	ultralytics.nn.modules.block.SPPF
[576, 576, 5]				
10	-1	1	0	torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']				
11	[-1, 6]	1	0	ultralytics.nn.modules.conv.Concat
[1]				
12	-1	2	1993728	ultralytics.nn.modules.block.C2f
[960, 384, 2]				
13	-1	1	0	torch.nn.modules.upsampling.Upsample
[None, 2, 'nearest']				
14	[-1, 4]	1	0	ultralytics.nn.modules.conv.Concat
[1]				
15	-1	2	517632	ultralytics.nn.modules.block.C2f
[576, 192, 2]				
16	-1	1	332160	ultralytics.nn.modules.conv.Conv
[192, 192, 3, 2]				
17	[-1, 12]	1	0	ultralytics.nn.modules.conv.Concat
[1]				
18	-1	2	1846272	ultralytics.nn.modules.block.C2f

```

[576, 384, 2]
19          -1 1 1327872 ultralytics.nn.modules.conv.Conv
[384, 384, 3, 2]
20          [-1, 9] 1 0 ultralytics.nn.modules.conv.Concat
[1]
21          -1 2 4207104 ultralytics.nn.modules.block.C2f
[960, 576, 2]
22          [15, 18, 21] 1 3777433 ultralytics.nn.modules.head.Detect
[3, [192, 384, 576]]
Model summary: 295 layers, 25,858,057 parameters, 25,858,041 gradients

```

Transferred 475/475 items from pretrained weights

Freezing layer 'model.22.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\train33\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

77 weight(decay=0.0), 84 weight(decay=0.0005), 83 bias(decay=0.0)

Image sizes 640 train, 640 val

Using 0 dataloader workers

Logging results to runs\detect\train33

Starting training for 100 epochs...

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
1/100	3.62G	2.035	2.838	1.829	14	640:
100%	203/203 [02:11<00:00,					
	Class	Images	Instances	Box(P	R	mAP50
mAP50-95): 100%	18/18 [00:13					
	all	283	802	0.485	0.164	0.119
0.049						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
2/100	3.9G	2.178	2.823	1.979	5	640:
100%	203/203 [01:47<00:00,					
	Class	Images	Instances	Box(P	R	mAP50
mAP50-95): 100%	18/18 [00:09					

	all	283	802	0.378	0.178	0.0428
0.0163						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
3/100	3.9G	2.211	2.794	2.032	14	640:
100%	203/203 [02:00<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:12					mAP50
	all	283	802	0.461	0.203	0.102
0.0364						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
4/100	3.87G	2.101	2.754	1.955	7	640:
100%	203/203 [01:51<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:09					mAP50
	all	283	802	0.181	0.234	0.12
0.0507						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
5/100	3.89G	2.054	2.631	1.921	10	640:
100%	203/203 [01:46<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:09					mAP50
	all	283	802	0.516	0.275	0.186
0.0806						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
6/100	3.88G	2.012	2.557	1.895	8	640:
100%	203/203 [01:46<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.29	0.278	0.211
0.0987						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
7/100 100%	3.88G 203/203 [01:33<00:00,	1.953	2.499	1.834	17	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.243	0.281
					0.24	0.117

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
8/100 100%	3.84G 203/203 [01:34<00:00,	1.933	2.451	1.804	13	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.316	0.302
					0.23	0.112

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
9/100 100%	3.89G 203/203 [01:33<00:00,	1.887	2.335	1.77	17	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.355	0.332
					0.251	0.115

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
10/100 100%	3.88G 203/203 [01:33<00:00,	1.864	2.325	1.754	17	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.58	0.31
					0.277	0.133

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

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
11/100	3.9G	1.84	2.273	1.741	9	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.427	0.293	0.291
0.147						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
12/100	3.9G	1.825	2.232	1.73	13	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.305	0.385	0.266
0.13						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
13/100	3.89G	1.805	2.225	1.723	19	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.358	0.374	0.257
0.115						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
14/100	3.87G	1.801	2.185	1.727	19	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.323	0.34	0.283
0.131						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
15/100	3.89G	1.767	2.144	1.682	13	640:
100%	203/203 [01:35<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.348	0.394	0.319
0.161						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
16/100 100%	3.8G 203/203 [01:33<00:00,	1.742	2.087	1.676	19	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.639	0.359	0.315
0.155						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
17/100 100%	3.9G 203/203 [01:34<00:00,	1.735	2.107	1.672	4	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.514	0.41	0.347
0.169						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
18/100 100%	3.92G 203/203 [01:33<00:00,	1.703	2.022	1.64	14	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.348	0.443	0.321
0.157						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
19/100 100%	3.9G 203/203 [01:32<00:00,	1.699	2.007	1.654	22	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.481	0.471	0.41
0.207						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
20/100 100%	3.87G 203/203 [01:34<00:00,	1.715	2.022	1.652	11	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.414	0.47
0.206						0.398

