

Hexcel Technical Interview Project – Amir Tavahin

This notebook contains my solution to Hexcel's technical interview task. I was asked to address the following two questions:

- **Q1:** Create a distribution plot for each image set, showing the total sterling value of coins in each image. Non-UK coins should be ignored.
- **Q2:** Create distribution plots showing the number of 'heads' detected per image.

The project is based on two unlabelled datasets:

- **DB1:** Simple coin images.
 - **DB2:** More complex samples with harder visual conditions.
-

My Approach

Since the datasets are unlabelled, I first needed a way to detect and classify coins. I used **Roboflow** to label the data by coin type and orientation (head/tail) and applied data augmentation to improve model robustness.

To tackle the problem efficiently, I used a transfer learning approach — specifically YOLO — to train a model that could generalise well to both datasets.

What's in this Notebook

The following sections show:

- Explanatory Data Analysis (EDA), to understand our original data structure.
- How the models were trained and evaluated.
- Sample predictions.
- The final distribution plots that answer Q1 and Q2.

EDA

Since we are dealing with image dataset, our EDA steps are as follow:

- number of images
- Image dimensions
- Channel information (RGB etc)
- Visual and sample previews

```
In [ ]: # getting all the dependencies  
%pip install tensorflow matplotlib seaborn pillow numpy opencv-python ultralytics l  
  
#PS: i installed more but forgot to add them here :)
```

Requirement already satisfied: tensorflow in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (2.19.0)
Requirement already satisfied: matplotlib in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (3.10.3)
Requirement already satisfied: seaborn in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (0.13.2)
Requirement already satisfied: pillow in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (11.2.1)
Requirement already satisfied: numpy in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (2.1.3)
Requirement already satisfied: opencv-python in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (4.11.0.86)
Requirement already satisfied: ultralytics in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (8.3.142)
Requirement already satisfied: labelImg in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (1.8.6)
Requirement already satisfied: absl-py>=1.0.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (2.2.2)
Requirement already satisfied: astunparse>=1.6.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (1.6.3)
Requirement already satisfied: flatbuffers>=24.3.25 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (25.2.10)
Requirement already satisfied: gast!=0.5.0,!0.5.1,!0.5.2,>=0.2.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (0.6.0)
Requirement already satisfied: google-pasta>=0.1.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (0.2.0)
Requirement already satisfied: libclang>=13.0.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (18.1.1)
Requirement already satisfied: opt-einsum>=2.3.2 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (3.4.0)
Requirement already satisfied: packaging in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (25.0)
Requirement already satisfied: protobuf!=4.21.0,!4.21.1,!4.21.2,!4.21.3,!4.21.4,!4.21.5,<6.0.0dev,>=3.20.3 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (5.29.4)
Requirement already satisfied: requests<3,>=2.21.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (2.32.3)
Requirement already satisfied: setuptools in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (65.5.0)
Requirement already satisfied: six>=1.12.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (1.17.0)
Requirement already satisfied: termcolor>=1.1.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (3.1.0)
Requirement already satisfied: typing-extensions>=3.6.6 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (4.13.2)
Requirement already satisfied: wrapt>=1.11.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (1.17.2)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (1.71.0)
Requirement already satisfied: tensorboard~2.19.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (2.19.0)
Requirement already satisfied: keras>=3.5.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (3.10.0)
Requirement already satisfied: h5py>=3.11.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (3.13.0)
Requirement already satisfied: ml-dtypes<1.0.0,>=0.5.1 in c:\users\amir\desktop\hexc

```
el technical interview\env\lib\site-packages (from tensorflow) (0.5.1)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow) (0.31.0)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from matplotlib) (1.3.2)
Requirement already satisfied: cycler>=0.10 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from matplotlib) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from matplotlib) (4.58.0)
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from matplotlib) (1.4.8)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from matplotlib) (3.2.3)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from matplotlib) (2.9.0.post0)
Requirement already satisfied: pandas>=1.2 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from seaborn) (2.2.3)
Requirement already satisfied: pyyaml>=5.3.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from ultralytics) (6.0.2)
Requirement already satisfied: scipy>=1.4.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from ultralytics) (1.15.3)
Requirement already satisfied: torch>=1.8.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from ultralytics) (2.7.0+cu118)
Requirement already satisfied: torchvision>=0.9.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from ultralytics) (0.22.0)
Requirement already satisfied: tqdm>=4.64.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from ultralytics) (4.67.1)
Requirement already satisfied: psutil in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from ultralytics) (7.0.0)
Requirement already satisfied: py-cpuinfo in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from ultralytics) (9.0.0)
Requirement already satisfied: ultralytics-thop>=2.0.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from ultralytics) (2.0.14)
Requirement already satisfied: pyqt5 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from labelImg) (5.15.11)
Requirement already satisfied: lxml in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from labelImg) (5.4.0)
Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from astunparse>=1.6.0->tensorflow) (0.45.1)
Requirement already satisfied: rich in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from keras>=3.5.0->tensorflow) (14.0.0)
Requirement already satisfied: namex in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from keras>=3.5.0->tensorflow) (0.0.9)
Requirement already satisfied: optree in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from keras>=3.5.0->tensorflow) (0.15.0)
Requirement already satisfied: pytz>=2020.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: charset-normalizer<4,>=2 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from requests<3,>=2.21.0->tensorflow) (3.4.2)
Requirement already satisfied: idna<4,>=2.5 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from requests<3,>=2.21.0->tensorflow) (3.10)
Requirement already satisfied: urllib3<3,>=1.21.1 in c:\users\amir\desktop\hexcel te
```

```
chnical interview\env\lib\site-packages (from requests<3,>=2.21.0->tensorflow) (2.4.0)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from requests<3,>=2.21.0->tensorflow) (2025.4.26)
Requirement already satisfied: markdown>=2.6.8 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow~2.19.0->tensorflow) (3.8)
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow~2.19.0->tensorflow) (0.7.2)
Requirement already satisfied: werkzeug>=1.0.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tensorflow~2.19.0->tensorflow) (3.1.3)
Requirement already satisfied: filelock in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from torch>=1.8.0->ultralytics) (3.18.0)
Requirement already satisfied: sympy>=1.13.3 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from torch>=1.8.0->ultralytics) (1.14.0)
Requirement already satisfied: networkx in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from torch>=1.8.0->ultralytics) (3.4.2)
Requirement already satisfied: jinja2 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from torch>=1.8.0->ultralytics) (3.1.6)
Requirement already satisfied: fsspec in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from torch>=1.8.0->ultralytics) (2025.5.0)
Requirement already satisfied: colorama in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from tqdm>=4.64.0->ultralytics) (0.4.6)
Requirement already satisfied: PyQt5-sip<13,>=12.15 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from pyqt5->labelImg) (12.17.0)
Requirement already satisfied: PyQt5-Qt5<5.16.0,>=5.15.2 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from pyqt5->labelImg) (5.15.2)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from sympy>=1.13.3->torch>=1.8.0->ultralytics) (1.3.0)
Requirement already satisfied: MarkupSafe>=2.1.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from werkzeug>=1.0.1->tensorboard~2.19.0->tensorflow) (3.0.2)
Requirement already satisfied: markdown-it-py>=2.2.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from rich->keras>=3.5.0->tensorflow) (3.0.0)
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from rich->keras>=3.5.0->tensorflow) (2.19.1)
Requirement already satisfied: mdurl~0.1 in c:\users\amir\desktop\hexcel technical interview\env\lib\site-packages (from markdown-it-py>=2.2.0->rich->keras>=3.5.0->tensorflow) (0.1.2)
Note: you may need to restart the kernel to use updated packages.
```

```
[notice] A new release of pip is available: 24.0 -> 25.1.1
```

```
[notice] To update, run: python.exe -m pip install --upgrade pip
```

```
In [1]: import os
import numpy as np
from PIL import Image
```

```
In [18]: #image count and structure
data_dir = 'Data\\dataset1' # data path
image_paths = [os.path.join(data_dir, fname) for fname in os.listdir(data_dir) if f
```

```
print(f"Total number of images: {len(image_paths)}")
```

```
Total number of images: 400
```

```
In [19]: # image dimensions
dims = []

for img_path in image_paths:
    with Image.open(img_path) as img:
        dims.append(img.size) # (width, height)

print(f"image dimension: {dims[:1]}")
```

```
image dimension: [(350, 350)]
```

```
In [20]: #checking colour channels
channels = []

for img_path in image_paths[:50]: # Limit to avoid slowdown
    with Image.open(img_path) as img:
        channels.append(len(img.getbands()))

print(f"Channel modes detected: {set(channels)}") #dealing with RGB
```

```
Channel modes detected: {3}
```

Q1: Model creation

we will be using YOLO V8 version, due to it's being efficient while being accurate. But before making any prediction on our data, we will be creating a small dataset (annotating 100 images), then those images will be augmented and e.g., applying various exposures, rotation, cropping etc to give the model more exposure when it comes to detecting images from dataset 2.

```
In [3]: from ultralytics import YOLO

#getting YOLO nano
model = YOLO('yolov8n.pt')

# fine-tuning the parameters for our need
results = model.train(
    data='Data\DB102\data.yaml',      # YOLO uses yaml file to coordinates the images
    imgsz=350,                      # using image size of 350x350 as our original d
    epochs=50,
    batch=16,
    project='runs/train_DB1',        # saving the outcome
    name='coin_value_v8n',           # file name
    device='cpu',                   # will be using CPU instead of GPU, can be chan
)
```

```

New https://pypi.org/project/ultralytics/8.3.145 available Update with 'pip install -U ultralytics'
Ultralytics 8.3.144 Python-3.11.9 torch-2.7.0+cu118 CPU (13th Gen Intel Core(TM) i7-13700K)
engine\trainer: agnostic_nms=False, amp=True, augment=False, auto_augment=randaugment, batch=16, bgr=0.0, box=7.5, cache=False, cfg=None, classes=None, close_mosaic=10, cls=0.5, conf=None, copy_paste=0.0, copy_paste_mode=flip, cos_lr=False, cutmix=0.0, data=Data\DB102\data.yaml, degrees=0.0, deterministic=True, device=cpu, dfl=1.5, dnn=False, dropout=0.0, dynamic=False, embed=None, epochs=50, erasing=0.4, exist_ok=False, fliplr=0.5, flipud=0.0, format=torchscript, fraction=1.0, freeze=None, half=False, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, imgsz=350, int8=False, iou=0.7, keras=False, kobj=1.0, line_width=None, lr0=0.01, lrf=0.01, mask_ratio=4, max_det=300, mixup=0.0, mode=train, model=yolov8n.pt, momentum=0.937, mosaic=1.0, multi_scale=False, name=coin_value_v8n3, nbs=64, nms=False, opset=None, optimize=False, optimizer=auto, overlap_mask=True, patience=100, perspective=0.0, plots=True, pose=12.0, pretrained=True, profile=False, project=runs/train_DB1, rect=False, resume=False, retina_masks=False, save=True, save_conf=False, save_crop=False, save_dir=runs\train_DB1\coin_value_v8n3, save_frames=False, save_json=False, save_period=-1, save_txt=False, scale=0.5, seed=0, shear=0.0, show=False, show_boxes=True, show_conf=True, show_labels=True, simplify=True, single_cls=False, source=None, split=val, stream_buffer=False, task=detect, time=None, tracker=botsort.yaml, translate=0.1, val=True, verbose=True, vid_stride=1, visualize=False, warmup_bias_lr=0.1, warmup_epochs=3.0, warmup_momentum=0.8, weight_decay=0.0005, workers=8, workspace=None
Overriding model.yaml nc=80 with nc=6

```

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

```

[1]
15           -1  1    37248 ultralytics.nn.modules.block.C2f
[192, 64, 1]
16           -1  1    36992 ultralytics.nn.modules.conv.Conv
[64, 64, 3, 2]
17      [-1, 12]  1       0 ultralytics.nn.modules.conv.Concat
[1]
18           -1  1   123648 ultralytics.nn.modules.block.C2f
[192, 128, 1]
19           -1  1   147712 ultralytics.nn.modules.conv.Conv
[128, 128, 3, 2]
20      [-1, 9]  1       0 ultralytics.nn.modules.conv.Concat
[1]
21           -1  1   493056 ultralytics.nn.modules.block.C2f
[384, 256, 1]
22      [15, 18, 21]  1   752482 ultralytics.nn.modules.head.Detect
[6, [64, 128, 256]]
Model summary: 129 layers, 3,012,018 parameters, 3,012,002 gradients, 8.2 GFLOPs

```

```

Transferred 319/355 items from pretrained weights
Freezing layer 'model.22.dfl.conv.weight'
WARNING imgsz=[350] must be multiple of max stride 32, updating to [352]
train: Fast image access (ping: 0.10.0 ms, read: 382.560.5 MB/s, size: 123.7 KB)
train: Scanning C:\Users\Amir\Desktop\Hexcel Technical interview\Data\DB102\train\labels.cache... 573 images, 0 backgrounds, 0 corrupt: 100%|██████████| 573/573 [00:00<?, ?it/s]
val: Fast image access (ping: 0.10.0 ms, read: 640.456.5 MB/s, size: 171.9 KB)
val: Scanning C:\Users\Amir\Desktop\Hexcel Technical interview\Data\DB102\valid\labels.cache... 54 images, 0 backgrounds, 0 corrupt: 100%|██████████| 54/54 [00:00<?, ?it/s]
Plotting labels to runs\train_DB1\coin_value_v8n3\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=0.001, momentum=0.9) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)
Image sizes 352 train, 352 val
Using 0 dataloader workers
Logging results to runs\train_DB1\coin_value_v8n3
Starting training for 50 epochs...

```

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
1/50	0G	0.782	3.005	0.9712	59	352: 100%
	██████████ 36/36 [00:16<00:00, 2.23it/s]					
	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 2.48it/s]						
	all	54	169	0.0147	0.982	0.25
0.208						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
2/50	0G	0.7463	1.885	0.9662	66	352: 100%
	██████████ 36/36 [00:14<00:00, 2.47it/s]					
	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.18it/s]						

	all	54	169	0.44	0.641	0.393
--	-----	----	-----	------	-------	-------

0.326

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
3/50	0G	0.7279	1.622	0.9501	86	352: 100%
	[36/36 [00:14<00:00, 2.51it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.36it/s]	all 54 169	0.338	0.687	0.524	

0.444

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
4/50	0G	0.6933	1.469	0.9317	70	352: 100%
	[36/36 [00:14<00:00, 2.56it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.39it/s]	all 54 169	0.412	0.51	0.495	

0.418

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
5/50	0G	0.6502	1.358	0.9215	81	352: 100%
	[36/36 [00:13<00:00, 2.58it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.41it/s]	all 54 169	0.469	0.717	0.688	

0.592

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
6/50	0G	0.6505	1.323	0.9224	68	352: 100%
	[36/36 [00:14<00:00, 2.55it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.28it/s]	all 54 169	0.419	0.798	0.699	

0.608

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
7/50	0G	0.6328	1.205	0.913	81	352: 100%
	[36/36 [00:13<00:00, 2.57it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.40it/s]	all 54 169	0.577	0.733	0.713	

0.624

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
8/50	0G	0.6441	1.176	0.9151	63	352: 100%
	[36/36 [00:14<00:00, 2.55it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.43it/s]	all 54 169	0.516	0.805	0.691	

0.615

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

9/50	0G	0.6073	1.087	0.9012	72	352: 100%
██████████ 36/36 [00:14<00:00, 2.52it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.44it/s]						
all	54	169	0.592	0.746	0.719	
0.639						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
10/50	0G	0.6005	1.079	0.9017	72	352: 100%
██████████ 36/36 [00:14<00:00, 2.55it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.45it/s]						
all	54	169	0.734	0.824	0.861	
0.777						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
11/50	0G	0.6134	1.045	0.8988	79	352: 100%
██████████ 36/36 [00:14<00:00, 2.55it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.46it/s]						
all	54	169	0.526	0.897	0.781	
0.695						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
12/50	0G	0.5915	1.035	0.8993	62	352: 100%
██████████ 36/36 [00:13<00:00, 2.59it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.23it/s]						
all	54	169	0.708	0.745	0.832	
0.742						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
13/50	0G	0.5952	0.9845	0.8947	69	352: 100%
██████████ 36/36 [00:13<00:00, 2.59it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.47it/s]						
all	54	169	0.589	0.711	0.676	
0.596						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
14/50	0G	0.5864	0.9354	0.896	76	352: 100%
██████████ 36/36 [00:13<00:00, 2.57it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.33it/s]						
all	54	169	0.714	0.874	0.821	
0.741						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
15/50	0G	0.5771	0.9225	0.8946	93	352: 100%
██████████ 36/36 [00:14<00:00, 2.50it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.29it/s]						

	all	54	169	0.794	0.782	0.846
--	-----	----	-----	-------	-------	-------

0.753

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
16/50	0G	0.5673	0.8999	0.8901	62	352: 100%
	[36/36 [00:14<00:00, 2.52it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.21it/s]	all 54 169	0.749	0.831	0.884	

0.791

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
17/50	0G	0.5656	0.8741	0.8896	60	352: 100%
	[36/36 [00:14<00:00, 2.47it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.38it/s]	all 54 169	0.636	0.903	0.852	

0.767

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
18/50	0G	0.5697	0.8286	0.8905	69	352: 100%
	[36/36 [00:13<00:00, 2.59it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.53it/s]	all 54 169	0.647	0.79	0.844	

0.747

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
19/50	0G	0.5612	0.8411	0.8911	57	352: 100%
	[36/36 [00:14<00:00, 2.57it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.57it/s]	all 54 169	0.613	0.791	0.804	

0.732

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
20/50	0G	0.5662	0.8264	0.8871	75	352: 100%
	[36/36 [00:14<00:00, 2.55it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.53it/s]	all 54 169	0.703	0.914	0.874	

0.784

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
21/50	0G	0.5557	0.813	0.8858	78	352: 100%
	[36/36 [00:14<00:00, 2.56it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.40it/s]	all 54 169	0.717	0.805	0.85	

0.765

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

22/50	0G	0.5484	0.7548	0.8815	62	352: 100%
██████████ 36/36 [00:13<00:00, 2.58it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.57it/s]						
all	54	169	0.652	0.775	0.79	
0.714						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
23/50	0G	0.5506	0.7412	0.8812	56	352: 100%
██████████ 36/36 [00:14<00:00, 2.56it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.55it/s]						
all	54	169	0.842	0.849	0.879	
0.798						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
24/50	0G	0.5445	0.7236	0.8806	69	352: 100%
██████████ 36/36 [00:13<00:00, 2.58it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.60it/s]						
all	54	169	0.693	0.869	0.849	
0.765						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
25/50	0G	0.5505	0.7128	0.8859	53	352: 100%
██████████ 36/36 [00:14<00:00, 2.56it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.63it/s]						
all	54	169	0.719	0.847	0.861	
0.776						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
26/50	0G	0.5426	0.7005	0.881	87	352: 100%
██████████ 36/36 [00:14<00:00, 2.56it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.56it/s]						
all	54	169	0.874	0.701	0.891	
0.81						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
27/50	0G	0.5312	0.6823	0.8758	64	352: 100%
██████████ 36/36 [00:14<00:00, 2.56it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.64it/s]						
all	54	169	0.737	0.803	0.88	
0.804						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
28/50	0G	0.5291	0.6669	0.8799	51	352: 100%
██████████ 36/36 [00:13<00:00, 2.59it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.59it/s]						

	all	54	169	0.708	0.777	0.816
--	-----	----	-----	-------	-------	-------

0.746

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
29/50	0G	0.5295	0.6501	0.8787	72	352: 100%
	[36/36 [00:13<00:00, 2.58it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.61it/s]	all 54 169	0.735	0.944	0.9	

0.812

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
30/50	0G	0.5273	0.6546	0.8795	62	352: 100%
	[36/36 [00:14<00:00, 2.54it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.64it/s]	all 54 169	0.718	0.861	0.876	

0.799

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
31/50	0G	0.5202	0.6436	0.8759	99	352: 100%
	[36/36 [00:14<00:00, 2.57it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.68it/s]	all 54 169	0.768	0.907	0.911	

0.835

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
32/50	0G	0.5241	0.6272	0.8765	53	352: 100%
	[36/36 [00:13<00:00, 2.59it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.69it/s]	all 54 169	0.74	0.808	0.875	

0.8

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
33/50	0G	0.5124	0.6148	0.8764	79	352: 100%
	[36/36 [00:14<00:00, 2.53it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.57it/s]	all 54 169	0.859	0.89	0.933	

0.854

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
34/50	0G	0.5101	0.6353	0.878	83	352: 100%
	[36/36 [00:14<00:00, 2.51it/s]	Class Images Instances	Box(P	R	mAP50 mAP50	
-95): 100%	2/2 [00:00<00:00, 3.57it/s]	all 54 169	0.641	0.829	0.844	

0.778

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size

35/50	0G	0.5121	0.6136	0.8734	78	352: 100%
██████████ 36/36 [00:14<00:00, 2.51it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.55it/s]						
all	54	169	0.735	0.882	0.92	
0.845						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
36/50	0G	0.5075	0.6099	0.8741	70	352: 100%
██████████ 36/36 [00:14<00:00, 2.57it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.68it/s]						
all	54	169	0.85	0.924	0.946	
0.861						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
37/50	0G	0.5022	0.603	0.8732	67	352: 100%
██████████ 36/36 [00:13<00:00, 2.60it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.67it/s]						
all	54	169	0.745	0.855	0.9	
0.822						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
38/50	0G	0.496	0.5614	0.8664	72	352: 100%
██████████ 36/36 [00:13<00:00, 2.58it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.64it/s]						
all	54	169	0.726	0.955	0.917	
0.84						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
39/50	0G	0.5054	0.562	0.8702	48	352: 100%
██████████ 36/36 [00:14<00:00, 2.56it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.65it/s]						
all	54	169	0.801	0.853	0.89	
0.811						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
40/50	0G	0.4974	0.5518	0.8723	57	352: 100%
██████████ 36/36 [00:14<00:00, 2.57it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.62it/s]						
all	54	169	0.707	0.873	0.873	
0.795						

Closing dataloader mosaic

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
41/50	0G	0.4284	0.4526	0.8362	44	352: 100%
██████████ 36/36 [00:13<00:00, 2.69it/s]						
Class	Images	Instances	Box(P)		R	mAP50 mAP50
-95): 100% ██████████ 2/2 [00:00<00:00, 3.56it/s]						

	all	54	169	0.77	0.839	0.869
--	-----	----	-----	------	-------	-------

0.793

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
42/50	0G	0.4253	0.4132	0.832	40	352: 100%
	[36/36 [00:13<00:00, 2.72it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.66it/s]	all 54 169	0.772	0.907	0.899	

0.823

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
43/50	0G	0.4189	0.3856	0.8332	41	352: 100%
	[36/36 [00:13<00:00, 2.69it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.52it/s]	all 54 169	0.802	0.907	0.906	

0.831

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
44/50	0G	0.4135	0.3852	0.8328	41	352: 100%
	[36/36 [00:13<00:00, 2.71it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.66it/s]	all 54 169	0.785	0.879	0.917	

0.837

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
45/50	0G	0.4129	0.3663	0.8364	42	352: 100%
	[36/36 [00:13<00:00, 2.70it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.47it/s]	all 54 169	0.832	0.927	0.92	

0.844

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
46/50	0G	0.4105	0.3597	0.8354	40	352: 100%
	[36/36 [00:13<00:00, 2.66it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.66it/s]	all 54 169	0.821	0.923	0.887	

0.815

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
47/50	0G	0.4052	0.3493	0.8267	40	352: 100%
	[36/36 [00:13<00:00, 2.71it/s]	Class Images Instances	Box(P	R	mAP50	mAP50
-95): 100%	2/2 [00:00<00:00, 3.63it/s]	all 54 169	0.826	0.904	0.911	

0.834

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

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
48/50	0G	0.4034	0.346	0.8334	40	352: 100%
					R	mAP50 mAP50
-95): 100%	36/36 [00:13<00:00, 2.69it/s]	Class	Images	Instances	Box(P	
					2/2 [00:00<00:00, 3.58it/s]	
					all 54 169 0.812 0.93 0.922	
						0.847

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
49/50	0G	0.3964	0.341	0.8253	44	352: 100%
					R	mAP50 mAP50
-95): 100%	36/36 [00:13<00:00, 2.70it/s]	Class	Images	Instances	Box(P	
					2/2 [00:00<00:00, 3.52it/s]	
					all 54 169 0.837 0.927 0.929	
						0.85

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
50/50	0G	0.4028	0.3347	0.8257	40	352: 100%
					R	mAP50 mAP50
-95): 100%	36/36 [00:13<00:00, 2.67it/s]	Class	Images	Instances	Box(P	
					2/2 [00:00<00:00, 3.53it/s]	
					all 54 169 0.874 0.89 0.927	
						0.849

50 epochs completed in 0.204 hours.

Optimizer stripped from runs\train_DB1\coin_value_v8n3\weights\last.pt, 6.2MB

Optimizer stripped from runs\train_DB1\coin_value_v8n3\weights\best.pt, 6.2MB

Validating runs\train_DB1\coin_value_v8n3\weights\best.pt...