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
21/100 100%	3.87G 203/203 [01:33<00:00,	1.679	2.015	1.634	14	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.461	0.398
0.188						0.365

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
22/100 100%	3.88G 203/203 [01:33<00:00,	1.67	1.928	1.612	9	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.452	0.481
0.211						0.416

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
23/100 100%	3.88G 203/203 [01:34<00:00,	1.657	1.917	1.615	12	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.497	0.454
0.227						0.439

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

24/100	3.82G	1.652	1.903	1.614	9	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.525	0.456	0.463
0.239						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
25/100	3.89G	1.651	1.885	1.596	16	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.458	0.505	0.444
0.238						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
26/100	3.89G	1.608	1.86	1.574	17	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.511	0.488	0.451
0.238						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
27/100	3.91G	1.599	1.816	1.584	12	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.462	0.492	0.434
0.23						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
28/100	3.88G	1.597	1.812	1.553	25	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.474	0.512	0.474
0.252						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
29/100	3.9G	1.598	1.8	1.572	9	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.447	0.534	0.458
0.233						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
30/100	3.89G	1.6	1.768	1.565	20	640:
100%	203/203 [01:34<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.504	0.499	0.482
0.254						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
31/100	3.87G	1.534	1.741	1.531	18	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.55	0.504	0.483
0.273						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
32/100	3.82G	1.558	1.727	1.558	17	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.481	0.49	0.462
0.255						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
33/100 100%	3.9G 203/203 [01:33<00:00, mAP50-95): 100%	1.571 Class 18/18 [00:08 0.276	1.732 Images 18/18 [00:08	1.553 Instances all	13 Box(P R	640: mAP50 0.488

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
34/100 100%	3.86G 203/203 [01:33<00:00, mAP50-95): 100%	1.544 Class 18/18 [00:08 0.276	1.706 Images 18/18 [00:08	1.538 Instances all	5 Box(P R	640: mAP50 0.504

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
35/100 100%	3.88G 203/203 [01:33<00:00, mAP50-95): 100%	1.512 Class 18/18 [00:08 0.278	1.647 Images 18/18 [00:08	1.502 Instances all	9 Box(P R	640: mAP50 0.511

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
36/100 100%	3.88G 203/203 [01:34<00:00, mAP50-95): 100%	1.523 Class 18/18 [00:08 0.278	1.675 Images 18/18 [00:08	1.532 Instances all	13 Box(P R	640: mAP50 0.509

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

37/100	3.9G	1.498	1.623	1.508	13	640:
100%	203/203 [01:35<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.558	0.534	0.523
0.291						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
38/100	3.9G	1.495	1.61	1.483	7	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.484	0.538	0.499
0.275						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
39/100	3.9G	1.495	1.603	1.505	18	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.542	0.548	0.551
0.314						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
40/100	3.83G	1.465	1.596	1.473	15	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.542	0.548	0.535
0.3						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
41/100	3.9G	1.48	1.572	1.48	18	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.563	0.554	0.539
0.306						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
42/100	3.88G	1.45	1.558	1.46	16	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances		Box(P)	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.595	0.551	0.569
0.327						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
43/100	3.92G	1.449	1.542	1.471	13	640:
100%	203/203 [01:50<00:00,					
	Class	Images	Instances		Box(P)	R
mAP50-95): 100%	18/18 [00:10					mAP50
	all	283	802	0.576	0.568	0.581
0.337						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
44/100	3.89G	1.438	1.504	1.455	13	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances		Box(P)	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.602	0.6	0.597
0.344						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
45/100	3.89G	1.449	1.513	1.465	27	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances		Box(P)	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.557	0.582	0.572
0.329						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
46/100 100%	3.88G 203/203 [01:33<00:00, mAP50-95): 100%	1.413 Class 18/18 [00:08 0.338	1.486	1.435	4	640:
			Box(P)	R	mAP50	
	all	283	802	0.571	0.603	0.584

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
47/100 100%	3.88G 203/203 [01:33<00:00, mAP50-95): 100%	1.403 Class 18/18 [00:08 0.346	1.462	1.435	16	640:
			Box(P)	R	mAP50	
	all	283	802	0.557	0.596	0.588

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
48/100 100%	3.82G 203/203 [01:34<00:00, mAP50-95): 100%	1.407 Class 18/18 [00:08 0.35	1.437	1.444	9	640:
			Box(P)	R	mAP50	
	all	283	802	0.586	0.61	0.609

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
49/100 100%	3.9G 203/203 [01:34<00:00, mAP50-95): 100%	1.379 Class 18/18 [00:08 0.364	1.409	1.421	11	640:
			Box(P)	R	mAP50	
	all	283	802	0.605	0.596	0.61

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

50/100	3.88G	1.395	1.433	1.428	17	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.579	0.59	0.59
0.34						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
51/100	3.91G	1.398	1.395	1.437	10	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.663	0.58	0.612
0.359						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
52/100	3.9G	1.361	1.363	1.409	23	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.563	0.641	0.612
0.359						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
53/100	3.9G	1.367	1.357	1.4	18	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.574	0.601	0.603
0.362						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
54/100	3.89G	1.345	1.352	1.395	13	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.635	0.571	0.6
0.359						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
55/100	3.89G	1.352	1.354	1.403	11	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.633	0.628	0.621
0.363						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
56/100	3.8G	1.326	1.325	1.401	26	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.653	0.604	0.65
0.386						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
57/100	3.9G	1.325	1.33	1.381	18	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.687	0.596	0.647
0.396						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
58/100	3.89G	1.315	1.315	1.387	11	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.667	0.579	0.648
0.397						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
59/100 100%	3.9G 203/203 [01:34<00:00,	1.322	1.313	1.392	28	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.624	0.645
					0.392	0.653

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
60/100 100%	3.88G 203/203 [01:34<00:00,	1.298	1.282	1.37	16	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.665	0.632
					0.394	0.663

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
61/100 100%	3.88G 203/203 [01:33<00:00,	1.293	1.255	1.359	20	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.659	0.628
					0.397	0.643

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
62/100 100%	3.89G 203/203 [01:34<00:00,	1.277	1.226	1.337	12	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.683	0.611
					0.395	0.666

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

63/100	3.89G	1.284	1.226	1.349	19	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.666	0.622	0.647
0.389						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
64/100	3.81G	1.265	1.243	1.352	23	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.652	0.629	0.646
0.385						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
65/100	3.89G	1.255	1.197	1.335	20	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.679	0.661	0.682
0.419						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
66/100	3.88G	1.246	1.203	1.321	8	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.613	0.672	0.651
0.392						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
67/100	3.9G	1.245	1.169	1.332	17	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					

	all	283	802	0.658	0.67	0.677
0.42						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
68/100 100%	3.91G 203/203 [01:33<00:00,	1.236	1.151	1.325	12	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.693	0.629	0.669
0.416						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
69/100 100%	3.88G 203/203 [01:33<00:00,	1.231	1.145	1.319	12	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.672	0.653	0.671
0.407						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
70/100 100%	3.9G 203/203 [01:33<00:00,	1.203	1.123	1.298	12	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.697	0.665	0.69
0.429						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
71/100 100%	3.89G 203/203 [01:33<00:00,	1.183	1.106	1.285	8	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
						mAP50
	all	283	802	0.676	0.66	0.682
0.426						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
72/100 100%	3.82G 203/203 [01:34<00:00,	1.186	1.1	1.295	23	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.659	0.651
0.431						0.682

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
73/100 100%	3.9G 203/203 [01:34<00:00,	1.176	1.082	1.293	6	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.684	0.678
0.444						0.704

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
74/100 100%	3.89G 203/203 [01:34<00:00,	1.188	1.11	1.296	13	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.628	0.711
0.437						0.695

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
75/100 100%	3.89G 203/203 [01:34<00:00,	1.151	1.056	1.268	6	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.666	0.689
0.446						0.714