Ultralytics 8.3.144 Python-3.11.9 torch-2.7.0+cu118 CPU (13th Gen Intel Core(TM) i7-13700K)

Model summary (fused): 72 layers, 3,006,818 parameters, 0 gradients, 8.1 GFLOPs

Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	36/36 [00:00<00:00, 3.62it/s]	Class	Images	Instances	Box(P	
					2/2 [00:00<00:00, 3.62it/s]	
					all 54 169 0.85 0.924 0.946	
0.861	0	49	83	0.952	0.946	0.988
0.903	1	18	22	0.727	0.864	0.924
0.864	2	28	31	1	0.819	0.978
0.872	3	7	7	0.571	1	0.844
0.739	5	26	26	1	0.992	0.995
0.926						

Speed: 0.1ms preprocess, 6.4ms inference, 0.0ms loss, 0.2ms postprocess per image
Results saved to runs\train_DB1\coin_value_v8n3

Running evaluation on our Val and test splits

In [41]: `from ultralytics import YOLO`

```
# Loading our best model
model = YOLO('runs/train_DB1/coin_value_v8n3/weights/best.pt')
```

```

# validating on val split
val_metrics = model.val(
    data='Data/DB102/data.yaml',
    split='val'
)

print("Validation results:", val_metrics)

# validating on test split
test_metrics = model.val(
    data='Data/DB102/data.yaml',
    split='test'
)

print("Test results:", test_metrics)

```

Ultralytics 8.3.145 Python-3.11.9 torch-2.5.1+cu121 CUDA:0 (NVIDIA GeForce RTX 4070 Ti, 12282MiB)

Model summary (fused): 72 layers, 3,006,818 parameters, 0 gradients, 8.1 GFLOPs

val: Fast image access (ping: 0.00.0 ms, read: 1566.9432.3 MB/s, size: 149.8 KB)

val: Scanning C:\Users\Amir\Desktop\Hexcel Technical interview\Data\DB102\valid\labels.cache... 54 images, 0 backgrounds, 0 corrupt: 100%|██████████| 54/54 [00:00<?, ?it/s]

Class	Images	Instances	Box(P)	R	mAP50	mAP50
-95): 100% ██████████ 4/4 [00:01<00:00, 2.31it/s]						

	all	54	169	0.85	0.925	0.944
0.86	0	49	83	0.952	0.948	0.988
0.904	1	18	22	0.727	0.864	0.924
0.864	2	28	31	1	0.819	0.978
0.872	3	7	7	0.57	1	0.837
0.733	5	26	26	1	0.992	0.995
0.926						

Speed: 0.7ms preprocess, 5.7ms inference, 0.0ms loss, 0.8ms postprocess per image
 Results saved to `runs\detect\val`

Validation results: `ultralytics.utils.metrics.DetMetrics` object with attributes:

```

ap_class_index: array([0, 1, 2, 3, 5])
box: ultralytics.utils.metrics.Metric object
confusion_matrix: <ultralytics.utils.metrics.ConfusionMatrix object at 0x000002188F1
60F50>
curves: ['Precision-Recall(B)', 'F1-Confidence(B)', 'Precision-Confidence(B)', 'Reca
ll-Confidence(B)']
curves_results: [[array([
        0,    0.001001,    0.002002,    0.003003,    0.00
4004,    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,    0.092092,    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,    0.204
      ])]

```

2,	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,
	0.22222,	0.22322,	0.22422,	0.22523,	0.22623,	0.22723,
3,	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,
	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,	0.25125,
5,	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,
	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,	0.27528,
8,	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,
	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,	0.2993,
3,	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,
	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,	0.32332,
2,	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,
	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,	0.34735,
5,	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,
	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,	0.37137,
7,	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,
	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,	0.3954,
4,	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,
	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,	0.41942,
2,	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,
	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,	0.44344,
4,	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,
	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,	0.46747,
7,	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,
	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,	0.49149,
9,	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,
	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,	0.51552,
2,	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,
	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,
						0.5405

4,	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,
	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,
6,	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,
	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,
9,	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,
	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,
1,	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,
	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,	0.63564,
4,	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,
	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,
6,	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,
	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,	0.68368,
8,	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,
	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,
1,	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,
	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,	0.73173,
3,	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,
	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,
6,	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,
	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,	0.77978,
8,	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,
	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,
8,	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,
	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,
3,	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,
	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,	0.85185,
5,	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,
	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,	0.87588,
						0.8768

```

8,      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,      0.900
9,      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,      0.9249
2,      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,      0.9489
5,      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,      0.9729
7,      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,      0.99
7,      0.998,      0.999,      1]), array([[ 1,      1,
1, ..., 0.89247, 0.89247,
      [ 1,      1,      1,      1, ..., 0.59459, 0.59459,
0],      [ 1,      1,      1,      1, ..., 0.70455, 0.70455,
0],      [ 1,      1,      1,      1, ..., 0.58333, 0.58333,
0],      [ 1,      1,      1,      1, ..., 1,      1,
0]]), 'Recall', 'Precision'], [array([
      0,      0.001001,      0.002002,      0.00
3003,      0.004004,      0.005005,      0.006006,
      0.007007,      0.008008,      0.009009,
0.01001,      0.011011,      0.012012,      0.013013,
      0.014014,      0.015015,      0.01601
6,      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,
      0.03603
6,      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,
      0.060
06,      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,
      0.0840
84,      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,
      0.1081
1,      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,
      0.1321
3,      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,
      0.1561

```

6,	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,	0.1801
8,	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,	0.204
2,	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,	0.2282
3,	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,	0.2522
5,	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,	0.2762
8,	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,	0.300
3,	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,	0.3243
2,	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,	0.3483
5,	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,	0.3723
7,	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,	0.396
4,	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,	0.4204
2,	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,	0.4444
4,	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,	0.4684
7,	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,	0.4924

9,	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,	0.5165
2,	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,
0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,	0.5405
4,	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,
0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,	0.5645
6,	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,
0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,	0.5885
9,	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,
0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,	0.6126
1,	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,
0.63063,	0.63163,	0.63263,	0.63363,	0.63463,	0.63564,	0.6366
4,	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,
0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,	0.6606
6,	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,
0.67868,	0.67968,	0.68068,	0.68168,	0.68268,	0.68368,	0.6846
8,	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,
0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,	0.7087
1,	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,
0.72673,	0.72773,	0.72873,	0.72973,	0.73073,	0.73173,	0.7327
3,	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,
0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,	0.7567
6,	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,
0.77477,	0.77578,	0.77678,	0.77778,	0.77878,	0.77978,	0.7807
8,	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,
0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,	0.804
8,	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,
0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,	0.8288

3, 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, 0.8528
 5, 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, 0.8768
 8, 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, 0.900
 9, 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, 0.9249
 2, 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, 0.9489
 5, 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, 0.9729
 7, 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, 0.99
 7, 0.998, 0.999, 1]), array([[0.32677, 0.32677, 0.
 53236, ... , 0, 0, 0],
 [0.040553, 0.040653, 0.19724, ..., 0, 0,
 0],
 [0.28571, 0.28571, 0.41602, ..., 0, 0,
 0],
 [0.1, 0.1, 0.1618, ..., 0, 0,
 0],
 [0.20968, 0.20968, 0.34934, ..., 0, 0,
 0]], 'Confidence', 'F1'], [array([0, 0.001001, 0.002002, 0.00300
 3, 0.004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.009009,
 0.01001, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015, 0.01601
 6, 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, 0.03603
 6, 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, 0.060
 06, 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, 0.0840
 84, 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, 0.1081

1,	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,	0.1321
3,	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,	0.1561
6,	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,	0.1801
8,	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,	0.204
2,	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,	0.2282
3,	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,	0.2522
5,	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,	0.2762
8,	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,	0.300
3,	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,	0.3243
2,	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,	0.3483
5,	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,	0.3723
7,	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,	0.396
4,	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,	0.4204
2,	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,	0.4444

4,	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,	0.4684
7,	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,	0.4924
9,	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,	0.5165
2,	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,	0.5405
4,	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,	0.5645
6,	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,	0.5885
9,	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,	0.6126
1,	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,	0.6366
4,	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,	0.6606
6,	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,	0.6846
8,	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,	0.7087
1,	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,	0.7327
3,	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,	0.7567
6,	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,	0.7807

8, 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, 0.804
 8, 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, 0.8288
 3, 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, 0.8528
 5, 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, 0.8768
 8, 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, 0.900
 9, 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, 0.9249
 2, 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, 0.9489
 5, 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, 0.9729
 7, 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, 0.99
 7, 0.998, 0.999, 1], array([[0.19529, 0.19529, 0.
 36273, ... , 1, 1, 1],
 [0.020696, 0.020748, 0.10941, ... , 1, 1,
 1],
 [0.16667, 0.16667, 0.26265, ... , 1, 1,
 1],
 [0.052632, 0.052632, 0.088019, ... , 1, 1,
 1],
 [0.11712, 0.11712, 0.21164, ... , 1, 1,
 1]]), 'Confidence', 'Precision'], [array([0, 0.001001, 0.002002,
 0.003003, 0.004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.0090
 09, 0.01001, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015,
 0.016016, 0.017017, 0.018018, 0.019019, 0.02002, 0.021021, 0.0220
 22, 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, 0.03603
 6, 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, 0.060

06, 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, 0.0840
 84, 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, 0.1081
 1, 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, 0.1321
 3, 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, 0.1561
 6, 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, 0.1801
 8, 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, 0.204
 2, 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, 0.2282
 3, 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, 0.2522
 5, 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, 0.2762
 8, 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, 0.300
 3, 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, 0.3243
 2, 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, 0.3483
 5, 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, 0.3723
 7, 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, 0.396

4,	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,	0.4204
2,	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,	0.4444
4,	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,	0.4684
7,	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,	0.4924
9,	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,	0.5165
2,	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,	0.5405
4,	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,	0.5645
6,	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,	0.5885
9,	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,	0.6126
1,	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,	0.6366
4,	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,	0.6606
6,	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,	0.6846
8,	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,	0.7087
1,	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,	0.7327


```
50-95(B)']
maps: array([ 0.90376,  0.86391,  0.87224,  0.73253,  0.85965,  0.
92581])
names: {0: '0', 1: '1', 2: '2', 3: '3', 4: '4', 5: '5'}
plot: True
results_dict: {'metrics/precision(B)': np.float64(0.8497223922320216), 'metrics/recall(B)': np.float64(0.9245662094082825), 'metrics/mAP50(B)': np.float64(0.9444481563179696), 'metrics/mAP50-95(B)': np.float64(0.8596503782865114), 'fitness': np.float64(0.8681301560896572)}
save_dir: WindowsPath('runs/detect/val')
speed: {'preprocess': 0.7133499998922667, 'inference': 5.7442351850719815, 'loss': 0.0002648146754061734, 'postprocess': 0.8448074071633594}
task: 'detect'
Ultralytics 8.3.145 Python-3.11.9 torch-2.5.1+cu121 CUDA:0 (NVIDIA GeForce RTX 4070 Ti, 12282MiB)
val: Fast image access (ping: 0.20.1 ms, read: 428.984.9 MB/s, size: 140.1 KB)
val: Scanning C:\Users\Amir\Desktop\Hexcel Technical interview\Data\DB102\test\labels... 28 images, 0 backgrounds, 0 corrupt: 100%|██████████| 28/28 [00:00<00:00, 944.05it/s]
val: New cache created: C:\Users\Amir\Desktop\Hexcel Technical interview\Data\DB102\test\labels.cache

```

	Class	Images	Instances	Box(P)	R	mAP50	mAP50-95
-95): 100%	██████████	2/2	[00:01<00:00,	1.39it/s]			

	all	28	88	0.886	0.927	0.964
0.89	0	25	38	0.912	1	0.994
0.925	1	10	15	0.933	0.925	0.971
0.92	2	15	17	0.937	0.877	0.976
0.911	3	5	6	0.704	0.833	0.885
0.778	5	10	12	0.947	1	0.995
0.914						

Speed: 0.4ms preprocess, 10.0ms inference, 0.0ms loss, 1.6ms postprocess per image
 Results saved to `runs\detect\val2`

Test results: `ultralytics.utils.metrics.DetMetrics` object with attributes:

```

ap_class_index: array([0, 1, 2, 3, 5])
box: ultralytics.utils.metrics.Metric object
confusion_matrix: <ultralytics.utils.metrics.ConfusionMatrix object at 0x000002188F0
1D9D0>
curves: ['Precision-Recall(B)', 'F1-Confidence(B)', 'Precision-Confidence(B)', 'Reca
ll-Confidence(B)']
curves_results: [[array([
        0,    0.001001,    0.002002,    0.003003,    0.00
4004,    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,    0.092092,    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,    0.204
])]]]

```

2,	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,
	0.22222,	0.22322,	0.22422,	0.22523,	0.22623,	0.22723,
3,	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,
	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,	0.25125,
5,	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,
	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,	0.27528,
8,	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,
	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,	0.2993,
3,	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,
	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,	0.32332,
2,	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,
	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,	0.34735,
5,	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,
	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,	0.37137,
7,	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,
	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,	0.3954,
4,	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,
	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,	0.41942,
2,	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,
	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,	0.44344,
4,	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,
	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,	0.46747,
7,	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,
	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,	0.49149,
9,	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,
	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,	0.51552,
2,	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,
	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,
						0.5405

4,	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,
	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,
6,	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,
	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,
9,	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,
	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,
1,	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,
	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,	0.63564,
4,	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,
	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,
6,	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,
	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,	0.68368,
8,	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,
	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,
1,	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,
	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,	0.73173,
3,	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,
	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,
6,	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,
	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,	0.77978,
8,	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,
	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,
8,	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,
	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,
3,	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,
	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,	0.85185,
5,	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,
	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,	0.87588,
						0.8768

```

8,      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,      0.900
9,      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,      0.9249
2,      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,      0.9489
5,      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,      0.9729
7,      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,      0.99
7,      0.998,      0.999,      1]), array([[ 1,      1,
1, ..., 0.95, 0.95,
      [ 1,      1,      1,      1, ..., 0.68182, 0.68182,
0],      [ 1,      1,      1,      1, ..., 0.89474, 0.89474,
0],      [ 1,      1,      1,      1, ..., 0.66667, 0.66667,
0],      [ 1,      1,      1,      1, ..., 1,      1,
0]]), 'Recall', 'Precision'], [array([
      0,      0.001001,      0.002002,      0.00
3003,      0.004004,      0.005005,      0.006006,
      0.007007,      0.008008,      0.009009,
0.01001,      0.011011,      0.012012,      0.013013,
      0.014014,      0.015015,      0.01601
6,      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,
      0.03603
6,      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,
      0.060
06,      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,
      0.0840
84,      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,
      0.1081
1,      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,
      0.1321
3,      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,
      0.1561

```

6,	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,	0.1801	
8,	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,	0.204	
2,	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,	0.2282	
3,	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,	0.2522	
5,	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,	0.2762	
8,	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,	0.300	
3,	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,	0.3243	
2,	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,	0.3483	
5,	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,	0.3723	
7,	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,	0.396	
4,	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,	0.4204	
2,	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,	0.4444	
4,	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,	0.4684	
7,	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,	0.48849,	0.48949,	0.49049,	0.49149,
				0.4924		

9,	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,	0.5165
2,	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,
0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,	0.5405
4,	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,
0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,	0.5645
6,	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,
0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,	0.5885
9,	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,
0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,	0.6126
1,	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,
0.63063,	0.63163,	0.63263,	0.63363,	0.63463,	0.63564,	0.6366
4,	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,
0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,	0.6606
6,	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,
0.67868,	0.67968,	0.68068,	0.68168,	0.68268,	0.68368,	0.6846
8,	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,
0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,	0.7087
1,	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,
0.72673,	0.72773,	0.72873,	0.72973,	0.73073,	0.73173,	0.7327
3,	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,
0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,	0.7567
6,	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,
0.77477,	0.77578,	0.77678,	0.77778,	0.77878,	0.77978,	0.7807
8,	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,
0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,	0.804
8,	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,
0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,	0.8288

3, 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, 0.8528
 5, 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, 0.8768
 8, 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, 0.900
 9, 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, 0.9249
 2, 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, 0.9489
 5, 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, 0.9729
 7, 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, 0.99
 7, 0.998, 0.999, 1]), array([[0.31667, 0.31667,
 0.5084, ... , 0, 0, 0, 0],
 [0.05291, 0.053484, 0.23696, ... , 0, 0, 0,
 0], [0.30909, 0.30909, 0.45615, ... , 0, 0, 0,
 0], [0.13333, 0.13333, 0.22694, ... , 0, 0, 0,
 0], [0.20339, 0.20349, 0.32316, ... , 0, 0, 0,
 0]]), 'Confidence', 'F1'], [array([0, 0.001001, 0.002002, 0.00300
 3, 0.004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.009009,
 0.01001, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015, 0.01601
 6, 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, 0.03603
 6, 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, 0.060
 06, 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, 0.0840
 84, 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, 0.1081

1,	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,	0.1321
3,	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,	0.1561
6,	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,	0.1801
8,	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,	0.204
2,	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,	0.2282
3,	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,	0.2522
5,	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,	0.2762
8,	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,	0.300
3,	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,	0.3243
2,	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,	0.3483
5,	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,	0.3723
7,	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,	0.396
4,	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,	0.4204
2,	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,	0.4444

4,	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,	0.4684
7,	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,	0.4924
9,	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,	0.5165
2,	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,	0.5405
4,	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,	0.5645
6,	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,	0.5885
9,	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,	0.6126
1,	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,	0.6366
4,	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,	0.6606
6,	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,	0.6846
8,	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,	0.7087
1,	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,	0.7327
3,	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,	0.7567
6,	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,	0.7807

8, 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, 0.804
 8, 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, 0.8288
 3, 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, 0.8528
 5, 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, 0.8768
 8, 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, 0.900
 9, 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, 0.9249
 2, 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, 0.9489
 5, 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, 0.9729
 7, 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, 0.99
 7, 0.998, 0.999, 1], array([[0.18812, 0.18812, 0.
 34084, ... , 1, 1, 1],
 [0.027174, 0.027477, 0.13441, ... , 1, 1,
 1],
 [0.1828, 0.1828, 0.29546, ... , 1, 1,
 1],
 [0.071429, 0.071429, 0.12799, ... , 1, 1,
 1],
 [0.11321, 0.11327, 0.19272, ... , 1, 1,
 1]]), 'Confidence', 'Precision'], [array([0, 0.001001, 0.002002,
 0.003003, 0.004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.0090
 09, 0.01001, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015,
 0.016016, 0.017017, 0.018018, 0.019019, 0.02002, 0.021021, 0.0220
 22, 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, 0.03603
 6, 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, 0.060

06, 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, 0.0840
 84, 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, 0.1081
 1, 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, 0.1321
 3, 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, 0.1561
 6, 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, 0.1801
 8, 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, 0.204
 2, 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, 0.2282
 3, 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, 0.2522
 5, 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, 0.2762
 8, 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, 0.300
 3, 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, 0.3243
 2, 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, 0.3483
 5, 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, 0.3723
 7, 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, 0.396

4,	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,	0.4204
2,	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,	0.4444
4,	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,	0.4684
7,	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,	0.4924
9,	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,	0.5165
2,	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,	0.5405
4,	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,	0.5645
6,	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,	0.5885
9,	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,	0.6126
1,	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,	0.6366
4,	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,	0.6606
6,	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,	0.6846
8,	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,	0.7087
1,	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,	0.7327

```

3,      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,      0.7567
6,      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,      0.7807
8,      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,      0.804
8,      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,      0.8288
3,      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,      0.8528
5,      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,      0.8768
8,      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,      0.900
9,      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,      0.9249
2,      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,      0.9489
5,      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,      0.9729
7,      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,      0.99
7,      0.998,      0.999,      1], array([[ 1,      1,
1,      ... ,      0,      0],
[ 1,      1,      1,      ... ,      0,      0,
0],      [ 1,      1,      1,      ... ,      0,      0,
0],      [ 1,      1,      1,      ... ,      0,      0,
0],      [ 1,      1,      1,      ... ,      0,      0,
0]]), 'Confidence', 'Recall'])
fitness: np.float64(0.8970894460779264)
keys: ['metrics/precision(B)', 'metrics/recall(B)', 'metrics/mAP50(B)', 'metrics/mAP

```

```

50-95(B)']
maps: array([    0.92485,     0.92028,     0.91114,     0.77758,     0.88964,     0.
91433])
names: {0: '0', 1: '1', 2: '2', 3: '3', 4: '4', 5: '5'}
plot: True
results_dict: {'metrics/precision(B)': np.float64(0.886466875660712), 'metrics/recal
l(B)': np.float64(0.9270582531103383), 'metrics/mAP50(B)': np.float64(0.964172323857
7727), 'metrics/mAP50-95(B)': np.float64(0.8896357929912768), 'fitness': np.float64
(0.8970894460779264)}
save_dir: WindowsPath('runs/detect/val2')
speed: {'preprocess': 0.42518214312232366, 'inference': 9.991164285435973, 'loss':
0.00034285715498429326, 'postprocess': 1.6136178570117667}
task: 'detect'

```

Making Prediction on the original Datasets (both 1 and 2)

For this step we will be using our best predictive model, which is trained on the augmented dataset that we created to make predictions on both datasets. Note the following code chunks aim to load the model, take in the designated dataset (1 or 2), then make it's prediction on it and save the output, both images as well as their corresponding labels, thus, the labels can be used to create a distribution plot.

```

In [37]: import os
import matplotlib.pyplot as plt
from ultralytics import YOLO

# Loading the best model
model = YOLO('runs/train_DB1/coin_value_v8n3/weights/best.pt')

# getting all the images from Dataset 1
image_dir = 'Data/dataset2'
image_paths = [
    os.path.join(image_dir, f)
    for f in os.listdir(image_dir)
    if f.lower().endswith('.jpg', '.jpeg', '.png')]
]

# Run inference and save predictions for later visualization
results = model.predict(
    source=image_paths,
    imgsz=350,
    batch=16,
    save=True,          # saves annotated images
    save_txt=True,      # saves Labels in YOLO .txt format
    project='runs/predict',
    name='dataset2_results',
    verbose=False
)

```

WARNING imgsz=[350] must be multiple of max stride 32, updating to [352]
Results saved to runs\predict\dataset2_results
400 labels saved to runs\predict\dataset2_results\labels

Q1: Creating a Distribution Plot For Dataset1

In [24]:

#Visualizing some outputs from dat

```
import os
import random
from PIL import Image
import matplotlib.pyplot as plt

# Folder containing YOLO output images (with boxes already drawn)
image_dir = "runs/predict/dataset1_results"

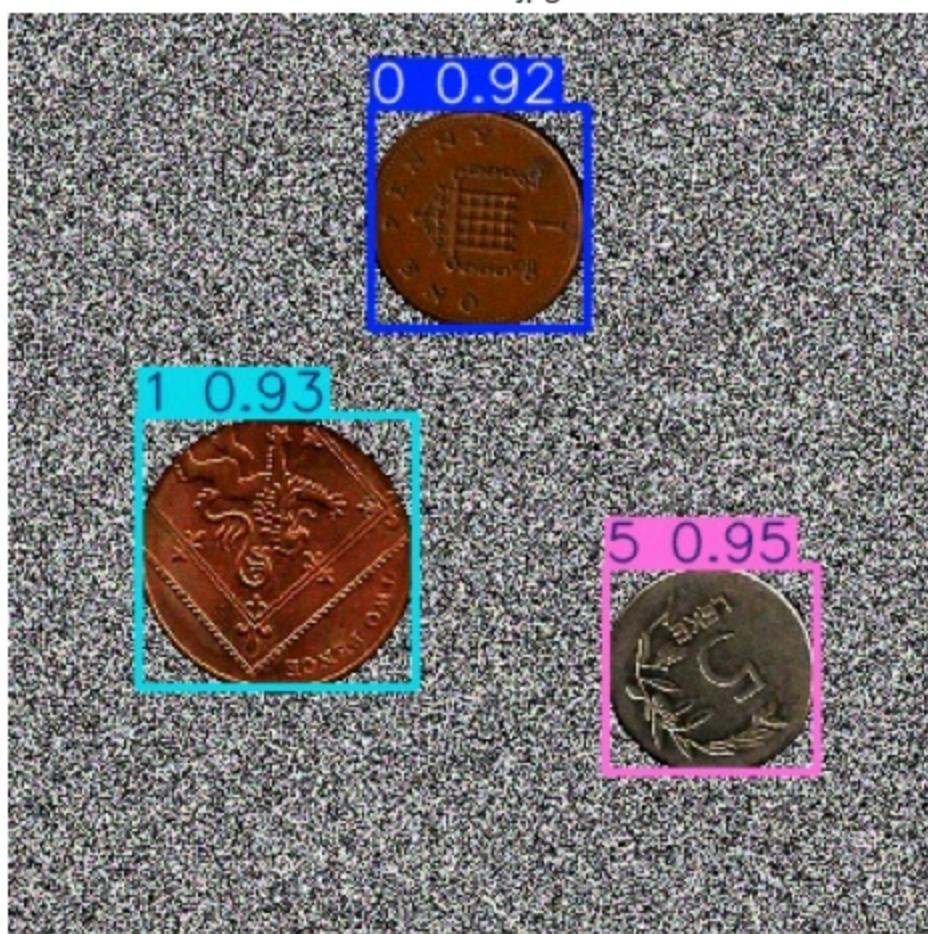
# Get list of image files (ignore the 'labels' folder and non-image files)
image_files = [f for f in os.listdir(image_dir)
               if f.lower().endswith((".jpg", ".png", ".jpeg"))
               and not os.path.isdir(os.path.join(image_dir, f))]

# Randomly select 5 images
sampled_images = random.sample(image_files, 5)

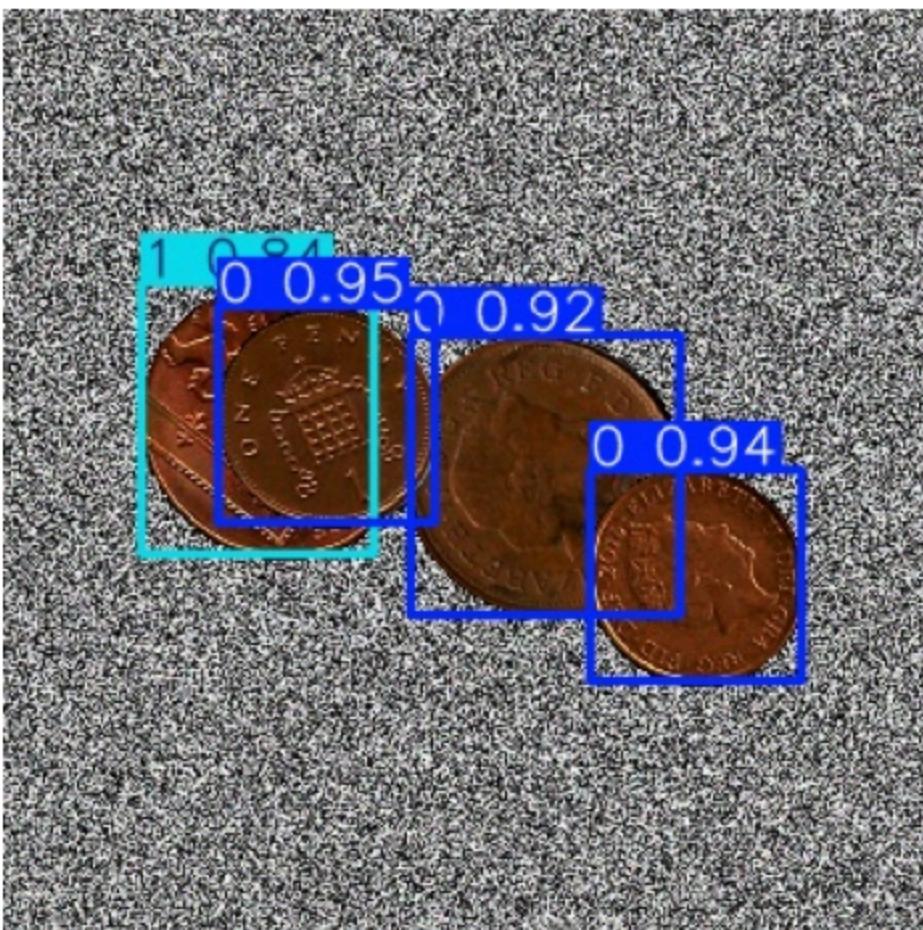
# Display each image
for filename in sampled_images:
    img_path = os.path.join(image_dir, filename)
    img = Image.open(img_path).convert("RGB")

    plt.figure(figsize=(6, 6))
    plt.imshow(img)
    plt.axis('off')
    plt.title(filename)
    plt.show()
```

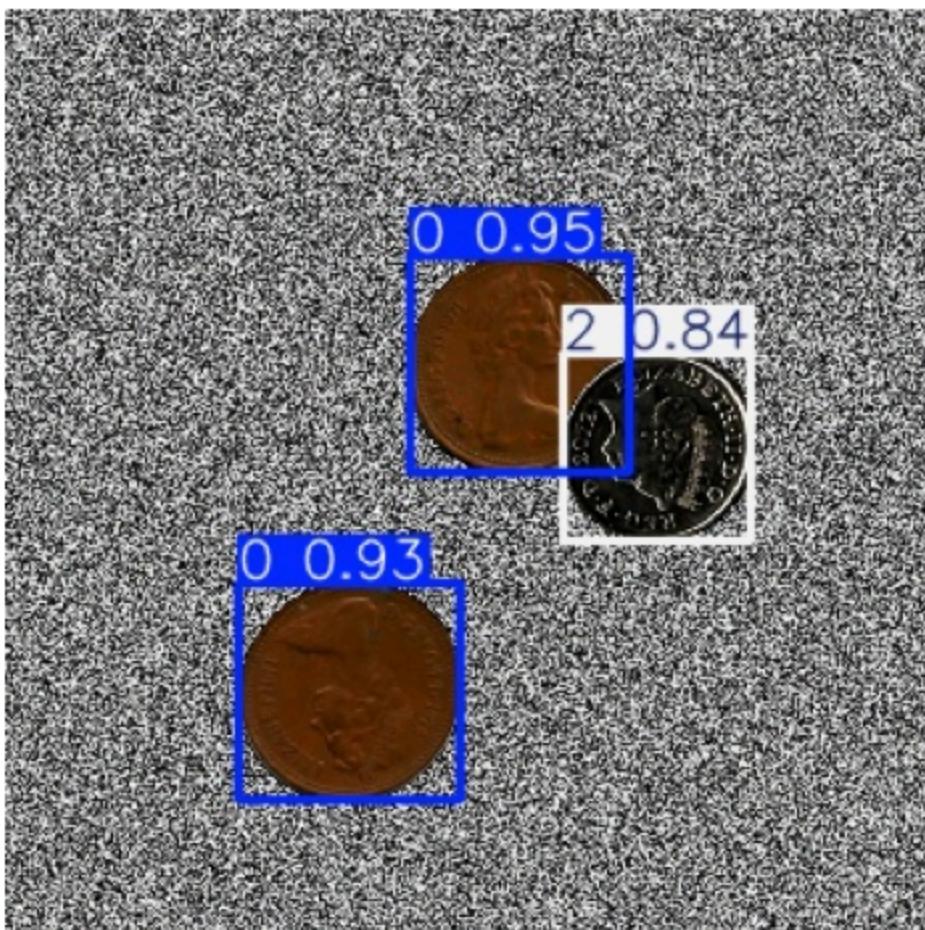
coins112.jpg



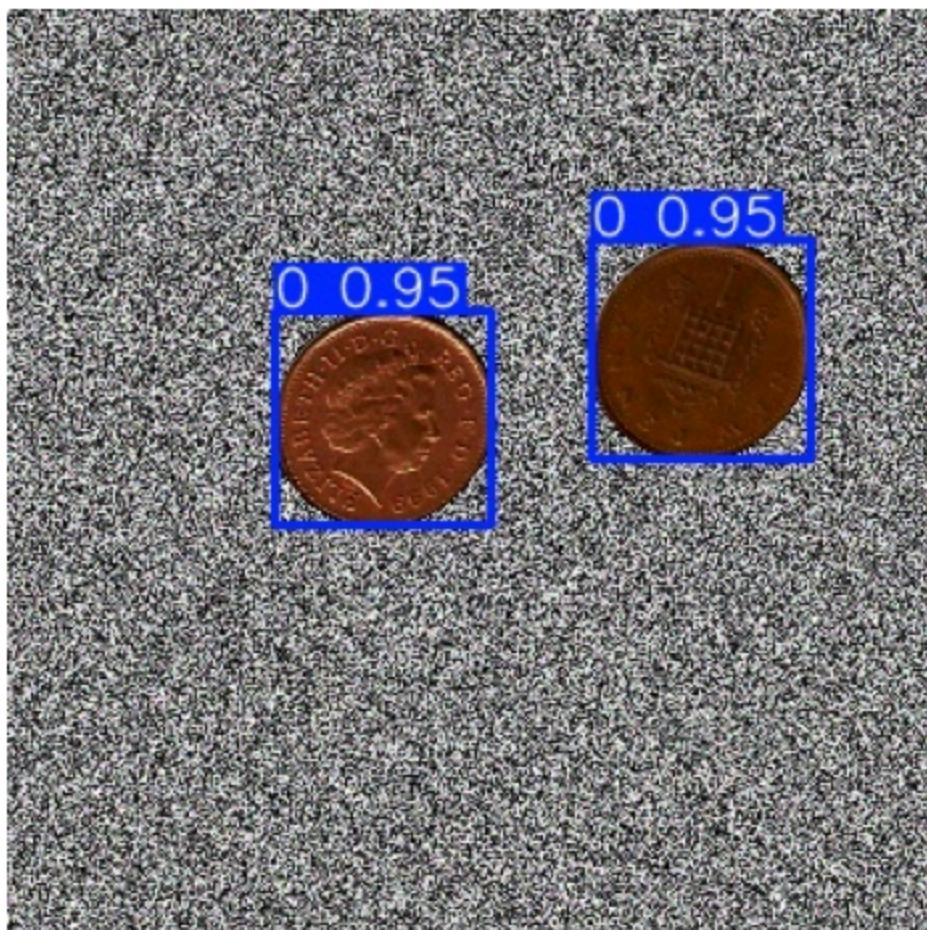
coins34.jpg



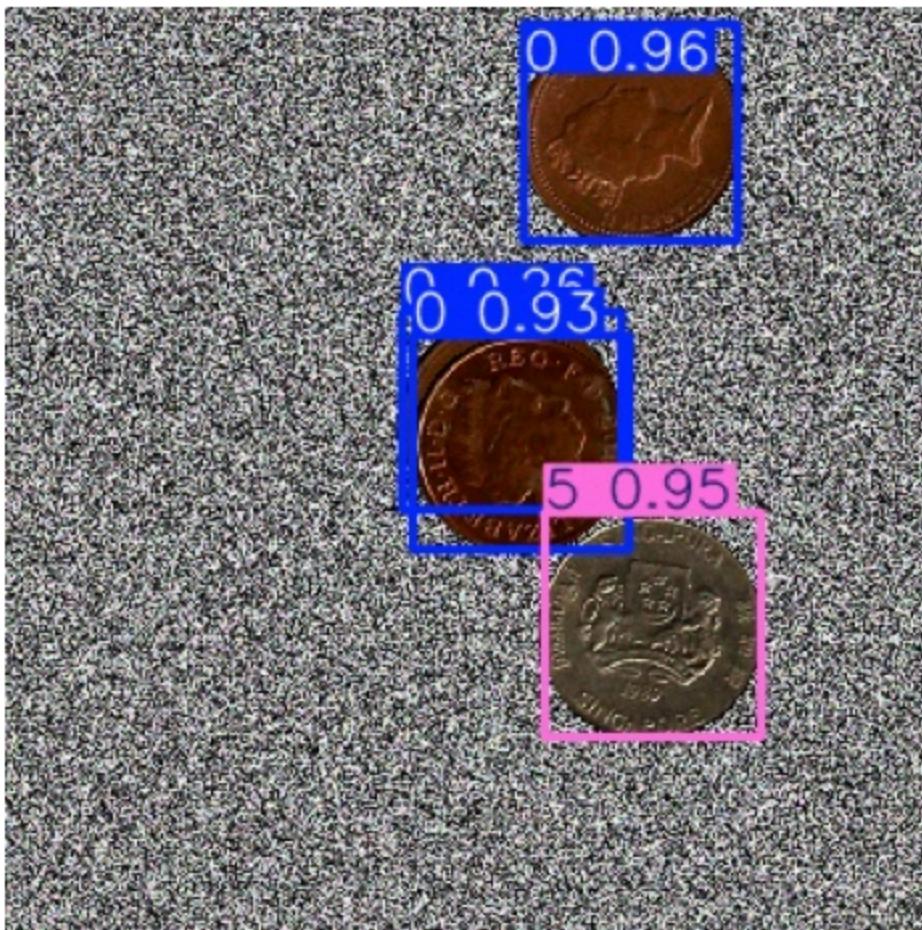
coins62.jpg



coins99.jpg



coins373.jpg



In []:

```
import os
from collections import Counter
import matplotlib.pyplot as plt

# Path to YOLO Label files (Dataset 1)
label_dir = "runs/predict/dataset1_results/labels"

# Map of UK coin class IDs to their sterling values
UK_CLASS_TO_VALUE = {
    "0": 0.01,  # 1p
    "1": 0.02,  # 2p
    "2": 0.05,  # 5p
    "3": 0.10,  # 10p
    "4": 0.20,  # 20p
    # "5" is a non-UK coin and excluded
}

image_totals = []

# Calculate total coin value for each image
for filename in os.listdir(label_dir):
    if filename.endswith(".txt"):
        total_value = 0
        with open(os.path.join(label_dir, filename), "r") as f:
            for line in f:
                #Loop through
                #only look
                #give the c
                #opening th
                #read each
```

```

        parts = line.strip().split()                                #split the
        if parts:
            class_id = parts[0]                                     #Getting cl
            value = UK_CLASS_TO_VALUE.get(class_id)                 #getting th
            if value is not None:
                total_value += value                               # add that
            image_totals.append(round(total_value, 2))           #saving the

# Count how many images had each exact total value
value_counts = Counter(image_totals)
sorted_items = sorted(value_counts.items()) # Sort by coin value

# Separate into x (coin values) and y (image counts)
x_vals = [f"£{val:.2f}" for val, _ in sorted_items] # Convert to string labels for
y_vals = [count for _, count in sorted_items]

# Plot the bar chart
plt.style.use("seaborn-v0_8-whitegrid")
fig, ax = plt.subplots(figsize=(18, 6)) # Wider layout to avoid overlap

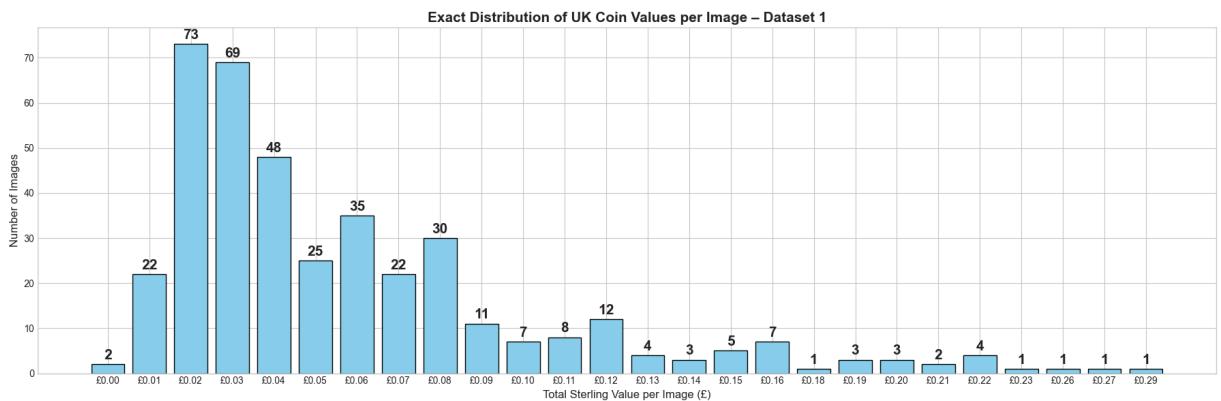
bars = ax.bar(x_vals, y_vals, color='skyblue', edgecolor='black')

# Add number labels above each bar
for bar in bars:
    height = bar.get_height()
    ax.text(bar.get_x() + bar.get_width() / 2, height + 0.5, str(int(height)),
            ha='center', va='bottom', fontsize=15, fontweight='bold')

# Title and axis labels
ax.set_title("Exact Distribution of UK Coin Values per Image – Dataset 1", fontsize=14)
ax.set_xlabel("Total Sterling Value per Image (£)", fontsize=12)
ax.set_ylabel("Number of Images", fontsize=12)

plt.tight_layout()
plt.show()

```



Q1: Creating a Distribution Plot For Dataset2

```
In [ ]: #Visualizing some outputs form dat

import os
import random
```

```

from PIL import Image
import matplotlib.pyplot as plt

image_dir = "runs/predict/dataset2_results"

# Get list of image files (ignore the 'labels' folder and non-image files)
image_files = [f for f in os.listdir(image_dir)
               if f.lower().endswith((".jpg", ".png", ".jpeg"))
               and not os.path.isdir(os.path.join(image_dir, f))]

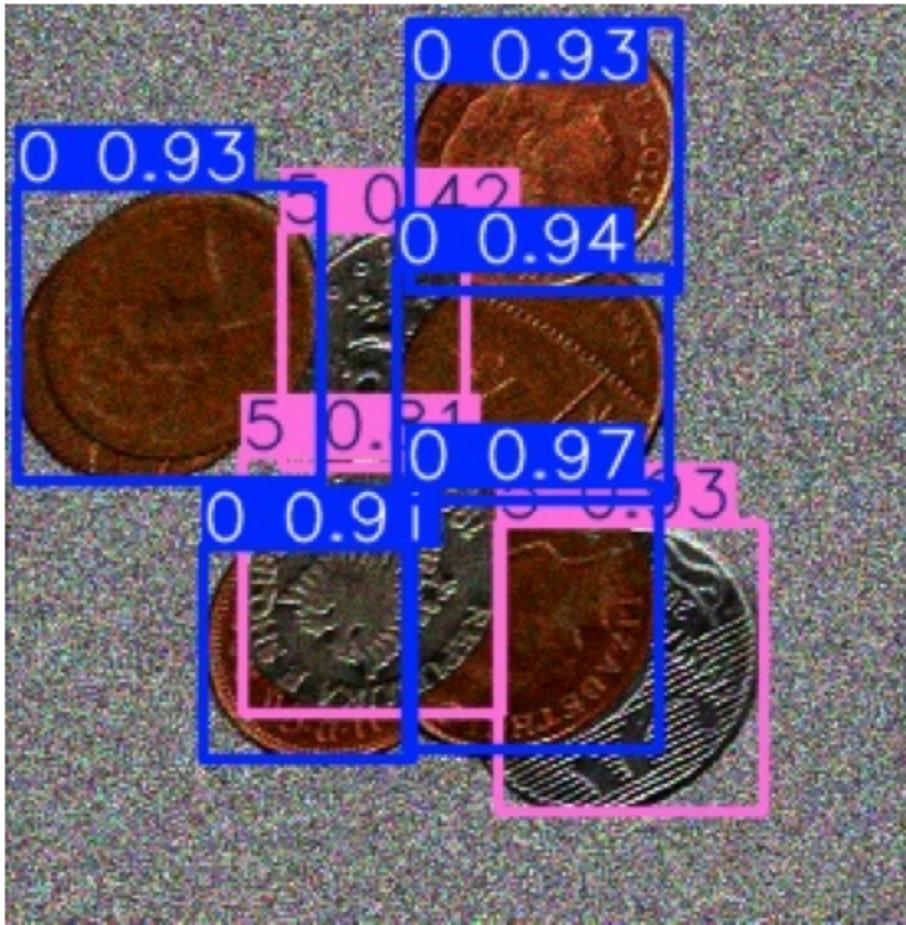
# Randomly select 5 images
sampled_images = random.sample(image_files, 5)

# Display each image
for filename in sampled_images:
    img_path = os.path.join(image_dir, filename)
    img = Image.open(img_path).convert("RGB")

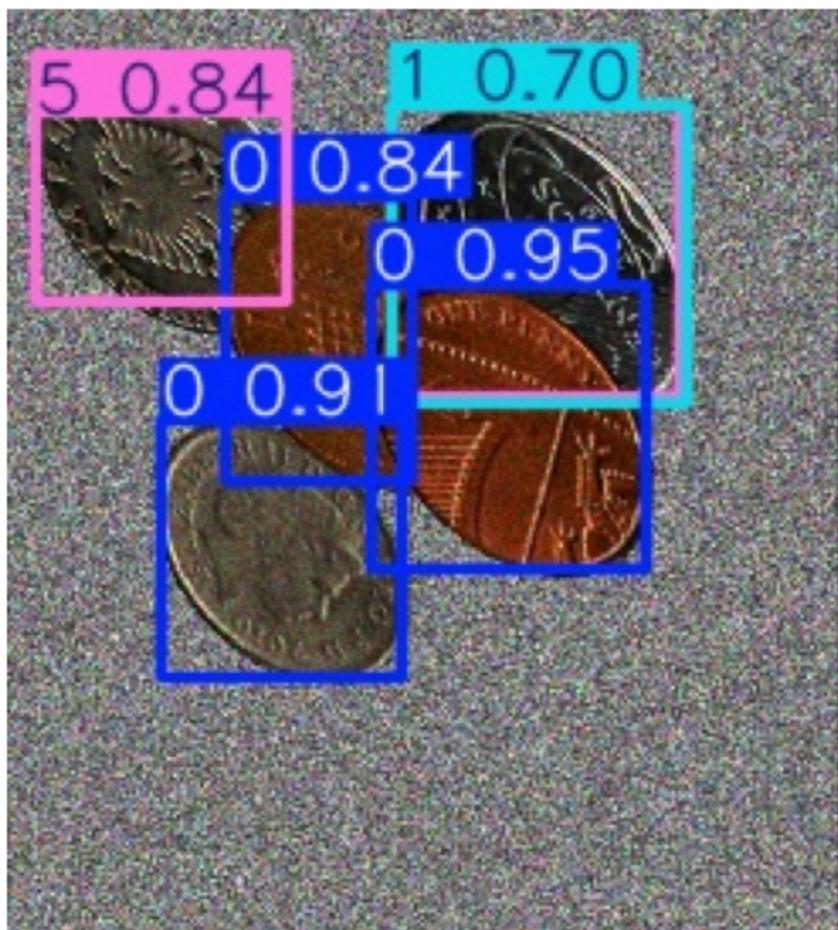
    plt.figure(figsize=(6, 6))
    plt.imshow(img)
    plt.axis('off')
    plt.title(filename)
    plt.show()