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

76/100	3.9G	1.168	1.05	1.269	5	640:
100%	203/203 [01:42<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%		18/18 [00:10				
	all	283	802	0.703	0.679	0.708
0.452						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
77/100	3.89G	1.163	1.048	1.281	20	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	0.652	0.672	0.683
0.431						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
78/100	3.89G	1.138	1.01	1.253	13	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%		18/18 [00:08				
	all	283	802	0.714	0.686	0.714
0.458						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
79/100	3.88G	1.136	1.004	1.251	10	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%		18/18 [00:08				
	all	283	802	0.695	0.683	0.711
0.45						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
80/100	3.81G	1.118	1.015	1.249	10	640:
100%	203/203 [01:33<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%		18/18 [00:08				

	all	283	802	0.686	0.694	0.712
0.459						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
81/100	3.89G	1.12	0.9897	1.24	18	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.675	0.691	0.704
0.45						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
82/100	3.89G	1.11	0.9934	1.243	14	640:
100%	203/203 [01:33<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.681	0.687	0.706
0.455						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
83/100	3.9G	1.094	0.962	1.223	11	640:
100%	203/203 [01:34<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.721	0.673	0.722
0.468						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
84/100	3.9G	1.089	0.9464	1.228	11	640:
100%	203/203 [01:34<00:00,	Class	Images	Instances	Box(P	R
mAP50-95): 100%	18/18 [00:08					mAP50
	all	283	802	0.687	0.683	0.717
0.461						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
85/100 100%	3.89G 203/203 [01:34<00:00,	1.082	0.9574	1.231	15	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.717	0.696
0.467						0.72

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
86/100 100%	3.89G 203/203 [01:34<00:00,	1.061	0.9243	1.215	24	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.756	0.67
0.475						0.732

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
87/100 100%	3.88G 203/203 [01:34<00:00,	1.054	0.9173	1.208	7	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.738	0.666
0.472						0.726

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
88/100 100%	3.81G 203/203 [01:34<00:00,	1.057	0.918	1.21	18	640: mAP50-95): 100% 18/18 [00:08
		Class	Images	Instances	Box(P	R
		all	283	802	0.744	0.649
0.467						0.722

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

89/100	3.9G	1.023	0.8996	1.194	14	640:
100%	203/203 [01:34<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.759	0.693	0.744
0.484						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
90/100	3.89G	1.034	0.8985	1.194	4	640:
100%	203/203 [01:32<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.755	0.689	0.746
0.492						

Closing dataloader mosaic

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
91/100	3.88G	0.9763	0.8015	1.193	16	640:
100%	203/203 [01:30<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.746	0.677	0.732
0.482						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
92/100	3.88G	0.9561	0.7709	1.18	4	640:
100%	203/203 [01:30<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.72	0.7	0.736
0.486						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
93/100	3.87G	0.9316	0.7476	1.161	6	640:
100%	203/203 [01:30<00:00,					

	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95) : 100%	18/18 [00:08					
	all	283	802	0.762	0.661	0.735
0.485						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
94/100	3.89G	0.923	0.7351	1.155	7	640:
100%	203/203 [01:30<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95) : 100%	18/18 [00:08					
	all	283	802	0.757	0.681	0.744
0.495						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
95/100	3.89G	0.9162	0.73	1.153	6	640:
100%	203/203 [01:32<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95) : 100%	18/18 [00:08					
	all	283	802	0.732	0.704	0.741
0.491						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
96/100	3.8G	0.913	0.7205	1.153	4	640:
100%	203/203 [01:31<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95) : 100%	18/18 [00:08					
	all	283	802	0.757	0.7	0.747
0.493						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
97/100	3.9G	0.8874	0.6956	1.136	10	640:
100%	203/203 [01:32<00:00,					
	Class	Images	Instances	Box(P)	R	mAP50
mAP50-95) : 100%	18/18 [00:08					

	all	283	802	0.767	0.699	0.751
0.498						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
98/100	3.88G	0.8868	0.6981	1.136	6	640:
100%	203/203 [01:32<00:00,					
	Class	Images	Instances	Box(P	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.728	0.712	0.751
0.501						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
99/100	3.88G	0.8725	0.6852	1.129	9	640:
100%	203/203 [01:32<00:00,					
	Class	Images	Instances	Box(P	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.754	0.706	0.753
0.505						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
100/100	3.89G	0.8816	0.6874	1.137	5	640:
100%	203/203 [01:31<00:00,					
	Class	Images	Instances	Box(P	R	mAP50
mAP50-95): 100%	18/18 [00:08					
	all	283	802	0.772	0.681	0.749
0.503						

100 epochs completed in 2.932 hours.

Optimizer stripped from runs\detect\train33\weights\last.pt, 52.0MB
Optimizer stripped from runs\detect\train33\weights\best.pt, 52.0MB

Validating runs\detect\train33\weights\best.pt...
Ultralytics 8.3.40 Python-3.11.11 torch-2.5.1 CUDA:0 (NVIDIA GeForce RTX 4060 Laptop GPU, 8188MiB)
Model summary (fused): 218 layers, 25,841,497 parameters, 0 gradients

```
[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)
Model summary (fused): 218 layers, 25,841,497 parameters, 0 gradients

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

          Class    Images Instances   Box(P)      R    mAP50
0.504          all     283       802    0.751    0.713    0.753
0.596        Bad Weld    141       194    0.722    0.791    0.817
0.628        Good Weld   175       335    0.81     0.836    0.874
0.288        Defect     128       273    0.721    0.513    0.567
Speed: 0.6ms preprocess, 14.3ms inference, 0.0ms loss, 2.0ms postprocess per
image
Results saved to runs\detect\train332
```

[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
0x000002311144B5D0>
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,
0.029029,	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,
0.053053,	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,
0.077077,	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,
0.1011,	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,
0.12513,	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,
0.14915,	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,
0.17317,	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,
0.1972,	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,
0.22122,	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([
1,             1,           1, ..., 0.02437,   0.012185,    0],
      [       1,           1,           1, ..., 0.0099243, 0.0049621,
0],
      [       1,           1,           1, ..., 0.00057865, 0.00028933,
0]), 'Recall', '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([[
0.39958,	0.39958,	0.44967,	...,	0,	0,	
[0.29991,	0.29991,	0.37216,	...,	0,	
0],					0,	
	[0.11035,	0.11035,	0.14561,	...,	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([
0.25099,      0.25099,      0.29183, ... ,           1,           1,           1],
[ 0.17757,     0.17757,     0.23058, ... ,           1,           1,
1],
[ 0.05929,     0.05929,     0.080221, ... ,          1,           1,
1]), 'Confidence', '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,
0.82182,     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,
0.84585,     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,
0.86987,     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,
0.89389,     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,
0.91792,     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,
0.94194,     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([[[
0.97938,     0.97938,     0.97938, ..., 0,          0,          0],
[ 0.96418,     0.96418,     0.96418, ..., 0,          0,          0],
[ 0.79487,     0.79487,     0.78755, ..., 0,          0,          0],
0]], 'Confidence', 'Recall')])

```

```

fitness: 0.5288674681940093
keys: ['metrics/precision(B)', 'metrics/recall(B)', 'metrics/mAP50(B)', 'metrics/mAP50-95(B)']
maps: array([ 0.59627, 0.62803, 0.2877])
names: {0: 'Bad Weld', 1: 'Good Weld', 2: 'Defect'}
plot: True
results_dict: {'metrics/precision(B)': 0.7508891640934022, 'metrics/recall(B)': 0.713204197975458, 'metrics/mAP50(B)': 0.7527016196918718, 'metrics/mAP50-95(B)': 0.503997006916469, 'fitness': 0.5288674681940093}
save_dir: WindowsPath('runs/detect/train332')
speed: {'preprocess': 0.5909899519526073, 'inference': 14.258233060263914, 'loss': 0.0, 'postprocess': 2.001553457954326}
task: 'detect'

```

[7]: # Save the trained model

```

model_path = "D:\Academics and University\Python\Intelligent Systems\Project\u2\my_yolov8n.pt"
model.save(model_path)

```

[8]:

```

import os
import random
from PIL import Image
from IPython.display import display
from ultralytics import YOLO

# 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))

```

[9]: # Load the trained model for inference

```

model = YOLO(model_path)