```

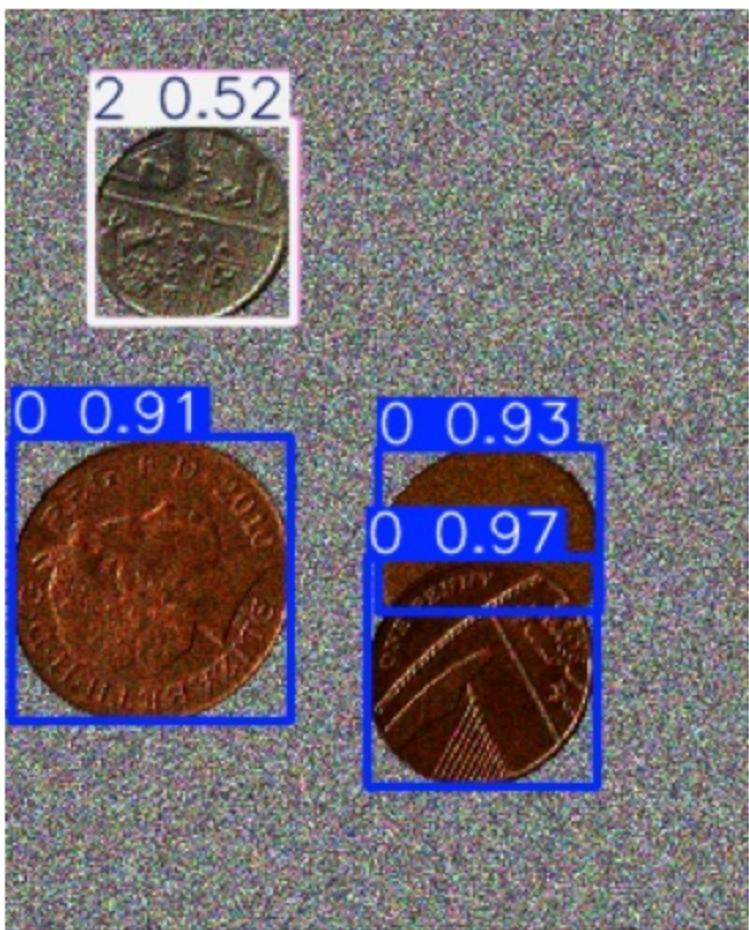
coins337.jpg



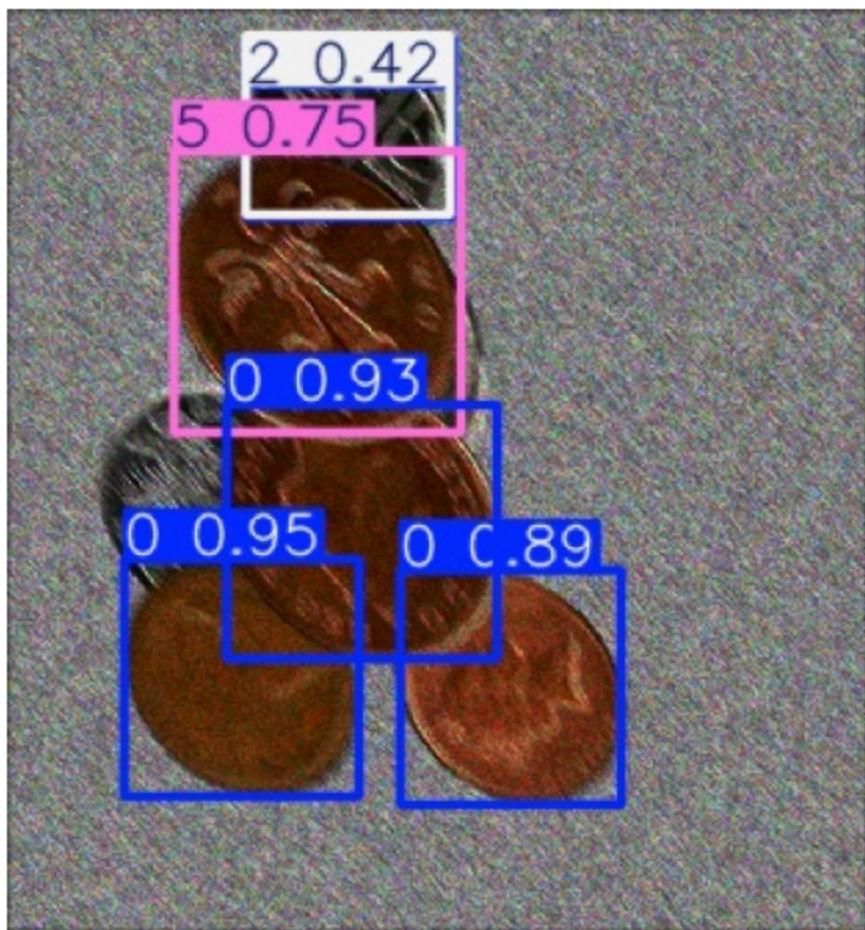
coins142.jpg

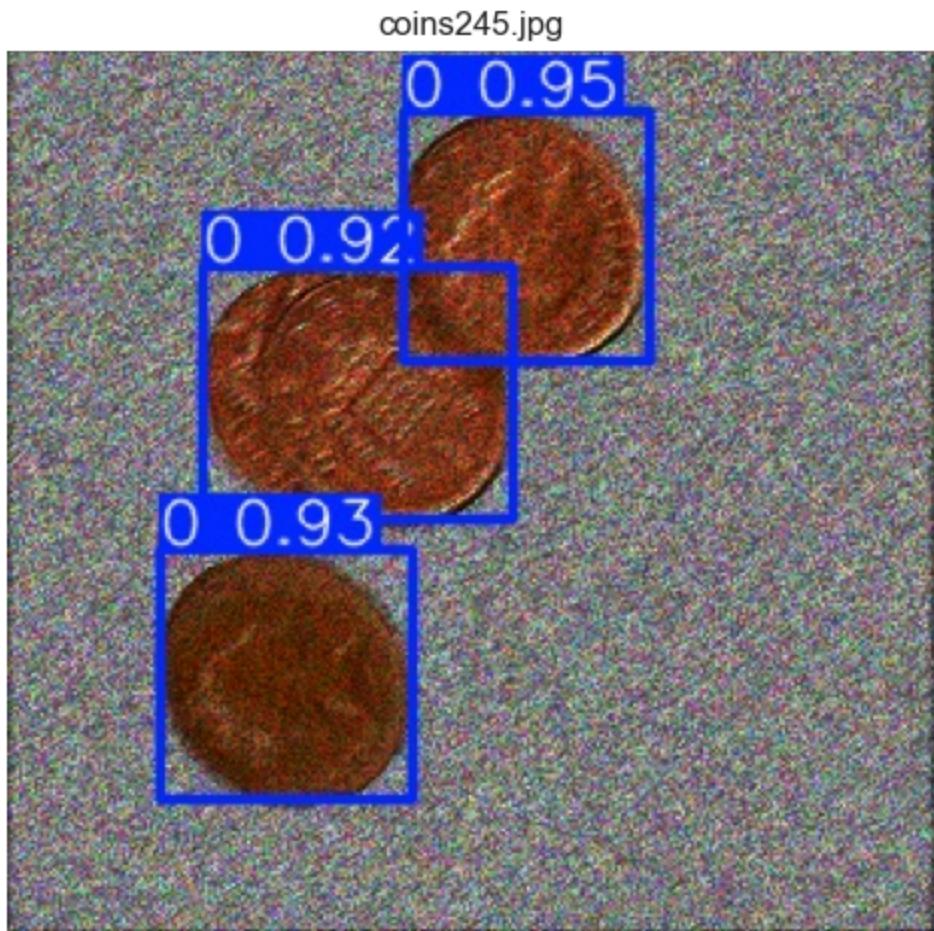


coins12.jpg



coins14.jpg





```
In [ ]: import os
from collections import Counter
import matplotlib.pyplot as plt

label_dir = "runs/predict/dataset2_results/labels"

UK_CLASS_TO_VALUE = {
    "0": 0.01, # 1p
    "1": 0.02, # 2p
    "2": 0.05, # 5p
    "3": 0.10, # 10p
    "4": 0.20, # 20p
    # "5" is a non-UK coin and excluded
}

image_totals = []

# Calculate total coin value for each image
for filename in os.listdir(label_dir):
    if filename.endswith(".txt"):
        total_value = 0
        with open(os.path.join(label_dir, filename), "r") as f:
            for line in f:
                parts = line.strip().split()
```

```

    if parts:
        class_id = parts[0]
        value = UK_CLASS_TO_VALUE.get(class_id)
        if value is not None:
            total_value += value
    image_totals.append(round(total_value, 2)) # Round to 2 decimal places

# Count how many images had each exact total value
value_counts = Counter(image_totals)
sorted_items = sorted(value_counts.items()) # Sort by coin value

# Separate into x (coin values) and y (image counts)
x_vals = [f"${val:.2f}" for val, _ in sorted_items] # Convert to string labels for
y_vals = [count for _, count in sorted_items]

# Plot the bar chart
plt.style.use("seaborn-v0_8-whitegrid")
fig, ax = plt.subplots(figsize=(18, 6)) # Wider layout to avoid overlap

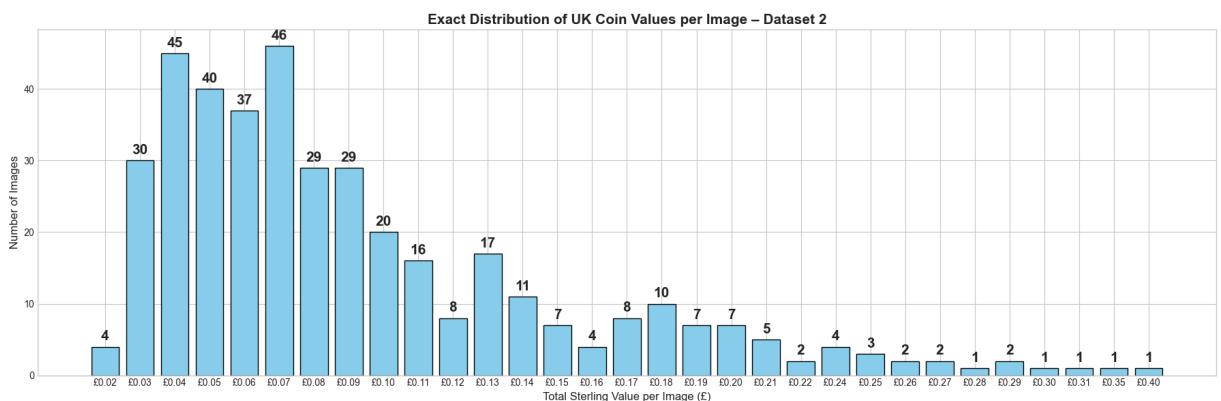
bars = ax.bar(x_vals, y_vals, color='skyblue', edgecolor='black')

# Add number labels above each bar
for bar in bars:
    height = bar.get_height()
    ax.text(bar.get_x() + bar.get_width() / 2, height + 0.5, str(int(height)),
            ha='center', va='bottom', fontsize=15, fontweight='bold')

# Title and axis labels
ax.set_title("Exact Distribution of UK Coin Values per Image – Dataset 2", fontsize=14)
ax.set_xlabel("Total Sterling Value per Image (£)", fontsize=12)
ax.set_ylabel("Number of Images", fontsize=12)

plt.tight_layout()
plt.show()

```



Q2: Model Creation

we will be taking the same approach as Q1, but this time we will train the model on a small sample of images to detect heads vs tail and then create a plot based on those

```
In [ ]: from ultralytics import YOLO

# Load base model
model = YOLO('yolov8m.pt') # using 8m (Small) for better performance

model.train(
    data='Data/Q2DB/data.yaml',
    imgsz=352,
    epochs=50,
    batch=16,
    dropout = 0.1,
    project='runs/train_heads_vs_tails',
    name='yolo_heads_tails_final',
    device= 'GPU',
    # --- Augmentations ---
    shear=5.0,          # Handle slanted coins (For DB2)
    perspective=0.001, # Mild perspective change
    fliplr=0.5,         # Horizontal flip
)
```

Ultralytics 8.3.145 Python-3.11.9 torch-2.5.1+cu121 CUDA:gpu (NVIDIA GeForce RTX 4070 Ti, 12282MiB)

engine\trainer: agnostic_nms=False, amp=True, augment=False, auto_augment=randaugment, batch=32, bgr=0.0, box=7.5, cache=False, cfg=None, classes=None, close_mosaic=10, cls=0.5, conf=None, copy_paste=0.0, copy_paste_mode=flip, cos_lr=False, cutmix=0.0, data=Data/Q2DB/data.yaml, degrees=0.0, deterministic=True, device=gpu, dfl=1.5, dnn=False, dropout=0.1, dynamic=False, embed=None, epochs=50, erasing=0.4, exist_ok=False, fliplr=0.5, flipud=0.0, format=torchscript, fraction=1.0, freeze=None, half=False, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, imgsz=352, int8=False, iou=0.7, keras=False, kobj=1.0, line_width=None, lr0=0.01, lrf=0.01, mask_ratio=4, max_det=300, mixup=0.0, mode=train, model=yolov8s.pt, momentum=0.937, mosaic=1.0, multi_scale=False, name=yolo_heads_tails_final2, nbs=64, nms=False, opset=None, optimize=False, optimizer=auto, overlap_mask=True, patience=100, perspective=0.001, plots=True, pose=12.0, pretrained=True, profile=False, project=runs/train_heads_vs_tails, rect=False, resume=False, retina_masks=False, save=True, save_conf=False, save_crop=False, save_dir=runs\train_heads_vs_tails\yolo_heads_tails_final2, save_frames=False, save_json=False, save_period=-1, save_txt=False, scale=0.5, seed=0, shear=5.0, show=False, show_boxes=True, show_conf=True, show_labels=True, simplify=True, single_cls=False, source=None, split=val, stream_buffer=False, task=detect, time=None, tracker=botsort.yaml, translate=0.1, val=True, verbose=True, vid_stride=1, visualize=False, warmup_bias_lr=0.1, warmup_epochs=3.0, warmup_momentum=0.8, weight_decay=0.0005, workers=8, workspace=None

Overriding model.yaml nc=80 with nc=2

	from	n	params	module	a
rguments					
0		-1 1	928	ultralytics.nn.modules.conv.Conv	
[3, 32, 3, 2]					
1		-1 1	18560	ultralytics.nn.modules.conv.Conv	
[32, 64, 3, 2]					
2		-1 1	29056	ultralytics.nn.modules.block.C2f	
[64, 64, 1, True]					
3		-1 1	73984	ultralytics.nn.modules.conv.Conv	
[64, 128, 3, 2]					
4		-1 2	197632	ultralytics.nn.modules.block.C2f	
[128, 128, 2, True]					
5		-1 1	295424	ultralytics.nn.modules.conv.Conv	
[128, 256, 3, 2]					
6		-1 2	788480	ultralytics.nn.modules.block.C2f	
[256, 256, 2, True]					
7		-1 1	1180672	ultralytics.nn.modules.conv.Conv	
[256, 512, 3, 2]					
8		-1 1	1838080	ultralytics.nn.modules.block.C2f	
[512, 512, 1, True]					
9		-1 1	656896	ultralytics.nn.modules.block.SPPF	
[512, 512, 5]					
10		-1 1	0	torch.nn.modules.upsampling.Upsample	
[None, 2, 'nearest']					
11		[-1, 6] 1	0	ultralytics.nn.modules.conv.Concat	
[1]					
12		-1 1	591360	ultralytics.nn.modules.block.C2f	
[768, 256, 1]					
13		-1 1	0	torch.nn.modules.upsampling.Upsample	
[None, 2, 'nearest']					
14		[-1, 4] 1	0	ultralytics.nn.modules.conv.Concat	
[1]					

```

15           -1 1    148224 ultralytics.nn.modules.block.C2f
[384, 128, 1]
16           -1 1    147712 ultralytics.nn.modules.conv.Conv
[128, 128, 3, 2]
17           [-1, 12] 1      0 ultralytics.nn.modules.conv.Concat
[1]
18           -1 1    493056 ultralytics.nn.modules.block.C2f
[384, 256, 1]
19           -1 1    590336 ultralytics.nn.modules.conv.Conv
[256, 256, 3, 2]
20           [-1, 9] 1      0 ultralytics.nn.modules.conv.Concat
[1]
21           -1 1    1969152 ultralytics.nn.modules.block.C2f
[768, 512, 1]
22           [15, 18, 21] 1   2116822 ultralytics.nn.modules.head.Detect
[2, [128, 256, 512]]
Model summary: 129 layers, 11,136,374 parameters, 11,136,358 gradients, 28.6 GFLOPs

```

```

Transferred 349/355 items from pretrained weights
Freezing layer 'model.22.dfl.conv.weight'
AMP: running Automatic Mixed Precision (AMP) checks...
AMP: checks passed
train: Fast image access (ping: 0.00.0 ms, read: 2391.7821.1 MB/s, size: 169.5 KB)
train: Scanning C:\Users\Amir\Desktop\Hexcel Technical interview\Data\Q2DB\train\labels.cache... 256 images, 0 backgrounds, 0 corrupt: 100%|██████████| 256/256 [00:00<?, ?it/s]
val: Fast image access (ping: 0.00.0 ms, read: 1391.3341.3 MB/s, size: 187.5 KB)
val: Scanning C:\Users\Amir\Desktop\Hexcel Technical interview\Data\Q2DB\valid\labels.cache... 30 images, 0 backgrounds, 0 corrupt: 100%|██████████| 30/30 [00:00<?, ?it/s]
Plotting labels to runs\train_heads_vs_tails\yolo_heads_tails_final2\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=0.001667, momentum=0.9) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)
Image sizes 352 train, 352 val
Using 8 dataloader workers
Logging results to runs\train_heads_vs_tails\yolo_heads_tails_final2
Starting training for 50 epochs...

```

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
1/50	5.72G	0.7905	2.83	1.046	117	352: 100% ██████████ 8/8 [00:00<00:00, 8.50it/s]
		Class	Images	Instances	Box(P)	R mAP50 mAP50
-95): 100% ██████████ 1/1 [00:00<00:00, 11.90it/s]						
		all	30	87	0.451	0.378 0.363
0.311						
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
2/50	5.72G	0.6265	1.531	0.9315	170	352: 100% ██████████ 8/8 [00:00<00:00, 12.94it/s]
		Class	Images	Instances	Box(P)	R mAP50 mAP50
-95): 100% ██████████ 1/1 [00:00<00:00, 10.64it/s]						
		all	30	87	0.464	0.953 0.7
0.643						

	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
0.776	3/50	5.72G	0.575	0.8707	0.8892	191	352: 100% ██████████ 8/8 [00:00<00:00, 12.90it/s]
			Class	Images	Instances	Box(P)	R mAP50 mAP50
	-95): 100% ██████████ 1/1 [00:00<00:00, 11.11it/s]		all	30	87	0.727	0.847 0.852
0.82	4/50	5.72G	0.5719	0.7283	0.8866	150	352: 100% ██████████ 8/8 [00:00<00:00, 13.22it/s]
			Class	Images	Instances	Box(P)	R mAP50 mAP50
	-95): 100% ██████████ 1/1 [00:00<00:00, 12.66it/s]		all	30	87	0.932	0.878 0.923
0.838	5/50	5.72G	0.5717	0.7475	0.8883	155	352: 100% ██████████ 8/8 [00:00<00:00, 13.49it/s]
			Class	Images	Instances	Box(P)	R mAP50 mAP50
	-95): 100% ██████████ 1/1 [00:00<00:00, 12.20it/s]		all	30	87	0.918	0.907 0.952
0.807	6/50	5.72G	0.5865	0.6747	0.891	148	352: 100% ██████████ 8/8 [00:00<00:00, 13.47it/s]
			Class	Images	Instances	Box(P)	R mAP50 mAP50
	-95): 100% ██████████ 1/1 [00:00<00:00, 11.76it/s]		all	30	87	0.797	0.88 0.912
0.812	7/50	5.72G	0.5813	0.6213	0.8827	172	352: 100% ██████████ 8/8 [00:00<00:00, 13.99it/s]
			Class	Images	Instances	Box(P)	R mAP50 mAP50
	-95): 100% ██████████ 1/1 [00:00<00:00, 12.50it/s]		all	30	87	0.897	0.908 0.936
0.65	8/50	5.72G	0.5993	0.6651	0.8914	172	352: 100% ██████████ 8/8 [00:00<00:00, 13.99it/s]
			Class	Images	Instances	Box(P)	R mAP50 mAP50
	-95): 100% ██████████ 1/1 [00:00<00:00, 12.50it/s]		all	30	87	0.584	0.81 0.711
0.807	9/50	5.72G	0.5518	0.6146	0.8807	149	352: 100% ██████████ 8/8 [00:00<00:00, 14.05it/s]
			Class	Images	Instances	Box(P)	R mAP50 mAP50
	-95): 100% ██████████ 1/1 [00:00<00:00, 12.82it/s]		all	30	87	0.683	0.796 0.892

	10/50	5.72G	0.5592	0.6153	0.8861	183	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.11it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.875	0.845	0.938
0.834							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
11/50	5.72G	0.5466	0.6063	0.8852	169	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.18it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.94	0.898	0.934
0.827							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
12/50	5.72G	0.5585	0.5943	0.8876	168	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.23it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.8	0.826	0.887
0.782							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
13/50	5.72G	0.5733	0.5862	0.8836	139	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.23it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.79	0.861	0.915
0.806							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
14/50	5.72G	0.5576	0.5791	0.8782	157	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.26it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.696	0.903	0.89
0.787							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
15/50	5.72G	0.5622	0.5945	0.8983	171	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.13it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.876	0.84	0.923
0.831							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
16/50	5.72G	0.5593	0.5858	0.8872	150	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.11it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.66it/s]	all	30	87	0.923	0.885	0.94
0.832							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	

	17/50	5.72G	0.5488	0.5444	0.8764	182	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.02it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.743	0.84	0.885
0.794							
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	18/50	5.72G	0.5498	0.5552	0.879	158	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.21it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.66it/s]	all	30	87	0.938	0.897	0.962
0.866							
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	19/50	5.72G	0.5464	0.5621	0.8765	119	352: 100%
	[██████████ 8/8 [00:00<00:00, 13.98it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.916	0.925	0.953
0.861							
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	20/50	5.72G	0.5375	0.5119	0.8917	180	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.13it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.98it/s]	all	30	87	0.953	0.942	0.96
0.889							
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	21/50	5.72G	0.5251	0.5047	0.8748	200	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.29it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.917	0.92	0.946
0.864							
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	22/50	5.72G	0.5201	0.4953	0.866	187	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.11it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.927	0.957	0.964
0.867							
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	23/50	5.72G	0.5166	0.5027	0.879	161	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.08it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.16it/s]	all	30	87	0.949	0.906	0.971
0.893							
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size

	24/50	5.72G	0.4892	0.4746	0.8651	160	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.23it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.33it/s]	all	30	87	0.933	0.963	0.965
0.881							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
25/50	5.72G	0.5036	0.4474	0.8707	178	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.21it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.16it/s]	all	30	87	0.958	0.989	0.962
0.88							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
26/50	5.72G	0.5029	0.4711	0.8705	162	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.23it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.16it/s]	all	30	87	0.949	0.971	0.963
0.885							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
27/50	5.72G	0.5014	0.4519	0.8668	179	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.16it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.946	0.976	0.968
0.889							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
28/50	5.72G	0.4845	0.4438	0.863	165	352: 100%	
[██████████ 8/8 [00:00<00:00, 13.68it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.66it/s]	all	30	87	0.955	0.919	0.967
0.886							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
29/50	5.72G	0.4919	0.4244	0.8697	148	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.11it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.36it/s]	all	30	87	0.946	0.987	0.969
0.901							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
30/50	5.72G	0.4965	0.4398	0.8597	160	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.05it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.946	0.972	0.966
0.897							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	

	31/50	5.72G	0.4853	0.4292	0.8607	159	352: 100%
	[██████████ 8/8 [00:00<00:00, 13.82it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.33it/s]	all	30	87	0.942	0.954	0.964
0.896							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
32/50	5.72G	0.484	0.4505	0.8664	152	352: 100%	
[██████████ 8/8 [00:00<00:00, 13.94it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.922	0.989	0.968
0.907							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
33/50	5.72G	0.5041	0.4437	0.8706	154	352: 100%	
[██████████ 8/8 [00:00<00:00, 13.80it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.24it/s]	all	30	87	0.911	0.944	0.959
0.901							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
34/50	5.72G	0.4931	0.4345	0.8646	155	352: 100%	
[██████████ 8/8 [00:00<00:00, 13.96it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.16it/s]	all	30	87	0.945	0.979	0.972
0.912							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
35/50	5.72G	0.4888	0.4194	0.8718	173	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.04it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.16it/s]	all	30	87	0.954	0.987	0.971
0.903							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
36/50	5.72G	0.4644	0.4074	0.8522	145	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.06it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.952	0.987	0.97
0.903							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
37/50	5.72G	0.4723	0.3992	0.852	162	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.06it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.33it/s]	all	30	87	0.958	0.976	0.971
0.904							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	

	38/50	5.72G	0.4877	0.398	0.8711	193	352: 100%
	[██████████ 8/8 [00:00<00:00, 13.99it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.16it/s]	all	30	87	0.956	0.972	0.97
0.905							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
39/50	5.72G	0.4729	0.387	0.8598	166	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.08it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.962	0.979	0.973
0.915							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
40/50	5.72G	0.4579	0.3692	0.8584	149	352: 100%	
[██████████ 8/8 [00:00<00:00, 13.99it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.956	0.981	0.977
0.911							
Closing dataloader mosaic							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
41/50	5.72G	0.378	0.2931	0.8258	92	352: 100%	
[██████████ 8/8 [00:00<00:00, 9.67it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.945	0.977	0.963
0.913							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
42/50	5.72G	0.3781	0.2755	0.8298	91	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.21it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 12.50it/s]	all	30	87	0.944	0.961	0.969
0.903							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
43/50	5.72G	0.3711	0.2586	0.8293	93	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.21it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 13.16it/s]	all	30	87	0.964	0.974	0.978
0.921							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
44/50	5.72G	0.382	0.2874	0.8284	97	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.12it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100%	[██████████ 1/1 [00:00<00:00, 11.76it/s]	all	30	87	0.959	0.959	0.972
0.917							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	

	45/50	5.72G	0.3764	0.268	0.8242	95	352: 100%
	[██████████ 8/8 [00:00<00:00, 14.11it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50
	-95): 100% ██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.971	0.961	0.972
0.918							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
46/50	5.72G	0.3654	0.2554	0.8248	96	352: 100%	
[██████████ 8/8 [00:00<00:00, 13.89it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100% ██████████ 1/1 [00:00<00:00, 12.99it/s]	all	30	87	0.972	0.987	0.973	
0.921							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
47/50	5.72G	0.3582	0.2316	0.8222	90	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.08it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100% ██████████ 1/1 [00:00<00:00, 12.19it/s]	all	30	87	0.961	0.989	0.975	
0.922							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
48/50	5.72G	0.3507	0.233	0.8208	94	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.16it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100% ██████████ 1/1 [00:00<00:00, 12.82it/s]	all	30	87	0.961	0.989	0.981	
0.93							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
49/50	5.72G	0.3563	0.2294	0.8223	96	352: 100%	
[██████████ 8/8 [00:00<00:00, 13.19it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100% ██████████ 1/1 [00:00<00:00, 12.42it/s]	all	30	87	0.962	0.989	0.981	
0.933							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
50/50	5.72G	0.3542	0.2334	0.8167	94	352: 100%	
[██████████ 8/8 [00:00<00:00, 14.06it/s]	Class	Images	Instances	Box(P)	R	mAP50 mAP50	
-95): 100% ██████████ 1/1 [00:00<00:00, 11.43it/s]	all	30	87	0.962	0.989	0.98	
0.929							

50 epochs completed in 0.016 hours.

Optimizer stripped from runs\train_heads_vs_tails\yolo_heads_tails_final2\weights\last.pt, 22.5MB

Optimizer stripped from runs\train_heads_vs_tails\yolo_heads_tails_final2\weights\best.pt, 22.5MB

Validating runs\train_heads_vs_tails\yolo_heads_tails_final2\weights\best.pt...

Ultralytics 8.3.145 Python-3.11.9 torch-2.5.1+cu121 CUDA:gpu (NVIDIA GeForce RTX 4070 Ti, 12282MiB)

Model summary (fused): 72 layers, 11,126,358 parameters, 0 gradients, 28.4 GFLOPs

-95): 100% |██████████| 1/1 [00:00<00:00, 9.74it/s]
all 30 87 0.962 0.989 0.981
0.932
0 27 43 0.955 1 0.984
0.924
1 26 44 0.968 0.977 0.978
0.941
Speed: 0.0ms preprocess, 0.5ms inference, 0.0ms loss, 0.6ms postprocess per image
Results saved to runs\train_heads_vs_tails\yolo_heads_tails_final2

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

```
ap_class_index: array([0, 1])
box: ultralytics.utils.metrics.Metric object
confusion_matrix: <ultralytics.utils.metrics.ConfusionMatrix object at 0x000001DA2D30A910>
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, 0.101011,
    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
], 0.001001, 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, 0.101011, 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]]
```

228,	0.28328,	0.28428,	0.28529,	0.28629,	0.28729,	
	0.28829,	0.28929,	0.29029,	0.29129,	0.29229,	0.2932
9,	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,	0.2993,
0.3003,	0.3013,	0.3023,	0.3033,	0.3043,	0.30531,	0.306
31,	0.30731,	0.30831,	0.30931,	0.31031,	0.31131,	
	0.31231,	0.31331,	0.31431,	0.31532,	0.31632,	0.3173
2,	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,	0.32332,
0.32432,	0.32533,	0.32633,	0.32733,	0.32833,	0.32933,	0.33
033,	0.33133,	0.33233,	0.33333,	0.33433,	0.33534,	
	0.33634,	0.33734,	0.33834,	0.33934,	0.34034,	0.3413
4,	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,	0.34735,
0.34835,	0.34935,	0.35035,	0.35135,	0.35235,	0.35335,	0.35
435,	0.35536,	0.35636,	0.35736,	0.35836,	0.35936,	
	0.36036,	0.36136,	0.36236,	0.36336,	0.36436,	0.3653
7,	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,	0.37137,
0.37237,	0.37337,	0.37437,	0.37538,	0.37638,	0.37738,	0.37
838,	0.37938,	0.38038,	0.38138,	0.38238,	0.38338,	
	0.38438,	0.38539,	0.38639,	0.38739,	0.38839,	0.3893
9,	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,	0.3954,
0.3964,	0.3974,	0.3984,	0.3994,	0.4004,	0.4014,	0.40
24,	0.4034,	0.4044,	0.40541,	0.40641,	0.40741,	
	0.40841,	0.40941,	0.41041,	0.41141,	0.41241,	0.4134
1,	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,	0.41942,
0.42042,	0.42142,	0.42242,	0.42342,	0.42442,	0.42543,	0.42
643,	0.42743,	0.42843,	0.42943,	0.43043,	0.43143,	
	0.43243,	0.43343,	0.43443,	0.43544,	0.43644,	0.4374
4,	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,	0.44344,
0.44444,	0.44545,	0.44645,	0.44745,	0.44845,	0.44945,	0.45
045,	0.45145,	0.45245,	0.45345,	0.45445,	0.45546,	
	0.45646,	0.45746,	0.45846,	0.45946,	0.46046,	0.4614
6,	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,	0.46747,
0.46847,	0.46947,	0.47047,	0.47147,	0.47247,	0.47347,	0.47
447,	0.47548,	0.47648,	0.47748,	0.47848,	0.47948,	
	0.48048,	0.48148,	0.48248,	0.48348,	0.48448,	0.4854
9,	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,	0.49149,
0.49249,	0.49349,	0.49449,	0.4955,	0.4965,	0.4975,	0.4
985,	0.4995,	0.5005,	0.5015,	0.5025,	0.5035,	
	0.5045,	0.50551,	0.50651,	0.50751,	0.50851,	0.5095
1,	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,	0.51552,
0.51652,	0.51752,	0.51852,	0.51952,	0.52052,	0.52152,	0.52
252,	0.52352,	0.52452,	0.52553,	0.52653,	0.52753,	
	0.52853,	0.52953,	0.53053,	0.53153,	0.53253,	0.5335
3,	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,
0.54054,	0.54154,	0.54254,	0.54354,	0.54454,	0.54555,	0.54
655,	0.54755,	0.54855,	0.54955,	0.55055,	0.55155,	
	0.55255,	0.55355,	0.55455,	0.55556,	0.55656,	0.5575
6,	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,
0.56456,	0.56557,	0.56657,	0.56757,	0.56857,	0.56957,	0.57
057,	0.57157,	0.57257,	0.57357,	0.57457,	0.57558,	
	0.57658,	0.57758,	0.57858,	0.57958,	0.58058,	0.5815
8,	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,
0.58859,	0.58959,	0.59059,	0.59159,	0.59259,	0.59359,	0.59
459,	0.5956,	0.5966,	0.5976,	0.5986,	0.5996,	
	0.6006,	0.6016,	0.6026,	0.6036,	0.6046,	0.6056
1,	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,
0.61261,	0.61361,	0.61461,	0.61562,	0.61662,	0.61762,	0.61

862,	0.61962,	0.62062,	0.62162,	0.62262,	0.62362,
	0.62462,	0.62563,	0.62663,	0.62763,	0.62863,
3,	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,
	0.63564,	0.63664,	0.63764,	0.63864,	0.63964,
264,	0.64364,	0.64464,	0.64565,	0.64665,	0.64765,
	0.64865,	0.64965,	0.65065,	0.65165,	0.65265,
5,	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,
	0.65966,	0.66066,	0.66166,	0.66266,	0.66366,
667,	0.66767,	0.66867,	0.66967,	0.67067,	0.67167,
	0.67267,	0.67367,	0.67467,	0.67568,	0.67668,
8,	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,
	0.68368,	0.68468,	0.68569,	0.68669,	0.68769,
069,	0.69169,	0.69269,	0.69369,	0.69469,	0.6957,
	0.6967,	0.6977,	0.6987,	0.6997,	0.7007,
7,	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,
	0.70771,	0.70871,	0.70971,	0.71071,	0.71171,
471,	0.71572,	0.71672,	0.71772,	0.71872,	0.71972,
	0.72072,	0.72172,	0.72272,	0.72372,	0.72472,
3,	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,
	0.73173,	0.73273,	0.73373,	0.73473,	0.73574,
874,	0.73974,	0.74074,	0.74174,	0.74274,	0.74374,
	0.74474,	0.74575,	0.74675,	0.74775,	0.74875,
5,	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,
	0.75576,	0.75676,	0.75776,	0.75876,	0.75976,
276,	0.76376,	0.76476,	0.76577,	0.76677,	0.76777,
	0.76877,	0.76977,	0.77077,	0.77177,	0.77277,
7,	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,
	0.77978,	0.78078,	0.78178,	0.78278,	0.78378,
679,	0.78779,	0.78879,	0.78979,	0.79079,	0.79179,
	0.79279,	0.79379,	0.79479,	0.7958,	0.7968,
8,	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,
	0.8038,	0.8048,	0.80581,	0.80681,	0.80781,
81,	0.81181,	0.81281,	0.81381,	0.81481,	0.81582,
	0.81682,	0.81782,	0.81882,	0.81982,	0.82082,
2,	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,
	0.82783,	0.82883,	0.82983,	0.83083,	0.83183,
483,	0.83584,	0.83684,	0.83784,	0.83884,	0.83984,
	0.84084,	0.84184,	0.84284,	0.84384,	0.84484,
5,	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,
	0.85185,	0.85285,	0.85385,	0.85485,	0.85586,
886,	0.85986,	0.86086,	0.86186,	0.86286,	0.86386,
	0.86486,	0.86587,	0.86687,	0.86787,	0.86887,
7,	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,
	0.87588,	0.87688,	0.87788,	0.87888,	0.88088,
288,	0.88388,	0.88488,	0.88589,	0.88689,	0.88789,
	0.88889,	0.88989,	0.89089,	0.89189,	0.89289,
9,	0.89489,	0.8959,	0.8969,	0.8979,	0.8989,
	0.8999,	0.9009,	0.9019,	0.9029,	0.9039,
91,	0.90791,	0.90891,	0.90991,	0.91091,	0.91191,
	0.91291,	0.91391,	0.91491,	0.91592,	0.91692,
2,	0.91892,	0.91992,	0.92092,	0.92192,	0.92292,
	0.92392,	0.92492,	0.92593,	0.92693,	0.92793,
093,	0.93193,	0.93293,	0.93393,	0.93493,	0.93594,
	0.93694,	0.93794,	0.93894,	0.93994,	0.94094,
4,	0.94294,	0.94394,	0.94494,	0.94595,	0.94695,
	0.94795,	0.94895,	0.95095,	0.95195,	0.95295,
	0.95395,	0.95495,	0.95595,	0.95695,	0.95795,

495, 0.95596, 0.95696, 0.95796, 0.95896, 0.95996,
 0.96096, 0.96196, 0.96296, 0.96396, 0.96496, 0.9659
 7, 0.96697, 0.96797, 0.96897, 0.96997, 0.97097, 0.97197,
 0.97297, 0.97397, 0.97497, 0.97598, 0.97698, 0.97798, 0.97
 898, 0.97998, 0.98098, 0.98198, 0.98298, 0.98398,
 0.98498, 0.98599, 0.98699, 0.98799, 0.98899, 0.9899
 9, 0.99099, 0.99199, 0.99299, 0.99399, 0.99499, 0.996,
 0.997, 0.998, 0.999, 1]), array([[1, 1,
 1, ..., 0.95556, 0.95556,
 0],
 [1, 1, 1, ..., 0.66667, 0.66667,
 0]]), 'Recall', 'Precision'], [array([0, 0.001001, 0.002002, 0.
 003003, 0.004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.0090
 09, 0.01001, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015,
 0.016016, 0.017017, 0.018018, 0.019019, 0.02002, 0.021021, 0.02
 2022, 0.023023,
 0.024024, 0.025025, 0.026026, 0.027027, 0.028028, 0.02902
 9, 0.03003, 0.031031, 0.032032, 0.033033, 0.034034, 0.035035,
 0.036036, 0.037037, 0.038038, 0.039039, 0.04004, 0.041041, 0.04
 2042, 0.043043, 0.044044, 0.045045, 0.046046, 0.047047,
 0.048048, 0.049049, 0.05005, 0.051051, 0.052052, 0.05305
 3, 0.054054, 0.055055, 0.056056, 0.057057, 0.058058, 0.059059,
 0.06006, 0.061061, 0.062062, 0.063063, 0.064064, 0.065065, 0.066
 066, 0.067067, 0.068068, 0.069069, 0.07007, 0.071071,
 0.072072, 0.073073, 0.074074, 0.075075, 0.076076, 0.07707
 7, 0.078078, 0.079079, 0.08008, 0.081081, 0.082082, 0.083083,
 0.084084, 0.085085, 0.086086, 0.087087, 0.088088, 0.089089, 0.0
 9009, 0.091091, 0.092092, 0.093093, 0.094094, 0.095095,
 0.096096, 0.097097, 0.098098, 0.099099, 0.1001, 0.101
 1, 0.1021, 0.1031, 0.1041, 0.10511, 0.10611, 0.10711,
 0.10811, 0.10911, 0.11011, 0.11111, 0.11211, 0.11311, 0.11
 411, 0.11512, 0.11612, 0.11712, 0.11812, 0.11912,
 0.12012, 0.12112, 0.12212, 0.12312, 0.12412, 0.1251
 3, 0.12613, 0.12713, 0.12813, 0.12913, 0.13013, 0.13113,
 0.13213, 0.13313, 0.13413, 0.13514, 0.13614, 0.13714, 0.13
 814, 0.13914, 0.14014, 0.14114, 0.14214, 0.14314,
 0.14414, 0.14515, 0.14615, 0.14715, 0.14815, 0.1491
 5, 0.15015, 0.15115, 0.15215, 0.15315, 0.15415, 0.15516,
 0.15616, 0.15716, 0.15816, 0.15916, 0.16016, 0.16116, 0.16
 216, 0.16316, 0.16416, 0.16517, 0.16617, 0.16717,
 0.16817, 0.16917, 0.17017, 0.17117, 0.17217, 0.1731
 7, 0.17417, 0.17518, 0.17618, 0.17718, 0.17818, 0.17918,
 0.18018, 0.18118, 0.18218, 0.18318, 0.18418, 0.18519, 0.18
 619, 0.18719, 0.18819, 0.18919, 0.19019, 0.19119,
 0.19219, 0.19319, 0.19419, 0.1952, 0.1962, 0.197
 2, 0.1982, 0.1992, 0.2002, 0.2012, 0.2022, 0.2032,
 0.2042, 0.20521, 0.20621, 0.20721, 0.20821, 0.20921, 0.210
 21, 0.21121, 0.21221, 0.21321, 0.21421, 0.21522,
 0.21622, 0.21722, 0.21822, 0.21922, 0.22022, 0.2212
 2, 0.22222, 0.22322, 0.22422, 0.22523, 0.22623, 0.22723,
 0.22823, 0.22923, 0.23023, 0.23123, 0.23223, 0.23323, 0.23
 423, 0.23524, 0.23624, 0.23724, 0.23824, 0.23924,
 0.24024, 0.24124, 0.24224, 0.24324, 0.24424, 0.2452
 5, 0.24625, 0.24725, 0.24825, 0.24925, 0.25025, 0.25125,
 0.25225, 0.25325, 0.25425, 0.25526, 0.25626, 0.25726, 0.25
 826, 0.25926, 0.26026, 0.26126, 0.26226, 0.26326,
 0.26426, 0.26527, 0.26627, 0.26727, 0.26827, 0.2692

7,	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,	0.27528,
	0.27628,	0.27728,	0.27828,	0.27928,	0.28028,	0.28128,
228,	0.28328,	0.28428,	0.28529,	0.28629,	0.28729,	
	0.28829,	0.28929,	0.29029,	0.29129,	0.29229,	0.2932
9,	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,	0.2993,
0.3003,	0.3013,	0.3023,	0.3033,	0.3043,	0.30531,	0.306
31,	0.30731,	0.30831,	0.30931,	0.31031,	0.31131,	
	0.31231,	0.31331,	0.31431,	0.31532,	0.31632,	0.3173
2,	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,	0.32332,
0.32432,	0.32533,	0.32633,	0.32733,	0.32833,	0.32933,	0.33
033,	0.33133,	0.33233,	0.33333,	0.33433,	0.33534,	
	0.33634,	0.33734,	0.33834,	0.33934,	0.34034,	0.3413
4,	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,	0.34735,
0.34835,	0.34935,	0.35035,	0.35135,	0.35235,	0.35335,	0.35
435,	0.35536,	0.35636,	0.35736,	0.35836,	0.35936,	
	0.36036,	0.36136,	0.36236,	0.36336,	0.36436,	0.3653
7,	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,	0.37137,
0.37237,	0.37337,	0.37437,	0.37538,	0.37638,	0.37738,	0.37
838,	0.37938,	0.38038,	0.38138,	0.38238,	0.38338,	
	0.38438,	0.38539,	0.38639,	0.38739,	0.38839,	0.3893
9,	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,	0.3954,
0.3964,	0.3974,	0.3984,	0.3994,	0.4004,	0.4014,	0.40
24,	0.4034,	0.4044,	0.40541,	0.40641,	0.40741,	
	0.40841,	0.40941,	0.41041,	0.41141,	0.41241,	0.4134
1,	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,	0.41942,
0.42042,	0.42142,	0.42242,	0.42342,	0.42442,	0.42543,	0.42
643,	0.42743,	0.42843,	0.42943,	0.43043,	0.43143,	
	0.43243,	0.43343,	0.43443,	0.43544,	0.43644,	0.4374
4,	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,	0.44344,
0.44444,	0.44545,	0.44645,	0.44745,	0.44845,	0.44945,	0.45
045,	0.45145,	0.45245,	0.45345,	0.45445,	0.45546,	
	0.45646,	0.45746,	0.45846,	0.45946,	0.46046,	0.4614
6,	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,	0.46747,
0.46847,	0.46947,	0.47047,	0.47147,	0.47247,	0.47347,	0.47
447,	0.47548,	0.47648,	0.47748,	0.47848,	0.47948,	
	0.48048,	0.48148,	0.48248,	0.48348,	0.48448,	0.4854
9,	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,	0.49149,
0.49249,	0.49349,	0.49449,	0.4955,	0.4965,	0.4975,	0.4
985,	0.4995,	0.5005,	0.5015,	0.5025,	0.5035,	
	0.5045,	0.50551,	0.50651,	0.50751,	0.50851,	0.5095
1,	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,	0.51552,
0.51652,	0.51752,	0.51852,	0.51952,	0.52052,	0.52152,	0.52
252,	0.52352,	0.52452,	0.52553,	0.52653,	0.52753,	
	0.52853,	0.52953,	0.53053,	0.53153,	0.53253,	0.5335
3,	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,
0.54054,	0.54154,	0.54254,	0.54354,	0.54454,	0.54555,	0.54
655,	0.54755,	0.54855,	0.54955,	0.55055,	0.55155,	
	0.55255,	0.55355,	0.55455,	0.55556,	0.55656,	0.5575
6,	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,
0.56456,	0.56557,	0.56657,	0.56757,	0.56857,	0.56957,	0.57
057,	0.57157,	0.57257,	0.57357,	0.57457,	0.57558,	
	0.57658,	0.57758,	0.57858,	0.57958,	0.58058,	0.5815
8,	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,
0.58859,	0.58959,	0.59059,	0.59159,	0.59259,	0.59359,	0.59
459,	0.5956,	0.5966,	0.5976,	0.5986,	0.5996,	
	0.6006,	0.6016,	0.6026,	0.6036,	0.6046,	0.6056

1,	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,
0.61261,	0.61361,	0.61461,	0.61562,	0.61662,	0.61762,	0.61
862,	0.61962,	0.62062,	0.62162,	0.62262,	0.62362,	
	0.62462,	0.62563,	0.62663,	0.62763,	0.62863,	0.6296
3,	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,	0.63564,
0.63664,	0.63764,	0.63864,	0.63964,	0.64064,	0.64164,	0.64
264,	0.64364,	0.64464,	0.64565,	0.64665,	0.64765,	
	0.64865,	0.64965,	0.65065,	0.65165,	0.65265,	0.6536
5,	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,
0.66066,	0.66166,	0.66266,	0.66366,	0.66466,	0.66567,	0.66
667,	0.66767,	0.66867,	0.66967,	0.67067,	0.67167,	
	0.67267,	0.67367,	0.67467,	0.67568,	0.67668,	0.6776
8,	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,	0.68368,
0.68468,	0.68569,	0.68669,	0.68769,	0.68869,	0.68969,	0.69
069,	0.69169,	0.69269,	0.69369,	0.69469,	0.6957,	
	0.6967,	0.6977,	0.6987,	0.6997,	0.7007,	0.701
7,	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,
0.70871,	0.70971,	0.71071,	0.71171,	0.71271,	0.71371,	0.71
471,	0.71572,	0.71672,	0.71772,	0.71872,	0.71972,	
	0.72072,	0.72172,	0.72272,	0.72372,	0.72472,	0.7257
3,	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,	0.73173,
0.73273,	0.73373,	0.73473,	0.73574,	0.73674,	0.73774,	0.73
874,	0.73974,	0.74074,	0.74174,	0.74274,	0.74374,	
	0.74474,	0.74575,	0.74675,	0.74775,	0.74875,	0.7497
5,	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,
0.75676,	0.75776,	0.75876,	0.75976,	0.76076,	0.76176,	0.76
276,	0.76376,	0.76476,	0.76577,	0.76677,	0.76777,	
	0.76877,	0.76977,	0.77077,	0.77177,	0.77277,	0.7737
7,	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,	0.77978,
0.78078,	0.78178,	0.78278,	0.78378,	0.78478,	0.78579,	0.78
679,	0.78779,	0.78879,	0.78979,	0.79079,	0.79179,	
	0.79279,	0.79379,	0.79479,	0.7958,	0.7968,	0.797
8,	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,
0.8048,	0.80581,	0.80681,	0.80781,	0.80881,	0.80981,	0.810
81,	0.81181,	0.81281,	0.81381,	0.81481,	0.81582,	
	0.81682,	0.81782,	0.81882,	0.81982,	0.82082,	0.8218
2,	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,
0.82883,	0.82983,	0.83083,	0.83183,	0.83283,	0.83383,	0.83
483,	0.83584,	0.83684,	0.83784,	0.83884,	0.83984,	
	0.84084,	0.84184,	0.84284,	0.84384,	0.84484,	0.8458
5,	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,	0.85185,
0.85285,	0.85385,	0.85485,	0.85586,	0.85686,	0.85786,	0.85
886,	0.85986,	0.86086,	0.86186,	0.86286,	0.86386,	
	0.86486,	0.86587,	0.86687,	0.86787,	0.86887,	0.8698
7,	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,	0.87588,
0.87688,	0.87788,	0.87888,	0.87988,	0.88088,	0.88188,	0.88
288,	0.88388,	0.88488,	0.88589,	0.88689,	0.88789,	
	0.88889,	0.88989,	0.89089,	0.89189,	0.89289,	0.8938
9,	0.89489,	0.8959,	0.8969,	0.8979,	0.8989,	0.8999,
0.9009,	0.9019,	0.9029,	0.9039,	0.9049,	0.90591,	0.906
91,	0.90791,	0.90891,	0.90991,	0.91091,	0.91191,	
	0.91291,	0.91391,	0.91491,	0.91592,	0.91692,	0.9179
2,	0.91892,	0.91992,	0.92092,	0.92192,	0.92292,	0.92392,
0.92492,	0.92593,	0.92693,	0.92793,	0.92893,	0.92993,	0.93
093,	0.93193,	0.93293,	0.93393,	0.93493,	0.93594,	
	0.93694,	0.93794,	0.93894,	0.93994,	0.94094,	0.9419

4, 0.94294, 0.94394, 0.94494, 0.94595, 0.94695, 0.94795,
 0.94895, 0.94995, 0.95095, 0.95195, 0.95295, 0.95395, 0.95
 495, 0.95596, 0.95696, 0.95796, 0.95896, 0.95996,
 0.96096, 0.96196, 0.96296, 0.96396, 0.96496, 0.9659
 7, 0.96697, 0.96797, 0.96897, 0.96997, 0.97097, 0.97197,
 0.97297, 0.97397, 0.97497, 0.97598, 0.97698, 0.97798, 0.97
 898, 0.97998, 0.98098, 0.98198, 0.98298, 0.98398,
 0.98498, 0.98599, 0.98699, 0.98799, 0.98899, 0.9899
 9, 0.99099, 0.99199, 0.99299, 0.99399, 0.99499, 0.996,
 0.997, 0.998, 0.999, 1]), array([[0.63235, 0.63235,
 0.75535, ..., 0, 0, 0, 0],
 [0.79279, 0.79279, 0.85915, ..., 0, 0,
 0]]), 'Confidence', 'F1'], [array([0, 0.001001, 0.002002, 0.003
 003, 0.004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.009009,
 0.01001, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015, 0.016
 016, 0.017017, 0.018018, 0.019019, 0.02002, 0.021021, 0.022022,
 0.023023,
 0.024024, 0.025025, 0.026026, 0.027027, 0.028028, 0.02902
 9, 0.03003, 0.031031, 0.032032, 0.033033, 0.034034, 0.035035,
 0.036036, 0.037037, 0.038038, 0.039039, 0.04004, 0.041041, 0.04
 2042, 0.043043, 0.044044, 0.045045, 0.046046, 0.047047,
 0.048048, 0.049049, 0.05005, 0.051051, 0.052052, 0.05305
 3, 0.054054, 0.055055, 0.056056, 0.057057, 0.058058, 0.059059,
 0.06006, 0.061061, 0.062062, 0.063063, 0.064064, 0.065065, 0.066
 066, 0.067067, 0.068068, 0.069069, 0.07007, 0.071071,
 0.072072, 0.073073, 0.074074, 0.075075, 0.076076, 0.07707
 7, 0.078078, 0.079079, 0.08008, 0.081081, 0.082082, 0.083083,
 0.084084, 0.085085, 0.086086, 0.087087, 0.088088, 0.089089, 0.0
 9009, 0.091091, 0.092092, 0.093093, 0.094094, 0.095095,
 0.096096, 0.097097, 0.098098, 0.099099, 0.1001, 0.101
 1, 0.1021, 0.1031, 0.1041, 0.10511, 0.10611, 0.10711,
 0.10811, 0.10911, 0.11011, 0.11111, 0.11211, 0.11311, 0.11
 411, 0.11512, 0.11612, 0.11712, 0.11812, 0.11912,
 0.12012, 0.12112, 0.12212, 0.12312, 0.12412, 0.1251
 3, 0.12613, 0.12713, 0.12813, 0.12913, 0.13013, 0.13113,
 0.13213, 0.13313, 0.13413, 0.13514, 0.13614, 0.13714, 0.13
 814, 0.13914, 0.14014, 0.14114, 0.14214, 0.14314,
 0.14414, 0.14515, 0.14615, 0.14715, 0.14815, 0.1491
 5, 0.15015, 0.15115, 0.15215, 0.15315, 0.15415, 0.15516,
 0.15616, 0.15716, 0.15816, 0.15916, 0.16016, 0.16116, 0.16
 216, 0.16316, 0.16416, 0.16517, 0.16617, 0.16717,
 0.16817, 0.16917, 0.17017, 0.17117, 0.17217, 0.1731
 7, 0.17417, 0.17518, 0.17618, 0.17718, 0.17818, 0.17918,
 0.18018, 0.18118, 0.18218, 0.18318, 0.18418, 0.18519, 0.18
 619, 0.18719, 0.18819, 0.18919, 0.19019, 0.19119,
 0.19219, 0.19319, 0.19419, 0.1952, 0.1962, 0.197
 2, 0.1982, 0.1992, 0.2002, 0.2012, 0.2022, 0.2032,
 0.2042, 0.20521, 0.20621, 0.20721, 0.20821, 0.20921, 0.210
 21, 0.21121, 0.21221, 0.21321, 0.21421, 0.21522,
 0.21622, 0.21722, 0.21822, 0.21922, 0.22022, 0.2212
 2, 0.22222, 0.22322, 0.22422, 0.22523, 0.22623, 0.22723,
 0.22823, 0.22923, 0.23023, 0.23123, 0.23223, 0.23323, 0.23
 423, 0.23524, 0.23624, 0.23724, 0.23824, 0.23924,
 0.24024, 0.24124, 0.24224, 0.24324, 0.24424, 0.2452
 5, 0.24625, 0.24725, 0.24825, 0.24925, 0.25025, 0.25125,
 0.25225, 0.25325, 0.25425, 0.25526, 0.25626, 0.25726, 0.25

826,	0.25926,	0.26026,	0.26126,	0.26226,	0.26326,	
	0.26426,	0.26527,	0.26627,	0.26727,	0.26827,	0.2692
7,	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,	0.27528,
0.27628,	0.27728,	0.27828,	0.27928,	0.28028,	0.28128,	0.28
228,	0.28328,	0.28428,	0.28529,	0.28629,	0.28729,	
	0.28829,	0.28929,	0.29029,	0.29129,	0.29229,	0.2932
9,	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,	0.2993,
0.3003,	0.3013,	0.3023,	0.3033,	0.3043,	0.30531,	0.306
31,	0.30731,	0.30831,	0.30931,	0.31031,	0.31131,	
	0.31231,	0.31331,	0.31431,	0.31532,	0.31632,	0.3173
2,	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,	0.32332,
0.32432,	0.32533,	0.32633,	0.32733,	0.32833,	0.32933,	0.33
033,	0.33133,	0.33233,	0.33333,	0.33433,	0.33534,	
	0.33634,	0.33734,	0.33834,	0.33934,	0.34034,	0.3413
4,	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,	0.34735,
0.34835,	0.34935,	0.35035,	0.35135,	0.35235,	0.35335,	0.35
435,	0.35536,	0.35636,	0.35736,	0.35836,	0.35936,	
	0.36036,	0.36136,	0.36236,	0.36336,	0.36436,	0.3653
7,	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,	0.37137,
0.37237,	0.37337,	0.37437,	0.37538,	0.37638,	0.37738,	0.37
838,	0.37938,	0.38038,	0.38138,	0.38238,	0.38338,	
	0.38438,	0.38539,	0.38639,	0.38739,	0.38839,	0.3893
9,	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,	0.3954,
0.3964,	0.3974,	0.3984,	0.3994,	0.4004,	0.4014,	0.40
24,	0.4034,	0.4044,	0.40541,	0.40641,	0.40741,	
	0.40841,	0.40941,	0.41041,	0.41141,	0.41241,	0.4134
1,	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,	0.41942,
0.42042,	0.42142,	0.42242,	0.42342,	0.42442,	0.42543,	0.42
643,	0.42743,	0.42843,	0.42943,	0.43043,	0.43143,	
	0.43243,	0.43343,	0.43443,	0.43544,	0.43644,	0.4374
4,	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,	0.44344,
0.44444,	0.44545,	0.44645,	0.44745,	0.44845,	0.44945,	0.45
045,	0.45145,	0.45245,	0.45345,	0.45445,	0.45546,	
	0.45646,	0.45746,	0.45846,	0.45946,	0.46046,	0.4614
6,	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,	0.46747,
0.46847,	0.46947,	0.47047,	0.47147,	0.47247,	0.47347,	0.47
447,	0.47548,	0.47648,	0.47748,	0.47848,	0.47948,	
	0.48048,	0.48148,	0.48248,	0.48348,	0.48448,	0.4854
9,	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,	0.49149,
0.49249,	0.49349,	0.49449,	0.4955,	0.4965,	0.4975,	0.4
985,	0.4995,	0.5005,	0.5015,	0.5025,	0.5035,	
	0.5045,	0.50551,	0.50651,	0.50751,	0.50851,	0.5095
1,	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,	0.51552,
0.51652,	0.51752,	0.51852,	0.51952,	0.52052,	0.52152,	0.52
252,	0.52352,	0.52452,	0.52553,	0.52653,	0.52753,	
	0.52853,	0.52953,	0.53053,	0.53153,	0.53253,	0.5335
3,	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,
0.54054,	0.54154,	0.54254,	0.54354,	0.54454,	0.54555,	0.54
655,	0.54755,	0.54855,	0.54955,	0.55055,	0.55155,	
	0.55255,	0.55355,	0.55455,	0.55556,	0.55656,	0.5575
6,	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,
0.56456,	0.56557,	0.56657,	0.56757,	0.56857,	0.56957,	0.57
057,	0.57157,	0.57257,	0.57357,	0.57457,	0.57558,	
	0.57658,	0.57758,	0.57858,	0.57958,	0.58058,	0.5815
8,	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,
0.58859,	0.58959,	0.59059,	0.59159,	0.59259,	0.59359,	0.59

459,	0.5956,	0.5966,	0.5976,	0.5986,	0.5996,	
	0.6006,	0.6016,	0.6026,	0.6036,	0.6046,	0.6056
1,	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,
0.61261,	0.61361,	0.61461,	0.61562,	0.61662,	0.61762,	0.61
862,	0.61962,	0.62062,	0.62162,	0.62262,	0.62362,	
	0.62462,	0.62563,	0.62663,	0.62763,	0.62863,	0.6296
3,	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,	0.63564,
0.63664,	0.63764,	0.63864,	0.63964,	0.64064,	0.64164,	0.64
264,	0.64364,	0.64464,	0.64565,	0.64665,	0.64765,	
	0.64865,	0.64965,	0.65065,	0.65165,	0.65265,	0.6536
5,	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,
0.66066,	0.66166,	0.66266,	0.66366,	0.66466,	0.66567,	0.66
667,	0.66767,	0.66867,	0.66967,	0.67067,	0.67167,	
	0.67267,	0.67367,	0.67467,	0.67568,	0.67668,	0.6776
8,	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,	0.68368,
0.68468,	0.68569,	0.68669,	0.68769,	0.68869,	0.68969,	0.69
069,	0.69169,	0.69269,	0.69369,	0.69469,	0.6957,	
	0.6967,	0.6977,	0.6987,	0.6997,	0.7007,	0.701
7,	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,
0.70871,	0.70971,	0.71071,	0.71171,	0.71271,	0.71371,	0.71
471,	0.71572,	0.71672,	0.71772,	0.71872,	0.71972,	
	0.72072,	0.72172,	0.72272,	0.72372,	0.72472,	0.7257
3,	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,	0.73173,
0.73273,	0.73373,	0.73473,	0.73574,	0.73674,	0.73774,	0.73
874,	0.73974,	0.74074,	0.74174,	0.74274,	0.74374,	
	0.74474,	0.74575,	0.74675,	0.74775,	0.74875,	0.7497
5,	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,
0.75676,	0.75776,	0.75876,	0.75976,	0.76076,	0.76176,	0.76
276,	0.76376,	0.76476,	0.76577,	0.76677,	0.76777,	
	0.76877,	0.76977,	0.77077,	0.77177,	0.77277,	0.7737
7,	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,	0.77978,
0.78078,	0.78178,	0.78278,	0.78378,	0.78478,	0.78579,	0.78
679,	0.78779,	0.78879,	0.78979,	0.79079,	0.79179,	
	0.79279,	0.79379,	0.79479,	0.7958,	0.7968,	0.797
8,	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,
0.8048,	0.80581,	0.80681,	0.80781,	0.80881,	0.80981,	0.810
81,	0.81181,	0.81281,	0.81381,	0.81481,	0.81582,	
	0.81682,	0.81782,	0.81882,	0.81982,	0.82082,	0.8218
2,	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,
0.82883,	0.82983,	0.83083,	0.83183,	0.83283,	0.83383,	0.83
483,	0.83584,	0.83684,	0.83784,	0.83884,	0.83984,	
	0.84084,	0.84184,	0.84284,	0.84384,	0.84484,	0.8458
5,	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,	0.85185,
0.85285,	0.85385,	0.85485,	0.85586,	0.85686,	0.85786,	0.85
886,	0.85986,	0.86086,	0.86186,	0.86286,	0.86386,	
	0.86486,	0.86587,	0.86687,	0.86787,	0.86887,	0.8698
7,	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,	0.87588,
0.87688,	0.87788,	0.87888,	0.87988,	0.88088,	0.88188,	0.88
288,	0.88388,	0.88488,	0.88589,	0.88689,	0.88789,	
	0.88889,	0.88989,	0.89089,	0.89189,	0.89289,	0.8938
9,	0.89489,	0.8959,	0.8969,	0.8979,	0.8989,	0.8999,
0.9009,	0.9019,	0.9029,	0.9039,	0.9049,	0.90591,	0.906
91,	0.90791,	0.90891,	0.90991,	0.91091,	0.91191,	
	0.91291,	0.91391,	0.91491,	0.91592,	0.91692,	0.9179
2,	0.91892,	0.91992,	0.92092,	0.92192,	0.92292,	0.92392,
0.92492,	0.92593,	0.92693,	0.92793,	0.92893,	0.92993,	0.93

093,	0.93193,	0.93293,	0.93393,	0.93493,	0.93594,	
	0.93694,	0.93794,	0.93894,	0.93994,	0.94094,	0.9419
4,	0.94294,	0.94394,	0.94494,	0.94595,	0.94695,	0.94795,
0.94895,	0.94995,	0.95095,	0.95195,	0.95295,	0.95395,	0.95
495,	0.95596,	0.95696,	0.95796,	0.95896,	0.95996,	
	0.96096,	0.96196,	0.96296,	0.96396,	0.96496,	0.9659
7,	0.96697,	0.96797,	0.96897,	0.96997,	0.97097,	0.97197,
0.97297,	0.97397,	0.97497,	0.97598,	0.97698,	0.97798,	0.97
898,	0.97998,	0.98098,	0.98198,	0.98298,	0.98398,	
	0.98498,	0.98599,	0.98699,	0.98799,	0.98899,	0.9899
9,	0.99099,	0.99199,	0.99299,	0.99399,	0.99499,	0.996,
0.997,	0.998,	0.999,	1],), array([[0.46237,	0.46237,	
0.60688,	...,	1,	1,	1],		
	[0.65672,	0.65672,	0.7665,	...,	1,
1]],	'Confidence',	'Precision']	, [array([0,	0.001001,	0.002002,
0.003003,	0.004004,	0.005005,	0.006006,	0.007007,	0.008008,	0.00
9009,	0.01001,	0.011011,	0.012012,	0.013013,	0.014014,	0.01501
5,	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,	0.02902
9,	0.03003,	0.031031,	0.032032,	0.033033,	0.034034,	0.035035,
0.036036,	0.037037,	0.038038,	0.039039,	0.04004,	0.041041,	0.04
2042,	0.043043,	0.044044,	0.045045,	0.046046,	0.047047,	
	0.048048,	0.049049,	0.05005,	0.051051,	0.052052,	0.05305
3,	0.054054,	0.055055,	0.056056,	0.057057,	0.058058,	0.059059,
0.06006,	0.061061,	0.062062,	0.063063,	0.064064,	0.065065,	0.066
066,	0.067067,	0.068068,	0.069069,	0.07007,	0.071071,	
	0.072072,	0.073073,	0.074074,	0.075075,	0.076076,	0.07707
7,	0.078078,	0.079079,	0.08008,	0.081081,	0.082082,	0.083083,
0.084084,	0.085085,	0.086086,	0.087087,	0.088088,	0.089089,	0.0
9009,	0.091091,	0.092092,	0.093093,	0.094094,	0.095095,	
	0.096096,	0.097097,	0.098098,	0.099099,	0.1001,	0.101
1,	0.1021,	0.1031,	0.1041,	0.10511,	0.10611,	0.10711,
0.10811,	0.10911,	0.11011,	0.11111,	0.11211,	0.11311,	0.11
411,	0.11512,	0.11612,	0.11712,	0.11812,	0.11912,	
	0.12012,	0.12112,	0.12212,	0.12312,	0.12412,	0.1251
3,	0.12613,	0.12713,	0.12813,	0.12913,	0.13013,	0.13113,
0.13213,	0.13313,	0.13413,	0.13514,	0.13614,	0.13714,	0.13
814,	0.13914,	0.14014,	0.14114,	0.14214,	0.14314,	
	0.14414,	0.14515,	0.14615,	0.14715,	0.14815,	0.1491
5,	0.15015,	0.15115,	0.15215,	0.15315,	0.15415,	0.15516,
0.15616,	0.15716,	0.15816,	0.15916,	0.16016,	0.16116,	0.16
216,	0.16316,	0.16416,	0.16517,	0.16617,	0.16717,	
	0.16817,	0.16917,	0.17017,	0.17117,	0.17217,	0.1731
7,	0.17417,	0.17518,	0.17618,	0.17718,	0.17818,	0.17918,
0.18018,	0.18118,	0.18218,	0.18318,	0.18418,	0.18519,	0.18
619,	0.18719,	0.18819,	0.18919,	0.19019,	0.19119,	
	0.19219,	0.19319,	0.19419,	0.1952,	0.1962,	0.197
2,	0.1982,	0.1992,	0.2002,	0.2012,	0.2022,	0.2032,
0.2042,	0.20521,	0.20621,	0.20721,	0.20821,	0.20921,	0.210
21,	0.21121,	0.21221,	0.21321,	0.21421,	0.21522,	
	0.21622,	0.21722,	0.21822,	0.21922,	0.22022,	0.2212
2,	0.22222,	0.22322,	0.22422,	0.22523,	0.22623,	0.22723,
0.22823,	0.22923,	0.23023,	0.23123,	0.23223,	0.23323,	0.23
423,	0.23524,	0.23624,	0.23724,	0.23824,	0.23924,	
	0.24024,	0.24124,	0.24224,	0.24324,	0.24424,	0.2452

5,	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,	0.25125,
	0.25225,	0.25325,	0.25425,	0.25526,	0.25626,	0.25726,
826,	0.25926,	0.26026,	0.26126,	0.26226,	0.26326,	
	0.26426,	0.26527,	0.26627,	0.26727,	0.26827,	0.2692
7,	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,	0.27528,
	0.27628,	0.27728,	0.27828,	0.27928,	0.28028,	0.28128,
228,	0.28328,	0.28428,	0.28529,	0.28629,	0.28729,	
	0.28829,	0.28929,	0.29029,	0.29129,	0.29229,	0.2932
9,	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,	0.2993,
	0.3003,	0.3013,	0.3023,	0.3033,	0.3043,	0.30531,
31,	0.30731,	0.30831,	0.30931,	0.31031,	0.31131,	
	0.31231,	0.31331,	0.31431,	0.31532,	0.31632,	0.3173
2,	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,	0.32332,
	0.32432,	0.32533,	0.32633,	0.32733,	0.32833,	0.32933,
033,	0.33133,	0.33233,	0.33333,	0.33433,	0.33534,	
	0.33634,	0.33734,	0.33834,	0.33934,	0.34034,	0.3413
4,	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,	0.34735,
	0.34835,	0.34935,	0.35035,	0.35135,	0.35235,	0.35335,
435,	0.35536,	0.35636,	0.35736,	0.35836,	0.35936,	
	0.36036,	0.36136,	0.36236,	0.36336,	0.36436,	0.3653
7,	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,	0.37137,
	0.37237,	0.37337,	0.37437,	0.37538,	0.37638,	0.37738,
838,	0.37938,	0.38038,	0.38138,	0.38238,	0.38338,	
	0.38438,	0.38539,	0.38639,	0.38739,	0.38839,	0.3893
9,	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,	0.3954,
	0.3964,	0.3974,	0.3984,	0.3994,	0.4004,	0.4014,
24,	0.4034,	0.4044,	0.40541,	0.40641,	0.40741,	
	0.40841,	0.40941,	0.41041,	0.41141,	0.41241,	0.4134
1,	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,	0.41942,
	0.42042,	0.42142,	0.42242,	0.42342,	0.42442,	0.42543,
643,	0.42743,	0.42843,	0.42943,	0.43043,	0.43143,	
	0.43243,	0.43343,	0.43443,	0.43544,	0.43644,	0.4374
4,	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,	0.44344,
	0.44444,	0.44545,	0.44645,	0.44745,	0.44845,	0.44945,
045,	0.45145,	0.45245,	0.45345,	0.45445,	0.45546,	
	0.45646,	0.45746,	0.45846,	0.45946,	0.46046,	0.4614
6,	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,	0.46747,
	0.46847,	0.46947,	0.47047,	0.47147,	0.47247,	0.47347,
447,	0.47548,	0.47648,	0.47748,	0.47848,	0.47948,	
	0.48048,	0.48148,	0.48248,	0.48348,	0.48448,	0.4854
9,	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,	0.49149,
	0.49249,	0.49349,	0.49449,	0.4955,	0.4965,	0.4975,
985,	0.4995,	0.5005,	0.5015,	0.5025,	0.5035,	
	0.5045,	0.50551,	0.50651,	0.50751,	0.50851,	0.5095
1,	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,	0.51552,
	0.51652,	0.51752,	0.51852,	0.51952,	0.52052,	0.52152,
252,	0.52352,	0.52452,	0.52553,	0.52653,	0.52753,	
	0.52853,	0.52953,	0.53053,	0.53153,	0.53253,	0.5335
3,	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,
	0.54054,	0.54154,	0.54254,	0.54354,	0.54454,	0.54555,
655,	0.54755,	0.54855,	0.54955,	0.55055,	0.55155,	
	0.55255,	0.55355,	0.55455,	0.55556,	0.55656,	0.5575
6,	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,
	0.56456,	0.56557,	0.56657,	0.56757,	0.56857,	0.56957,
057,	0.57157,	0.57257,	0.57357,	0.57457,	0.57558,	
	0.57658,	0.57758,	0.57858,	0.57958,	0.58058,	0.5815

8,	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,
	0.58859,	0.58959,	0.59059,	0.59159,	0.59259,	0.59359,
459,	0.5956,	0.5966,	0.5976,	0.5986,	0.5996,	
	0.6006,	0.6016,	0.6026,	0.6036,	0.6046,	0.6056
1,	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,
0.61261,	0.61361,	0.61461,	0.61562,	0.61662,	0.61762,	0.61
862,	0.61962,	0.62062,	0.62162,	0.62262,	0.62362,	
	0.62462,	0.62563,	0.62663,	0.62763,	0.62863,	0.6296
3,	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,	0.63564,
0.63664,	0.63764,	0.63864,	0.63964,	0.64064,	0.64164,	0.64
264,	0.64364,	0.64464,	0.64565,	0.64665,	0.64765,	
	0.64865,	0.64965,	0.65065,	0.65165,	0.65265,	0.6536
5,	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,
0.66066,	0.66166,	0.66266,	0.66366,	0.66466,	0.66567,	0.66
667,	0.66767,	0.66867,	0.66967,	0.67067,	0.67167,	
	0.67267,	0.67367,	0.67467,	0.67568,	0.67668,	0.6776
8,	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,	0.68368,
0.68468,	0.68569,	0.68669,	0.68769,	0.68869,	0.68969,	0.69
069,	0.69169,	0.69269,	0.69369,	0.69469,	0.6957,	
	0.6967,	0.6977,	0.6987,	0.6997,	0.7007,	0.701
7,	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,
0.70871,	0.70971,	0.71071,	0.71171,	0.71271,	0.71371,	0.71
471,	0.71572,	0.71672,	0.71772,	0.71872,	0.71972,	
	0.72072,	0.72172,	0.72272,	0.72372,	0.72472,	0.7257
3,	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,	0.73173,
0.73273,	0.73373,	0.73473,	0.73574,	0.73674,	0.73774,	0.73
874,	0.73974,	0.74074,	0.74174,	0.74274,	0.74374,	
	0.74474,	0.74575,	0.74675,	0.74775,	0.74875,	0.7497
5,	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,
0.75676,	0.75776,	0.75876,	0.75976,	0.76076,	0.76176,	0.76
276,	0.76376,	0.76476,	0.76577,	0.76677,	0.76777,	
	0.76877,	0.76977,	0.77077,	0.77177,	0.77277,	0.7737
7,	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,	0.77978,
0.78078,	0.78178,	0.78278,	0.78378,	0.78478,	0.78579,	0.78
679,	0.78779,	0.78879,	0.78979,	0.79079,	0.79179,	
	0.79279,	0.79379,	0.79479,	0.7958,	0.7968,	0.797
8,	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,
0.8048,	0.80581,	0.80681,	0.80781,	0.80881,	0.80981,	0.810
81,	0.81181,	0.81281,	0.81381,	0.81481,	0.81582,	
	0.81682,	0.81782,	0.81882,	0.81982,	0.82082,	0.8218
2,	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,
0.82883,	0.82983,	0.83083,	0.83183,	0.83283,	0.83383,	0.83
483,	0.83584,	0.83684,	0.83784,	0.83884,	0.83984,	
	0.84084,	0.84184,	0.84284,	0.84384,	0.84484,	0.8458
5,	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,	0.85185,
0.85285,	0.85385,	0.85485,	0.85586,	0.85686,	0.85786,	0.85
886,	0.85986,	0.86086,	0.86186,	0.86286,	0.86386,	
	0.86486,	0.86587,	0.86687,	0.86787,	0.86887,	0.8698
7,	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,	0.87588,
0.87688,	0.87788,	0.87888,	0.87988,	0.88088,	0.88188,	0.88
288,	0.88388,	0.88488,	0.88589,	0.88689,	0.88789,	
	0.88889,	0.88989,	0.89089,	0.89189,	0.89289,	0.8938
9,	0.89489,	0.8959,	0.8969,	0.8979,	0.8989,	0.8999,
0.9009,	0.9019,	0.9029,	0.9039,	0.9049,	0.90591,	0.906
91,	0.90791,	0.90891,	0.90991,	0.91091,	0.91191,	
	0.91291,	0.91391,	0.91491,	0.91592,	0.91692,	0.9179

```

2,      0.91892,      0.91992,      0.92092,      0.92192,      0.92292,      0.92392,
0.92492,      0.92593,      0.92693,      0.92793,      0.92893,      0.92993,      0.93
093,      0.93193,      0.93293,      0.93393,      0.93493,      0.93594,
          0.93694,      0.93794,      0.93894,      0.93994,      0.94094,      0.9419
4,      0.94294,      0.94394,      0.94494,      0.94595,      0.94695,      0.94795,
0.94895,      0.94995,      0.95095,      0.95195,      0.95295,      0.95395,      0.95
495,      0.95596,      0.95696,      0.95796,      0.95896,      0.95996,
          0.96096,      0.96196,      0.96296,      0.96396,      0.96496,      0.9659
7,      0.96697,      0.96797,      0.96897,      0.96997,      0.97097,      0.97197,
0.97297,      0.97397,      0.97497,      0.97598,      0.97698,      0.97798,      0.97
898,      0.97998,      0.98098,      0.98198,      0.98298,      0.98398,
          0.98498,      0.98599,      0.98699,      0.98799,      0.98899,      0.9899
9,      0.99099,      0.99199,      0.99299,      0.99399,      0.99499,      0.996,
0.997,      0.998,      0.999,           1]), array([[        1,
1, ...,
0,          0,          0],
[        1,        1,        0.97727, ...,        0,        0,
0]]), 'Confidence', 'Recall']]
```

fitness: np.float64(0.9373362695526436)

keys: ['metrics/precision(B)', 'metrics/recall(B)', 'metrics/mAP50(B)', 'metrics/mAP50-95(B)']

maps: array([0.92397, 0.94102])

names: {0: '0', 1: '1'}

plot: True

results_dict: {'metrics/precision(B)': np.float64(0.9616940847971054), 'metrics/recall(B)': np.float64(0.9886363636363636), 'metrics/mAP50(B)': np.float64(0.9809009835194045), 'metrics/mAP50-95(B)': np.float64(0.932495745778559), 'fitness': np.float64(0.9373362695526436)}

save_dir: WindowsPath('runs/train_heads_vs_tails/yolo_heads_tails_final2')

speed: {'preprocess': 0.036700000055134296, 'inference': 0.46038666672150913, 'loss': 0.0001166665848965446, 'postprocess': 0.584760002501471}

task: 'detect'

In [49]:

```

from ultralytics import YOLO

# Loading our best model
model = YOLO('runs/train_heads_vs_tails/yolo_heads_tails_final/weights/best.pt')

# validating on val split
val_metrics = model.val(
    data='Data/Q2DB/data.yaml',
    split='val'
)

print("Validation results:", val_metrics)

```

Ultralytics 8.3.145 Python-3.11.9 torch-2.5.1+cu121 CUDA:0 (NVIDIA GeForce RTX 4070 Ti, 12282MiB)

Model summary (fused): 72 layers, 11,126,358 parameters, 0 gradients, 28.4 GFLOPs

val: Fast image access (ping: 0.00.0 ms, read: 2599.31117.2 MB/s, size: 189.7 KB)

val: Scanning C:\Users\Amir\Desktop\Hexcel Technical interview\Data\Q2DB\valid\label.s.cache... 30 images, 0 backgrounds, 0 corrupt: 100%|██████████| 30/30 [00:00<?, ?it/s]

Class	Images	Instances	Box(P)	R	mAP50	mAP50-95
-95): 100%	██████████	2/2	[00:01<00:00, 1.85it/s]			

	all	30	87	0.941	0.978	0.99
0.939	0	27	43	0.955	0.978	0.987
0.922	1	26	44	0.928	0.977	0.993
0.955						

Speed: 0.3ms preprocess, 4.2ms inference, 0.0ms loss, 1.2ms postprocess per image
 Results saved to `runs\detect\val3`

Validation results: `ultralytics.utils.metrics.DetMetrics` object with attributes:

```

ap_class_index: array([0, 1])
box: ultralytics.utils.metrics.Metric object
confusion_matrix: <ultralytics.utils.metrics.ConfusionMatrix object at 0x000001DA7BA
29A10>
curves: ['Precision-Recall(B)', 'F1-Confidence(B)', 'Precision-Confidence(B)', 'Reca
ll-Confidence(B)']
curves_results: [[array([
        0,      0.001001,      0.002002,      0.003003,      0.00
4004,      0.005005,      0.006006,      0.007007,      0.008008,
        0.009009,      0.01001,      0.011011,      0.012012,      0.013013,
        0.014014,      0.015015,      0.016016,      0.0170
17,      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,      0.03603
6,      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,      0.060
06,      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,
        0.084
84,      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,      0.1081
1,      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,      0.1321
3,      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,
        0.1561
6,      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,
        0.180
8,      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,
        0.204
2,      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,
        0.228
3,      0.22923,      0.23023,      0.23123,      0.23223,
        0.23323,      0.23423,      0.23524,      0.23624,
        0.23724,      0.23824,      0.23924,
        0.24024
])]]]

```

	0.24024,	0.24124,	0.24224,	0.24324,	0.24424,	0.24525,
0.24625,	0.24725,	0.24825,	0.24925,	0.25025,	0.25125,	0.2522
5,	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,	0.2762
8,	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,	0.300
3,	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,	0.3243
2,	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,	0.3483
5,	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,	0.3723
7,	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,	0.396
4,	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,	0.4204
2,	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,	0.4444
4,	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,	0.4684
7,	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,	0.4924
9,	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,	0.5165
2,	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,	0.5405
4,	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,	0.5645
6,	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,	0.5885
9,	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,	0.6126
1,	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,	0.6366
4,	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,	0.6606
6,	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,	0.6846
8,	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,	0.7087
1,	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,	0.7327
3,	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,	0.7567
6,	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,	0.7807
8,	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,	0.804
8,	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,	0.8288
3,	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,	0.8528
5,	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,	0.8768
8,	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,	0.900
9,	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,     0.9249
2,      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,     0.9489
5,      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,     0.9729
7,      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,      0.99
7,      0.998,       0.999,       1]), array([[ 1,          1,
1, ..., 0.95556, 0.95556,
    [ 1,          1,          1, ..., 0.88,      0.88,
0]]]), 'Recall', 'Precision'], [array([
0,      0.001001, 0.002002, 0.00
3003, 0.004004, 0.005005, 0.006006,
0.007007, 0.008008, 0.009009,
0.01001, 0.011011, 0.012012, 0.013013,
0.014014, 0.015015, 0.01601
6,      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,
0.03603
6,      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,
0.060
06, 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,
0.0840
84, 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,
0.1081
1, 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,
0.1321
3, 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,
0.1561
6, 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,
0.1801
8, 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,
0.204
2, 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,
0.2282

```

3,	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,
	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,	0.25125,
						0.2522
5,	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,
	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,	0.27528,
						0.2762
8,	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,
	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,	0.2993,
						0.300
3,	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,
	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,	0.32332,
						0.3243
2,	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,
	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,	0.34735,
						0.3483
5,	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,
	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,	0.37137,
						0.3723
7,	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,
	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,	0.3954,
						0.396
4,	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,
	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,	0.41942,
						0.4204
2,	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,
	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,	0.44344,
						0.4444
4,	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,
	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,	0.46747,
						0.4684
7,	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,
	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,	0.49149,
						0.4924
9,	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,
	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,	0.51552,
						0.5165
2,	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,
	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,
						0.5405
4,	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,
	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,
						0.5645

6,	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,	0.5885
9,	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,
0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,	0.6126
1,	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,	0.6366
4,	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,
0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,	0.6606
6,	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,	0.6846
8,	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,
0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,	0.7087
1,	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,	0.7327
3,	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,
0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,	0.7567
6,	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,	0.7807
8,	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,
0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,	0.804
8,	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,
0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,	0.8288
3,	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,
0.84685,	0.84785,	0.84885,	0.84985,	0.85085,	0.85185,	0.8528
5,	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,
0.87087,	0.87187,	0.87287,	0.87387,	0.87487,	0.87588,	0.8768
8,	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,
0.89489,	0.8959,	0.8969,	0.8979,	0.8989,	0.8999,	0.900

9, 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, 0.9249
 2, 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, 0.9489
 5, 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, 0.9729
 7, 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, 0.99
 7, 0.998, 0.999, 1]), array([[0.63235, 0.63235, 0.
 76553, ..., 0, 0, 0],
 [0.67176, 0.67176, 0.79805, ..., 0, 0,
 0]]), 'Confidence', 'F1'], [array([0, 0.001001, 0.002002, 0.00300
 3, 0.004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.009009,
 0.01001, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015, 0.01601
 6, 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, 0.03603
 6, 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, 0.060
 06, 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, 0.0840
 84, 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, 0.1081
 1, 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, 0.1321
 3, 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, 0.1561
 6, 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, 0.1801
 8, 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, 0.204
 2, 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,
3,	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,
5,	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,
8,	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,
3,	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,
2,	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,
5,	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,
7,	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,
4,	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,
2,	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,
4,	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,
7,	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,
9,	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,
2,	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,
4,	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,	0.5645
6,	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,	0.5885
9,	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,	0.6126
1,	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,	0.6366
4,	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,	0.6606
6,	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,	0.6846
8,	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,	0.7087
1,	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,	0.7327
3,	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,	0.7567
6,	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,	0.7807
8,	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,	0.804
8,	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,	0.8288
3,	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,	0.8528
5,	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,	0.8768
8,	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,	0.900
9,	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,	0.9249
2,	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,	0.9489
5,	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,	0.9729
7,	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,	0.99
7,	0.998,	0.999,		1]), array([[0.46237,	0.46237,	0.
62013,	...,	1,	1,	1],		
	[0.50575,	0.50575,	0.66397,	...,	1,	1,
1]]), 'Confidence', 'Precision'], [array([0,	0.001001,	0.002002,				
0.003003,	0.004004,	0.005005,	0.006006,	0.007007,	0.008008,	0.0090
09,	0.01001,	0.011011,	0.012012,	0.013013,	0.014014,	0.015015,
0.016016,	0.017017,	0.018018,	0.019019,	0.02002,	0.021021,	0.0220
22,	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,	0.03603
6,	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,	0.060
06,	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,	0.0840
84,	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,	0.1081
1,	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,	0.1321
3,	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,	0.1561
6,	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,	0.1801
8,	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,	0.204

2,	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,
	0.22222,	0.22322,	0.22422,	0.22523,	0.22623,	0.22723,
3,	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,
	0.24625,	0.24725,	0.24825,	0.24925,	0.25025,	0.25125,
5,	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,
	0.27027,	0.27127,	0.27227,	0.27327,	0.27427,	0.27528,
8,	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,
	0.29429,	0.2953,	0.2963,	0.2973,	0.2983,	0.2993,
3,	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,
	0.31832,	0.31932,	0.32032,	0.32132,	0.32232,	0.32332,
2,	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,
	0.34234,	0.34334,	0.34434,	0.34535,	0.34635,	0.34735,
5,	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,
	0.36637,	0.36737,	0.36837,	0.36937,	0.37037,	0.37137,
7,	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,
	0.39039,	0.39139,	0.39239,	0.39339,	0.39439,	0.3954,
4,	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,
	0.41441,	0.41542,	0.41642,	0.41742,	0.41842,	0.41942,
2,	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,
	0.43844,	0.43944,	0.44044,	0.44144,	0.44244,	0.44344,
4,	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,
	0.46246,	0.46346,	0.46446,	0.46547,	0.46647,	0.46747,
7,	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,
	0.48649,	0.48749,	0.48849,	0.48949,	0.49049,	0.49149,
9,	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,
	0.51051,	0.51151,	0.51251,	0.51351,	0.51451,	0.51552,
2,	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,
	0.53453,	0.53554,	0.53654,	0.53754,	0.53854,	0.53954,
						0.5405

4,	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,
	0.55856,	0.55956,	0.56056,	0.56156,	0.56256,	0.56356,
6,	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,
	0.58258,	0.58358,	0.58458,	0.58559,	0.58659,	0.58759,
9,	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,
	0.60661,	0.60761,	0.60861,	0.60961,	0.61061,	0.61161,
1,	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,
	0.63063,	0.63163,	0.63263,	0.63363,	0.63463,	0.63564,
4,	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,
	0.65465,	0.65566,	0.65666,	0.65766,	0.65866,	0.65966,
6,	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,
	0.67868,	0.67968,	0.68068,	0.68168,	0.68268,	0.68368,
8,	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,
	0.7027,	0.7037,	0.7047,	0.70571,	0.70671,	0.70771,
1,	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,
	0.72673,	0.72773,	0.72873,	0.72973,	0.73073,	0.73173,
3,	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,
	0.75075,	0.75175,	0.75275,	0.75375,	0.75475,	0.75576,
6,	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,
	0.77477,	0.77578,	0.77678,	0.77778,	0.77878,	0.77978,
8,	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,
	0.7988,	0.7998,	0.8008,	0.8018,	0.8028,	0.8038,
8,	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,
	0.82282,	0.82382,	0.82482,	0.82583,	0.82683,	0.82783,
3,	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,
	0.84685,	0.84785,	0.84885,	0.84985,	0.85085,	0.85185,
5,	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,
	0.87087,	0.87187,	0.87287,	0.87387,	0.87487,	0.87588,
						0.8768

```

8,      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,      0.900
9,      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,      0.9249
2,      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,      0.9489
5,      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,      0.9729
7,      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,      0.99
7,      0.998,      0.999,      1]), array([[      1,      1,
1, ...,      0,      0,
[      1,      1,      1, ...,      0,      0,
0]]], 'Confidence', 'Recall'])
fitness: np.float64(0.9437840783605287)
keys: ['metrics/precision(B)', 'metrics/recall(B)', 'metrics/mAP50(B)', 'metrics/mAP
50-95(B)']
maps: array([ 0.92233,  0.95497])
names: {0: '0', 1: '1'}
plot: True
results_dict: {'metrics/precision(B)': np.float64(0.9411578606530888), 'metrics/recal
l(B)': np.float64(0.9778780141523178), 'metrics/mAP50(B)': np.float64(0.9899741741
741741), 'metrics/mAP50-95(B)': np.float64(0.9386518454923458), 'fitness': np.float64
(0.9437840783605287)}
save_dir: WindowsPath('runs/detect/val3')
speed: {'preprocess': 0.3238399998129656, 'inference': 4.15478666642836, 'loss': 0.0
006133331529175242, 'postprocess': 1.1697933334896031}
task: 'detect'

```

making prediction on both datasets

```

In [63]: import os
from ultralytics import YOLO

# Loading the best model
model = YOLO('runs/train_heads_vs_tails/yolo_heads_tails_final/weights/best.pt')

image_dir = 'Data/dataset2'
image_paths = [
    os.path.join(image_dir, f)
    for f in os.listdir(image_dir)
    if f.lower().endswith('.jpg', '.jpeg', '.png'))
]

# Run inference and save predictions for later visualization

```

```

results = model.predict(
    source=image_paths,
    imgsz=352,
    batch=16,
    save=True,           # saves annotated images
    save_txt=True,       # saves labels in YOLO .txt format
    project='runs/predict/Q2',
    name='dataset2_results_extra',
    verbose=False
)

```

Results saved to runs\predict\Q2\dataset2_results_extra
400 labels saved to runs\predict\Q2\dataset2_results_extra\labels

Q2: Creating a Distribution Plot for Dataset1 Only Head Counts

```

In [64]:                                     #Visualizing some outputs from dat

import os
import random
from PIL import Image
import matplotlib.pyplot as plt

# Folder containing YOLO output images (with boxes already drawn)
image_dir = "runs\predict\Q2\dataset1_results_extra"

# Get list of image files (ignore the 'labels' folder and non-image files)
image_files = [f for f in os.listdir(image_dir)
               if f.lower().endswith((".jpg", ".png", ".jpeg"))
               and not os.path.isdir(os.path.join(image_dir, f))]

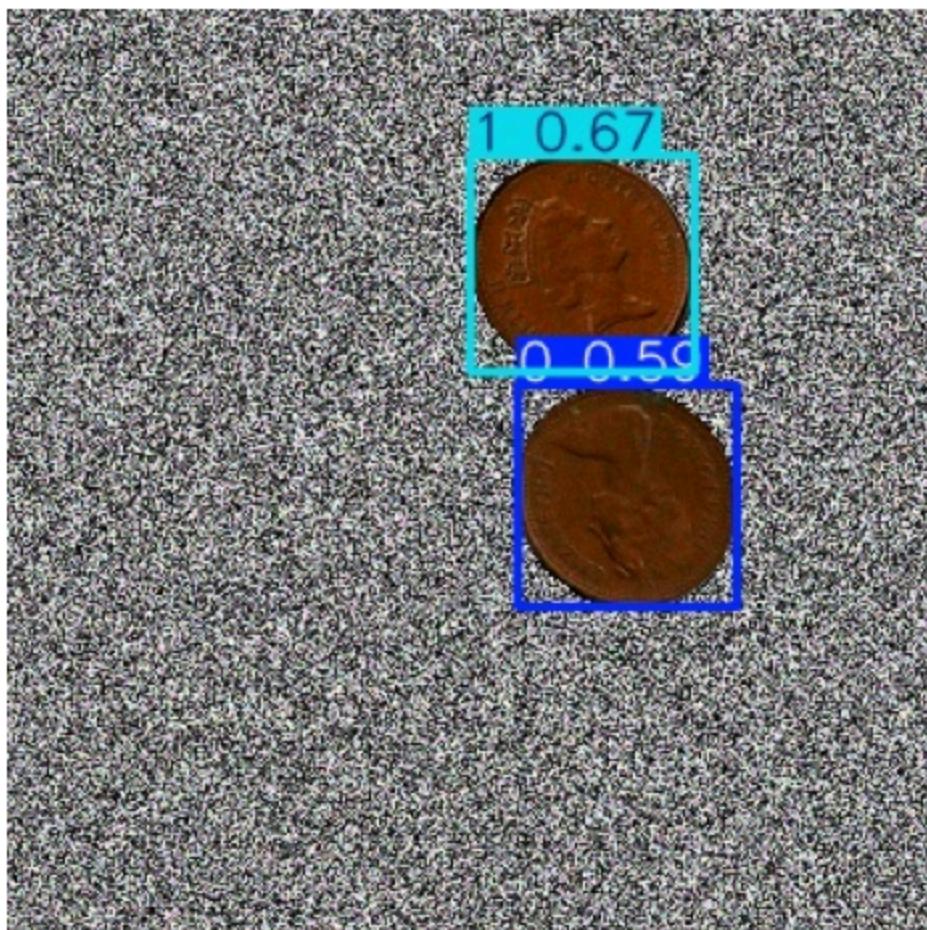
# Randomly select 5 images
sampled_images = random.sample(image_files, 5)

# Display each image
for filename in sampled_images:
    img_path = os.path.join(image_dir, filename)
    img = Image.open(img_path).convert("RGB")

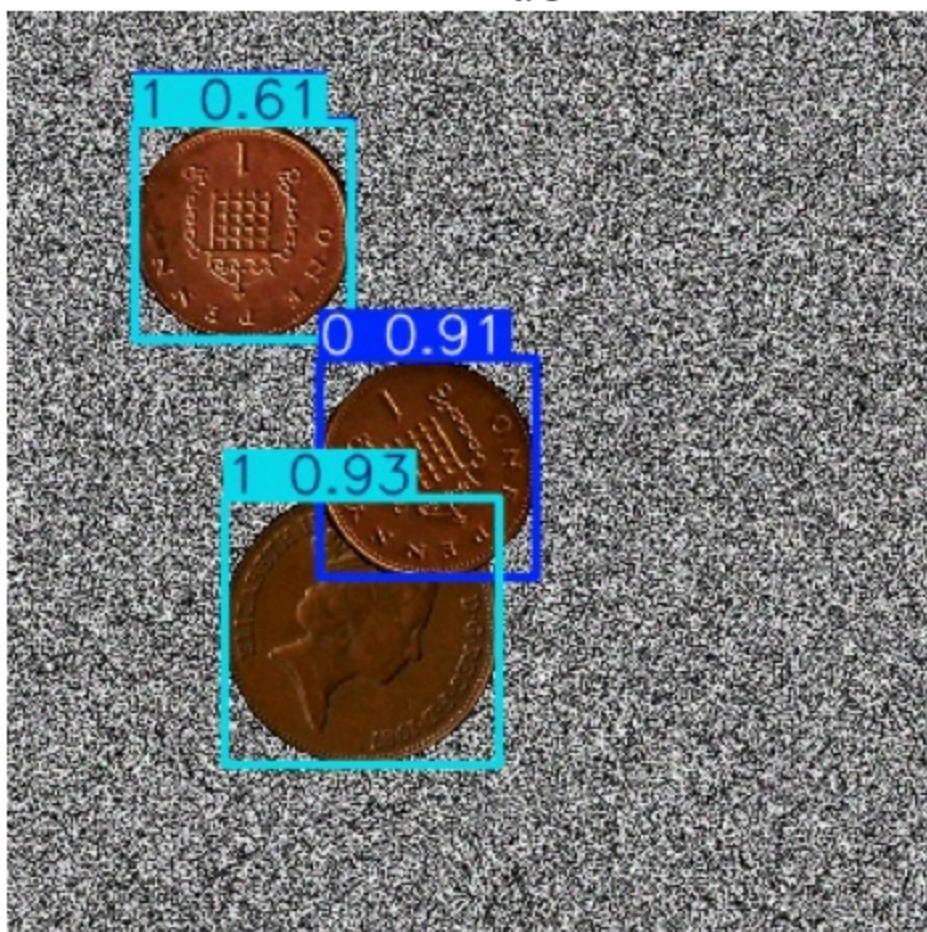
    plt.figure(figsize=(6, 6))
    plt.imshow(img)
    plt.axis('off')
    plt.title(filename)
    plt.show()

```

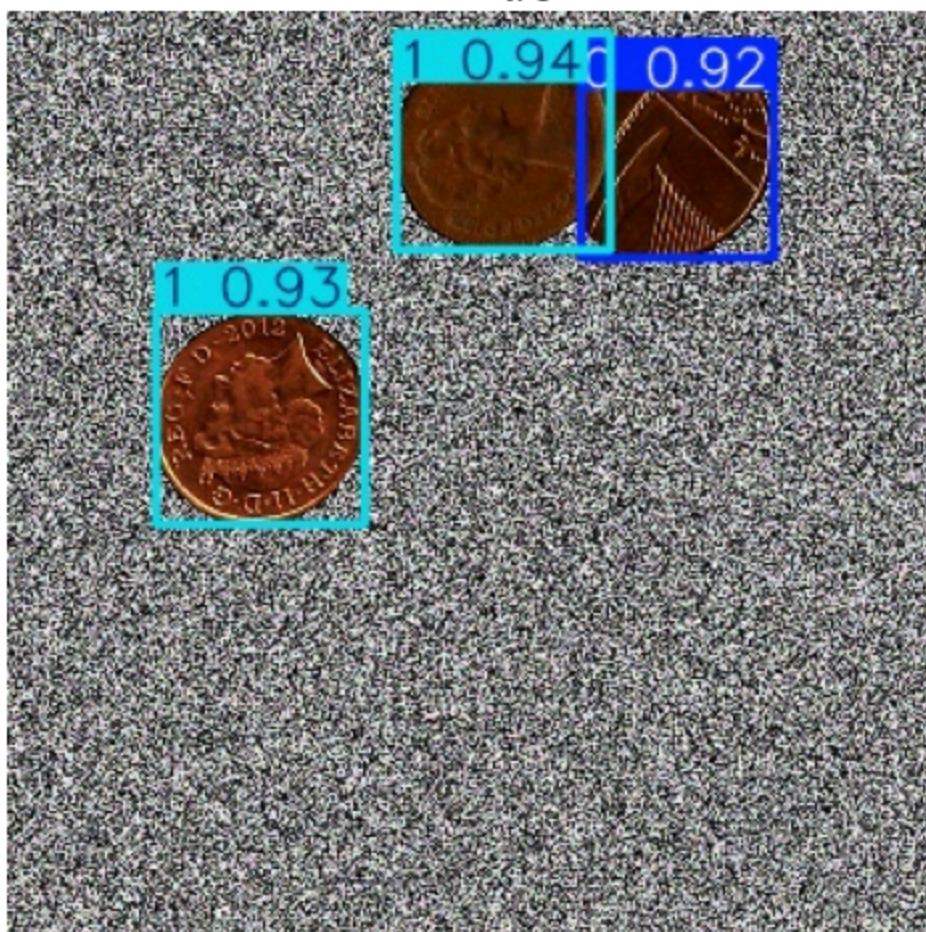
coins163.jpg



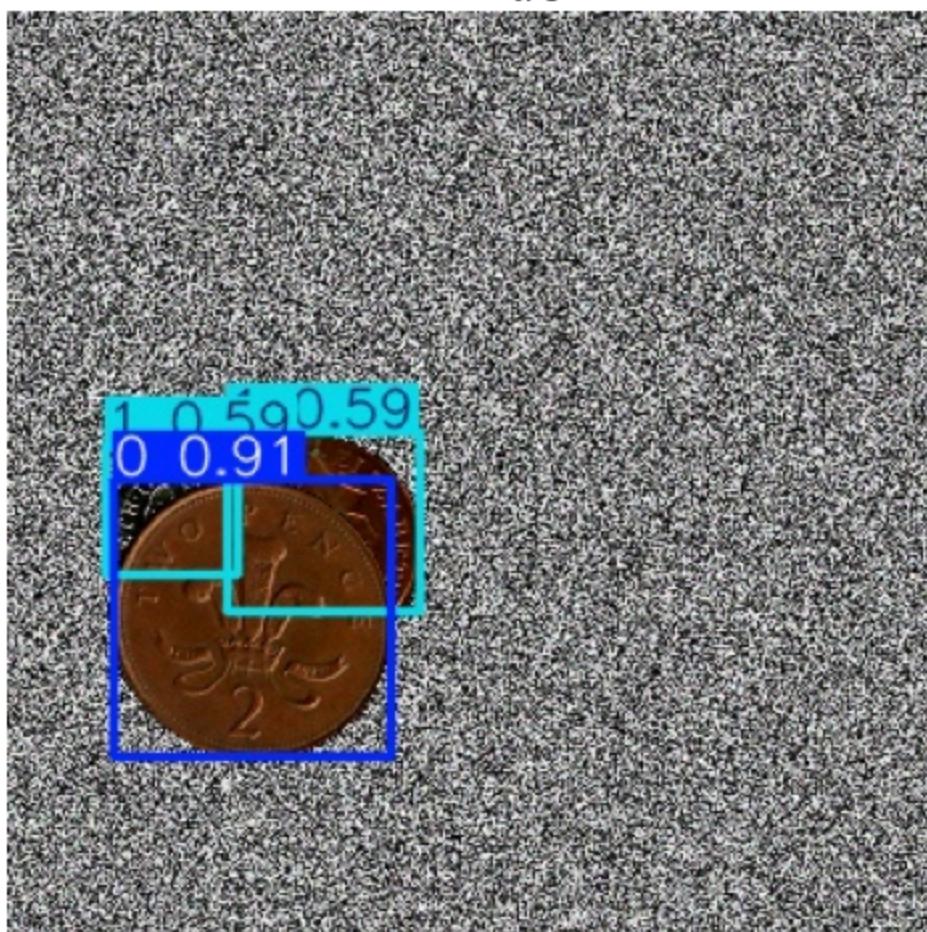
coins229.jpg



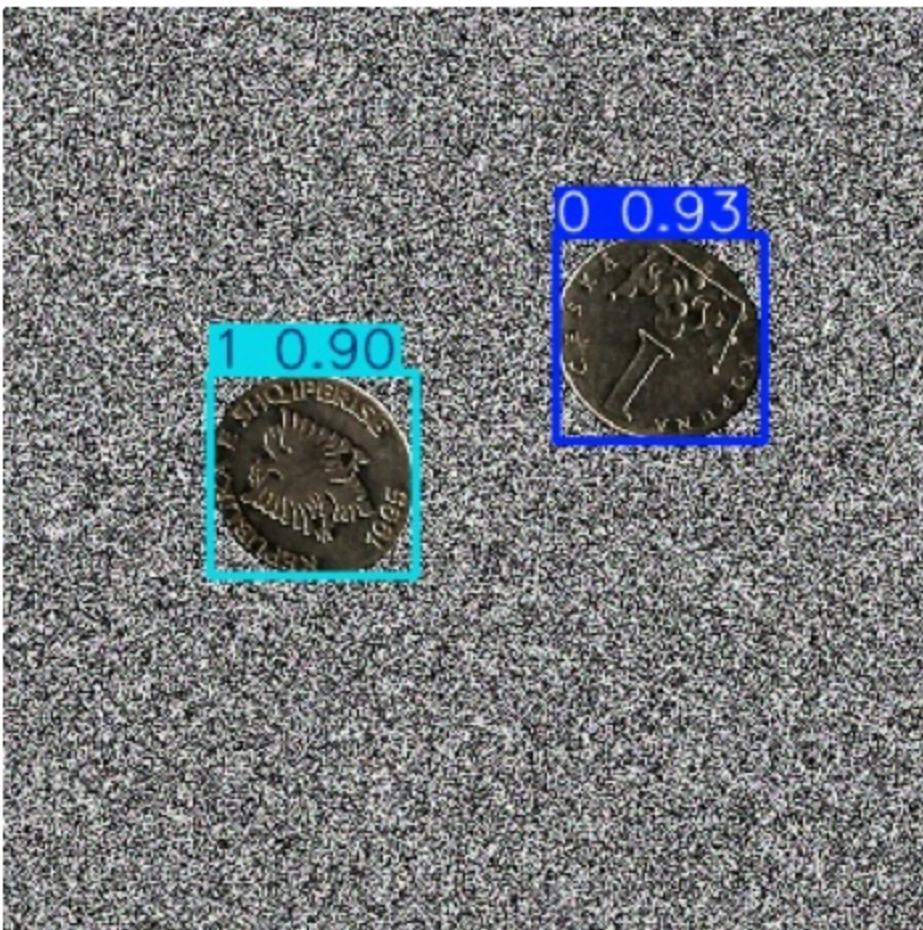
coins87.jpg



coins142.jpg



coins384.jpg



In []:

```
import os
from collections import Counter
import matplotlib.pyplot as plt

label_dir = "runs/predict/Q2/dataset1_results_extra/labels"

# Class ID for heads
HEAD_CLASS = "1"

head_percentages = []

# Loop through label files to calculate head percentage per image
for filename in os.listdir(label_dir):
    if filename.endswith(".txt"):
        head_count = 0
        total_count = 0
        with open(os.path.join(label_dir, filename), "r") as f:
            for line in f:
                parts = line.strip().split()
                if parts:
                    total_count += 1
                    if parts[0] == HEAD_CLASS:
                        head_count += 1
# Avoid division by zero
```

```

        if total_count > 0:
            percentage = round((head_count / total_count) * 100)
            head_percentages.append(percentage)

# Count how many images had each head percentage
value_counts = Counter(head_percentages)
sorted_items = sorted(value_counts.items()) # Sort by percentage

# Separate into x (percentage values) and y (image counts)
x_vals = [f"{val}%" for val, _ in sorted_items]
y_vals = [count for _, count in sorted_items]

# Plot the bar chart
plt.style.use("seaborn-v0_8-whitegrid")
fig, ax = plt.subplots(figsize=(20, 6)) # Wider layout to avoid overlap

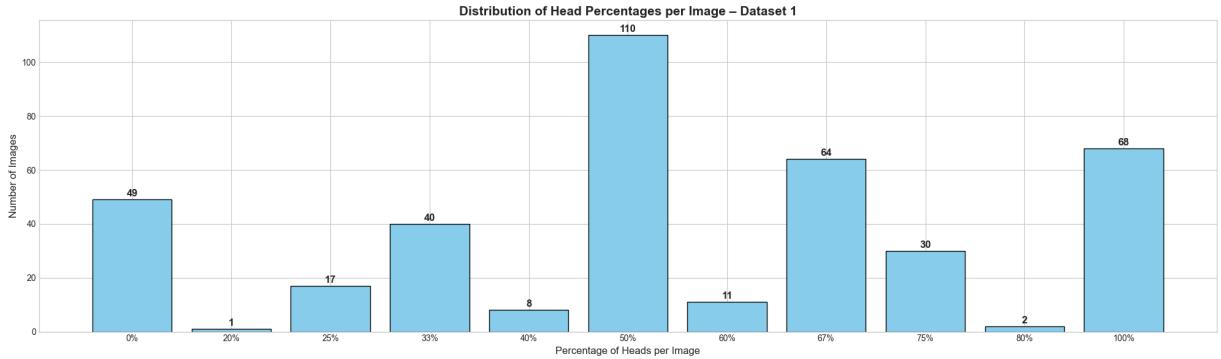
bars = ax.bar(x_vals, y_vals, color='skyblue', edgecolor='black')

# Add number labels above each bar
for bar in bars:
    height = bar.get_height()
    ax.text(bar.get_x() + bar.get_width() / 2, height + 0.5, str(int(height)),
            ha='center', va='bottom', fontsize=12, fontweight='bold')

# Set title and axis labels
ax.set_title("Distribution of Head Percentages per Image - Dataset 1", fontsize=15,
            ax.set_xlabel("Percentage of Heads per Image", fontsize=12)
            ax.set_ylabel("Number of Images", fontsize=12)

plt.tight_layout()
plt.show()

```



Q2: Creating a Distribution plot for Dataset2 Only Head Counts

```

In [66]: #Visualizing some outputs from dat

import os
import random
from PIL import Image
import matplotlib.pyplot as plt

# Folder containing YOLO output images (with boxes already drawn)

```

```

image_dir = "runs\predict\Q2\dataset2_results_extra"

# Get list of image files (ignore the 'labels' folder and non-image files)
image_files = [f for f in os.listdir(image_dir)
               if f.lower().endswith((".jpg", ".png", ".jpeg"))
               and not os.path.isdir(os.path.join(image_dir, f))]

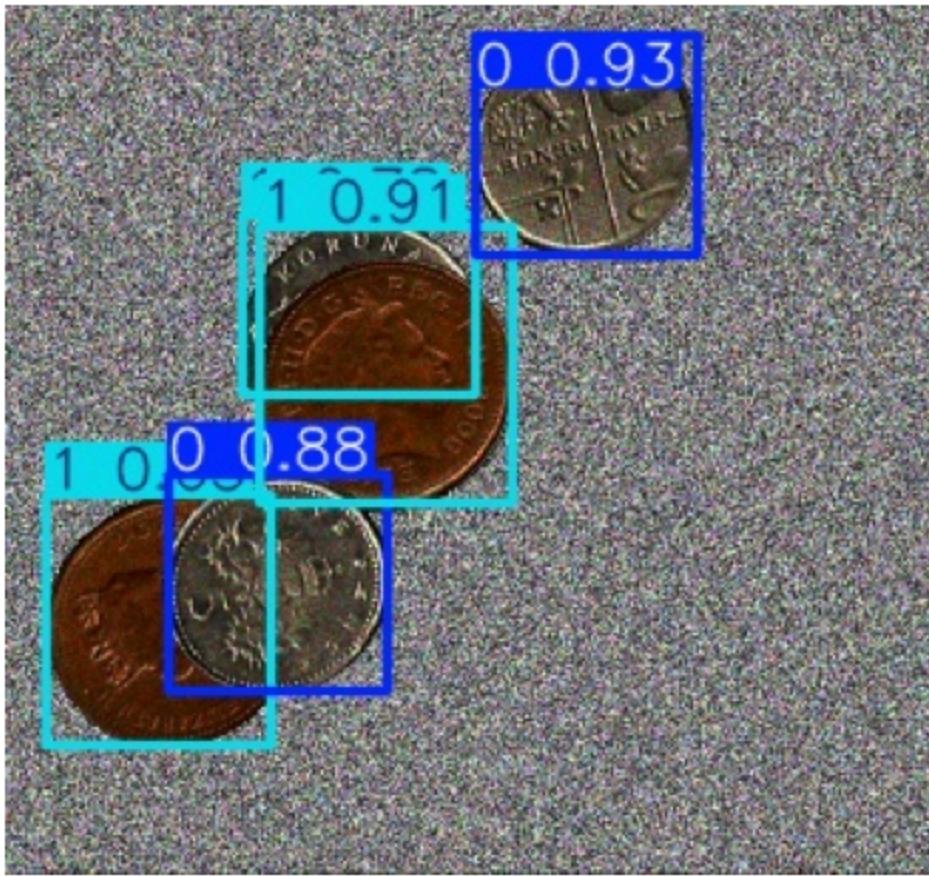
# Randomly select 5 images
sampled_images = random.sample(image_files, 5)

# Display each image
for filename in sampled_images:
    img_path = os.path.join(image_dir, filename)
    img = Image.open(img_path).convert("RGB")

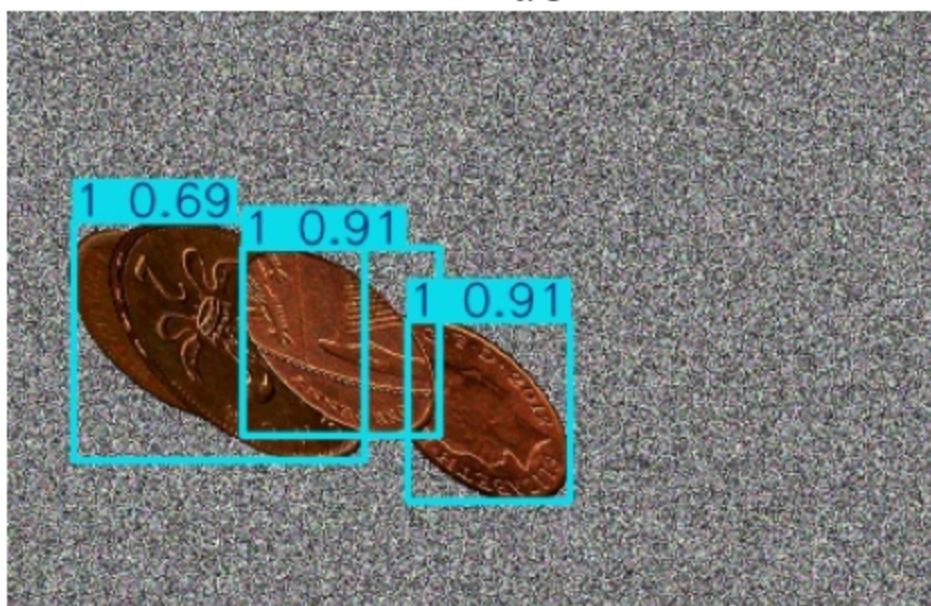
    plt.figure(figsize=(6, 6))
    plt.imshow(img)
    plt.axis('off')
    plt.title(filename)
    plt.show()

```

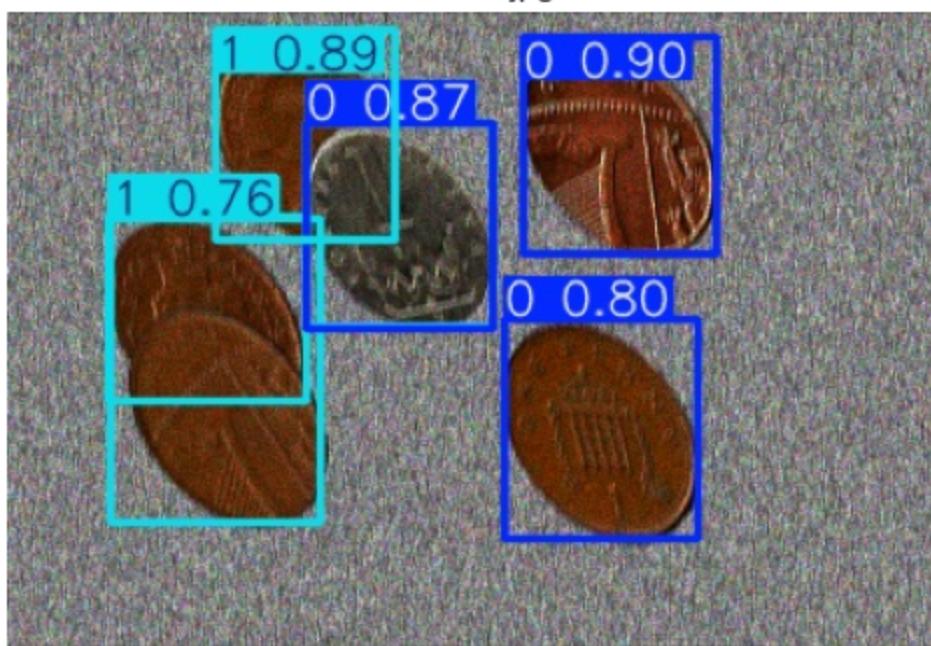
coins214.jpg



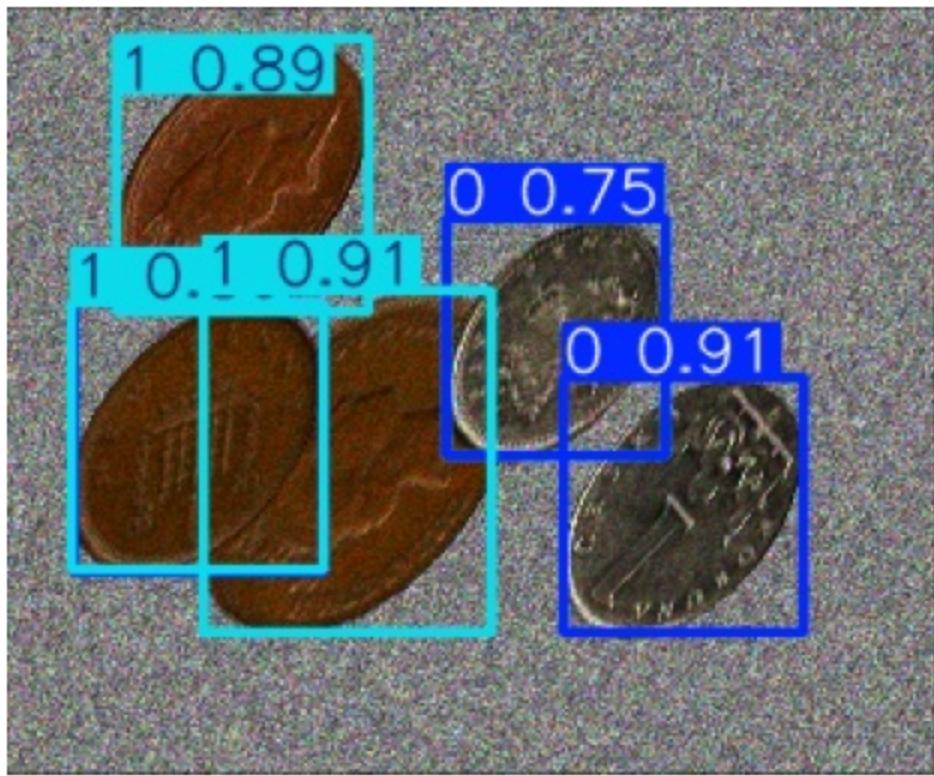
coins344.jpg



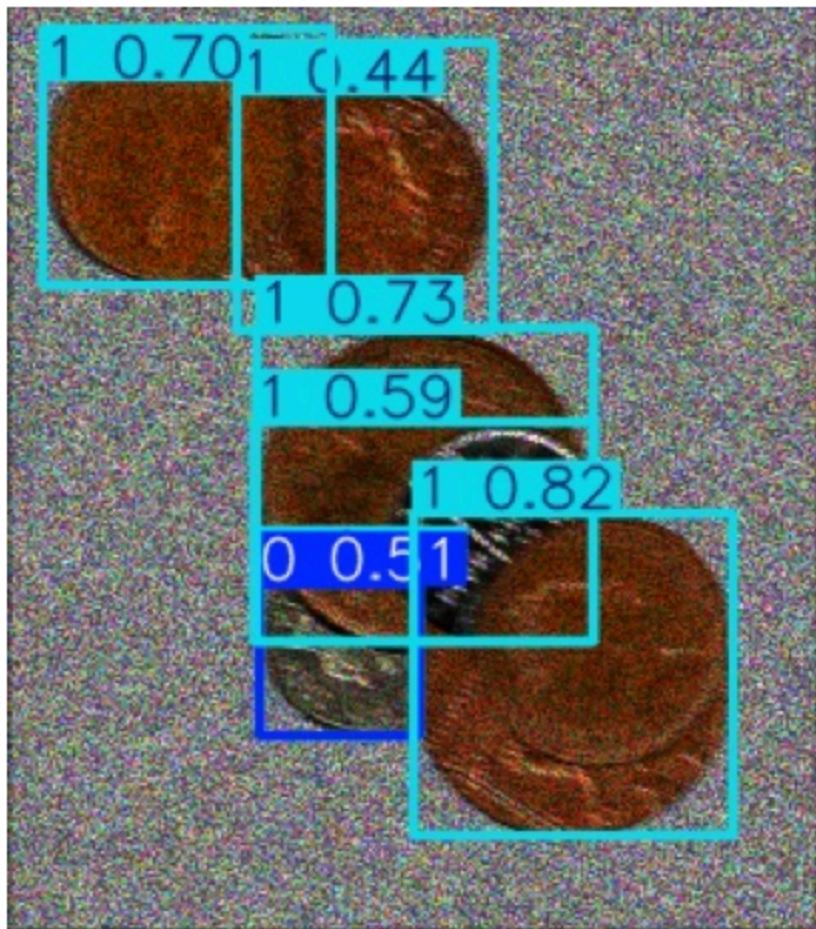
coins64.jpg



coins377.jpg



coins167.jpg



In []:

```
import os
from collections import Counter
import matplotlib.pyplot as plt

label_dir = "runs\predict\Q2\dataset2_results_extra\labels"

HEAD_CLASS = "1"

head_percentages = []

# Loop through Label files to calculate head percentage per image
for filename in os.listdir(label_dir):
    if filename.endswith(".txt"):
        head_count = 0
        total_count = 0
        with open(os.path.join(label_dir, filename), "r") as f:
            for line in f:
                parts = line.strip().split()
                if parts:
                    total_count += 1
                    if parts[0] == HEAD_CLASS:
                        head_count += 1

            if total_count > 0:
                percentage = round((head_count / total_count) * 100) # Integer percent
                head_percentages.append(percentage)

# Count how many images had each head percentage
value_counts = Counter(head_percentages)
sorted_items = sorted(value_counts.items()) # Sort by percentage

# Separate into x (percentage values) and y (image counts)
x_vals = [f"{val}%" for val, _ in sorted_items]
y_vals = [count for _, count in sorted_items]

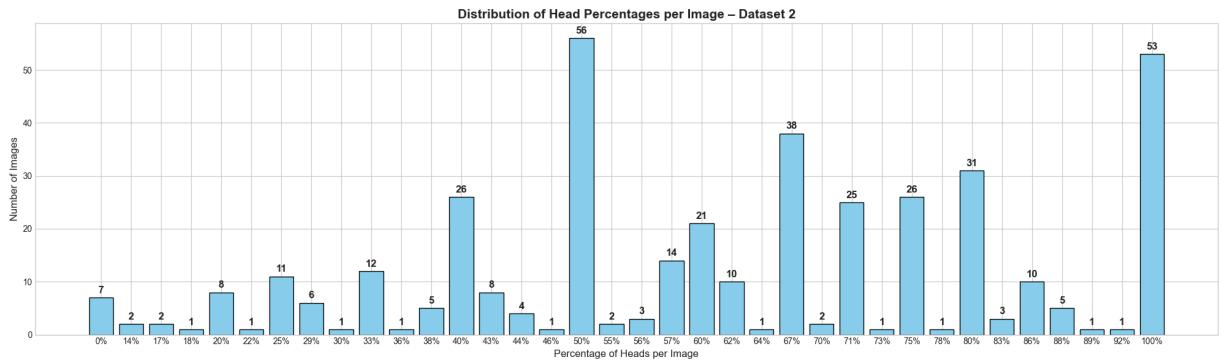
# Plot the bar chart
plt.style.use("seaborn-v0_8-whitegrid")
fig, ax = plt.subplots(figsize=(20, 6)) # Wider layout to avoid overlap

bars = ax.bar(x_vals, y_vals, color='skyblue', edgecolor='black')

# Add number labels above each bar
for bar in bars:
    height = bar.get_height()
    ax.text(bar.get_x() + bar.get_width() / 2, height + 0.5, str(int(height)),
            ha='center', va='bottom', fontsize=12, fontweight='bold')

# Set title and axis labels
ax.set_title("Distribution of Head Percentages per Image - Dataset 2", fontsize=15,
            ax.set_xlabel("Percentage of Heads per Image", fontsize=12)
            ax.set_ylabel("Number of Images", fontsize=12)
```

```
plt.tight_layout()  
plt.show()
```



```
In [ ]: %pip install nbconvert[webpdf]  
%playwright install
```

```
In [5]: import os  
os.getcwd()  
  
!jupyter nbconvert --to webpdf "C:\Users\Amir\Desktop\Hexcel Technical interview\Am
```

```
[NbConvertApp] Converting notebook C:\Users\Amir\Desktop\Hexcel Technical interview
\AmirTavahin.ipynb to webpdf
[NbConvertApp] WARNING | Alternative text is missing on 24 image(s).
[NbConvertApp] Building PDF
Traceback (most recent call last):
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\we
bpdf.py", line 78, in main
    from playwright.async_api import async_playwright # type: ignore[import-not-fou
nd]
    ~~~~~
ModuleNotFoundError: No module named 'playwright'
```

The above exception was the direct cause of the following exception:

```
Traceback (most recent call last):
  File "<frozen numpy>", line 198, in _run_module_as_main
  File "<frozen numpy>", line 88, in _run_code
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\Scripts\jupyter-nbconvert.EXE\__main
__.py", line 7, in <module>
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\jupyter_core\applicati
on.py", line 280, in launch_instance
    super().launch_instance(argv=argv, **kwargs)
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\traitlets\config\appli
cation.py", line 1077, in launch_instance
    app.start()
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\nbconvertap
p.py", line 412, in start
    self.convert_notebooks()
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\nbconvertap
p.py", line 590, in convert_notebooks
    self.convert_single_notebook(notebook_filename)
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\nbconvertap
p.py", line 556, in convert_single_notebook
    output, resources = self.export_single_notebook(
    ~~~~~
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\nbconvertap
p.py", line 479, in export_single_notebook
    output, resources = self.exporter.from_filename(
    ~~~~~
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\t
emplateexporter.py", line 389, in from_filename
    return super().from_filename(filename, resources, **kw) # type:ignore[return-va
lue]
    ~~~~~
  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\ex
porter.py", line 201, in from_filename
```

```
    return self.from_file(f, resources=resources, **kw)
    ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\tex
tplateexporter.py", line 395, in from_file
    return super().from_file(file_stream, resources, **kw) # type:ignore[return-val
ue]
    ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\ex
porter.py", line 220, in from_file
    return self.from_notebook_node(
    ^^^^^^^^^^^^^^^^^^^^^^

  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\we
bpdf.py", line 172, in from_notebook_node
    pdf_data = self.run_playwright(html)
    ^^^^^^^^^^^^^^^^^^^^^^

  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\we
bpdf.py", line 161, in run_playwright
    pdf_data = pool.submit(run_coroutine, main(temp_file)).result()
    ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

  File "C:\Program Files\WindowsApps\PythonSoftwareFoundation.Python.3.11_3.11.2544.
0_x64_qbz5n2kfra8p0\Lib\concurrent\futures\_base.py", line 456, in result
    return self.__get_result()
    ^^^^^^^^^^^^^^^^^^

  File "C:\Program Files\WindowsApps\PythonSoftwareFoundation.Python.3.11_3.11.2544.
0_x64_qbz5n2kfra8p0\Lib\concurrent\futures\_base.py", line 401, in __get_result
    raise self._exception
  File "C:\Program Files\WindowsApps\PythonSoftwareFoundation.Python.3.11_3.11.2544.
0_x64_qbz5n2kfra8p0\Lib\concurrent\futures\thread.py", line 58, in run
    result = self.fn(*self.args, **self.kwargs)
    ^^^^^^^^^^^^^^^^^^^^^^

  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\we
bpdf.py", line 159, in run_coroutine
    return loop.run_until_complete(coro)
    ^^^^^^^^^^^^^^^^^^^^^^

  File "C:\Program Files\WindowsApps\PythonSoftwareFoundation.Python.3.11_3.11.2544.
0_x64_qbz5n2kfra8p0\Lib\asyncio\base_events.py", line 654, in run_until_complete
    return future.result()
    ^^^^^^^^^^

  File "C:\Users\Amir\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qb
z5n2kfra8p0\LocalCache\local-packages\Python311\site-packages\nbconvert\exporters\we
bpdf.py", line 84, in main
    raise RuntimeError(msg) from e
RuntimeError: Playwright is not installed to support Web PDF conversion. Please inst
all `nbconvert[webpdf]` to enable.
```