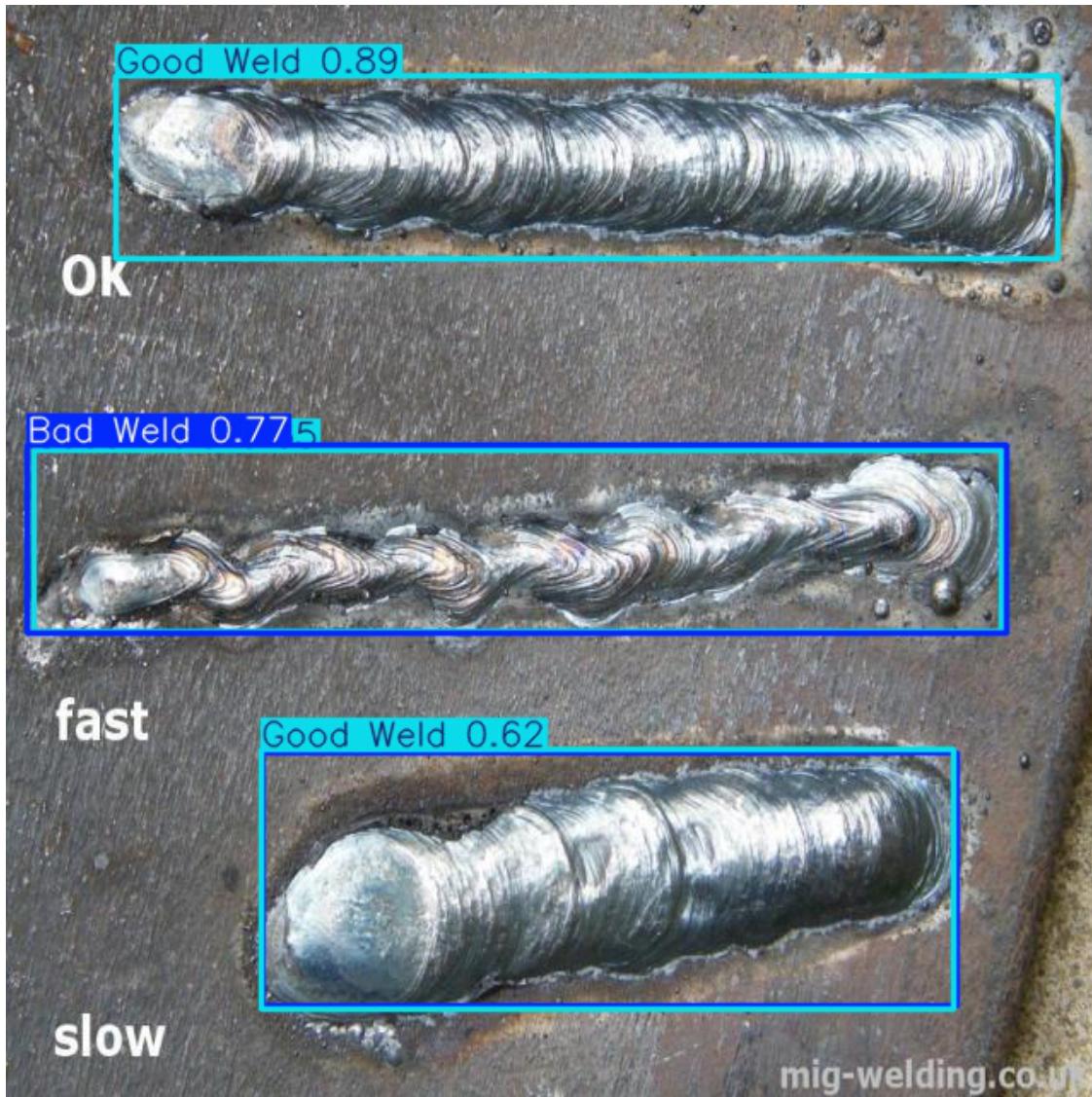
print("Displaying results from model trained on version 1 with augmentation:")

```

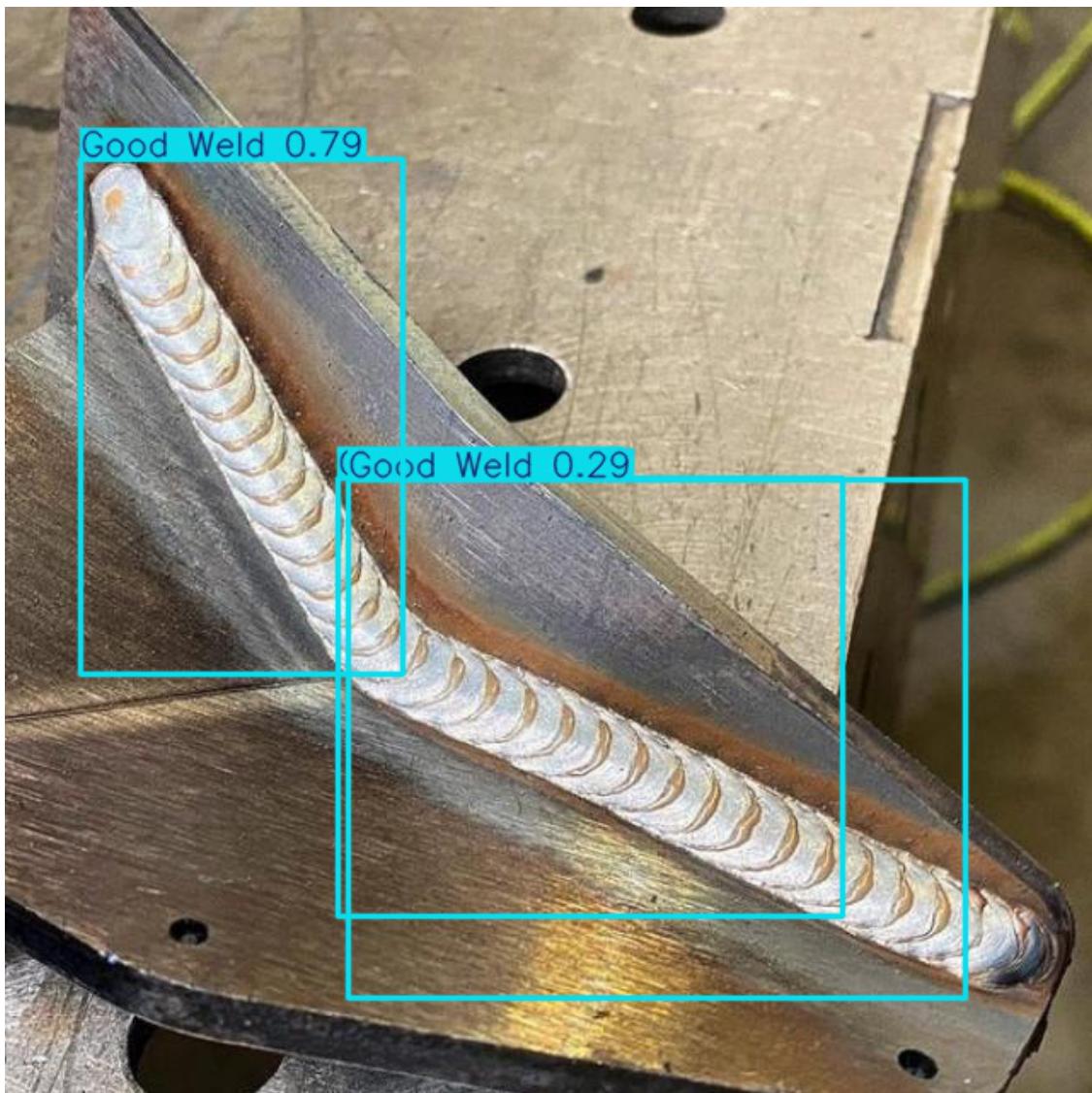
```
img_dir = "D:/Academics and University/Python/Intelligent Systems/Project 2/  
Welding Dataset/test/images"  
display_results(model, img_dir)
```

Displaying results from model trained on version 1 with augmentation:

```
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,  
3 Good Welds, 103.9ms  
Speed: 10.8ms preprocess, 103.9ms inference, 0.0ms 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\mig-good-  
welds_5.jpeg.rf.34d691732b9aaf7d94f3fcdaa144fdb.jpg: 640x640 3 Good Welds,  
24.8ms  
Speed: 5.5ms preprocess, 24.8ms inference, 4.2ms 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_vid205.jpeg.rf.4732128c8ac74427330c636ff0  
e63949.jpg: 640x640 1 Bad Weld, 24.1ms  
Speed: 4.0ms preprocess, 24.1ms 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\bad_weld_vid374.jpeg.jpg.rf.d1c904ca6a097b2c516652
38ba9e1147.jpg: 640x640 1 Bad Weld, 2 Defects, 31.2ms
Speed: 2.0ms preprocess, 31.2ms inference, 4.0ms 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\Spatters-welding-
images_9.jpeg.jpg.rf.a43f10bbaf404937f530d9c278654acb.jpg: 640x640 1 Good Weld,
23.0ms
Speed: 6.5ms preprocess, 23.0ms inference, 4.3ms 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\Screenshot-2022-12-05-
230149.jpeg.rf.9a609cc50aed07d1532d574bdfddd081.jpg: 640x640 2 Good Welds,
73.5ms
Speed: 5.0ms preprocess, 73.5ms inference, 4.5ms postprocess per image at shape
(1, 3, 640, 640)



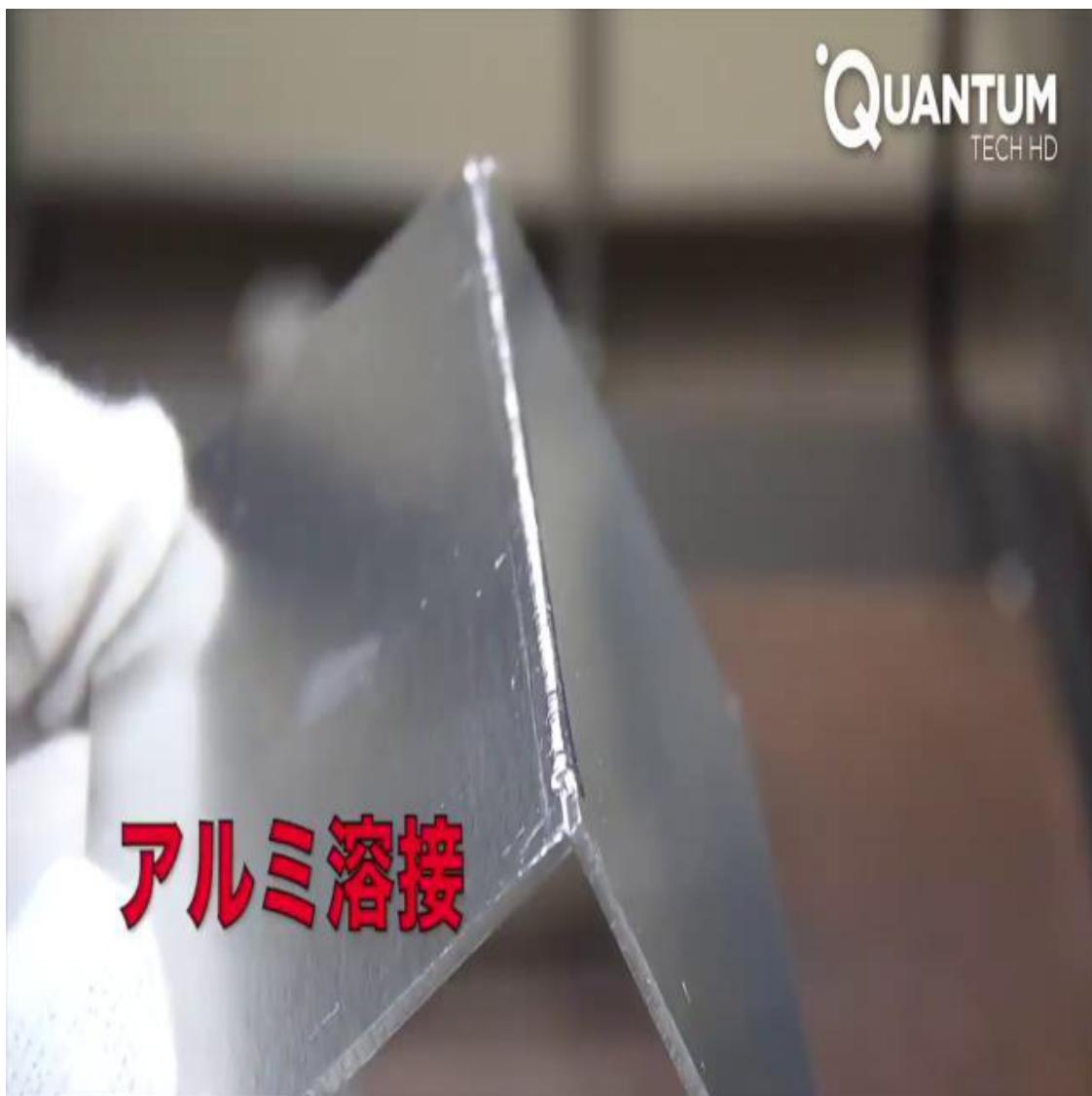
```
image 1/1 D:\Academics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\good-tig-  
welds_3.jpeg.rf.c6af4c75c9f0f8866e1d58bb2a2ae0d.jpg: 640x640 2 Good Welds,  
27.6ms  
Speed: 0.0ms preprocess, 27.6ms inference, 4.0ms postprocess per image at shape  
(1, 3, 640, 640)
```



```
image 1/1 D:\Acadamics and University\Python\Intelligent Systems\Project  
2\Welding Dataset\test\images\good_weld_vid1098.jpeg.rf.fa02bd1ec37898d82bf99052  
5548da93.jpg: 640x640 (no detections), 41.7ms  
Speed: 0.0ms preprocess, 41.7ms inference, 1.2ms 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_vid1134.jpeg.jpg.rf.5531f5eb2fc03e6b2b99  
2469c012caa4.jpg: 640x640 (no detections), 21.5ms  
Speed: 3.6ms preprocess, 21.5ms inference, 0.0ms 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\good_weld_vid189.jpeg.jpg.rf.33380af68fa3c4f459a81  
f26d1bdbcb9.jpg: 640x640 1 Good Weld, 30.6ms  
Speed: 0.0ms preprocess, 30.6ms inference, 6.7ms postprocess per image at shape  
(1, 3, 640, 640)
```



[]:

[]:

[]: