

```
In [ ]: !mkdir -p ~/.kaggle
        !cp kaggle.json ~/.kaggle/
```

```
In [ ]: !chmod 600 /root/.kaggle/kaggle.json
        !kaggle datasets download -d ninadaithal/chess-pieces-dataset
```

```
Downloading chess-pieces-dataset.zip to /content
 83% 7.00M/8.41M [00:01<00:00, 8.13MB/s]
100% 8.41M/8.41M [00:01<00:00, 5.79MB/s]
```

```
In [ ]: import zipfile
        zip_ref = zipfile.ZipFile('/content/chess-pieces-dataset.zip', 'r')
        zip_ref.extractall('/content')
        zip_ref.close()
```

```
In [ ]: pip install ultralytics
```

```
Collecting ultralytics
```

```
  Downloading ultralytics-8.0.211-py3-none-any.whl (645 kB)
```

```
645.4/645.4 kB 9.1 MB/s eta 0:00:00
```

```
Requirement already satisfied: matplotlib>=3.3.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (3.7.1)
```

```
Requirement already satisfied: numpy>=1.22.2 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (1.23.5)
```

```
Requirement already satisfied: opencv-python>=4.6.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (4.8.0.76)
```

```
Requirement already satisfied: pillow>=7.1.2 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (9.4.0)
```

```
Requirement already satisfied: pyyaml>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (6.0.1)
```

```
Requirement already satisfied: requests>=2.23.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (2.31.0)
```

```
Requirement already satisfied: scipy>=1.4.1 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (1.11.3)
```

```
Requirement already satisfied: torch>=1.8.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (2.1.0+cu118)
```

```
Requirement already satisfied: torchvision>=0.9.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (0.16.0+cu118)
```

```
Requirement already satisfied: tqdm>=4.64.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (4.66.1)
```

```
Requirement already satisfied: pandas>=1.1.4 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (1.5.3)
```

```
Requirement already satisfied: seaborn>=0.11.0 in /usr/local/lib/python3.10/dist-packages (from ultralytics) (0.12.2)
```

```
Requirement already satisfied: psutil in /usr/local/lib/python3.10/dist-packages (from ultralytics) (5.9.5)
```

```
Requirement already satisfied: py-cpuinfo in /usr/local/lib/python3.10/dist-packages (from ultralytics) (9.0.0)
```

Collecting thop>=0.1.1 (from ultralytics)

Downloading thop-0.1.1.post2209072238-py3-none-any.whl (15 kB)

Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (1.2.0)

Requirement already satisfied: cycycler>=0.10 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (0.12.1)

Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (4.44.0)

Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (1.4.5)

Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (23.2)

Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (3.1.1)

Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.3.0->ultralytics) (2.8.2)

Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.1.4->ultralytics) (2023.3.post1)

Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (3.3.2)

Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (3.4)

Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (2.0.7)

Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests>=2.23.0->ultralytics) (2023.7.22)

Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (3.13.1)

Requirement already satisfied: typing-extensions in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (4.5.0)

Requirement already satisfied: sympy in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (1.12)

Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (3.2.1)

Requirement already satisfied: jinja2 in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (3.1.2)

Requirement already satisfied: fsspec in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (2023.6.0)

Requirement already satisfied: triton==2.1.0 in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->ultralytics) (2.1.0)

Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.7->matplotlib)

```
tlib>=3.3.0->ultralitics) (1.16.0)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.10/dist-packages (from jinja2->torch>=1.8.0->ultralitics) (2.1.3)
Requirement already satisfied: mpmath>=0.19 in /usr/local/lib/python3.10/dist-packages (from sympy->torch>=1.8.0->ultralitics) (1.3.0)
Installing collected packages: thop, ultralytics
Successfully installed thop-0.1.1.post2209072238 ultralytics-8.0.211
```

```
In [ ]: !git clone https://github.com/ultralitics/ultralitics.git
```

```
Cloning into 'ultralitics'...
remote: Enumerating objects: 18113, done.
remote: Counting objects: 100% (1025/1025), done.
remote: Compressing objects: 100% (627/627), done.
remote: Total 18113 (delta 588), reused 668 (delta 377), pack-reused 17088
Receiving objects: 100% (18113/18113), 9.97 MiB | 10.26 MiB/s, done.
Resolving deltas: 100% (12549/12549), done.
```

```
In [ ]: %cat data.yaml
```

```
train: ../train/images
val: ../valid/images
test: ../test/images

nc: 12
names: ['black-camel', 'black-elephant', 'black-horse', 'black-king', 'black-pawn', 'black-queen', 'white-camel', 'white-elephant', 'white-horse', 'white-king', 'white-pawn', 'white-queen']

roboflow:
  workspace: tutorial-knlj8
  project: chess-board-detection-uuppk
  version: 4
  license: CC BY 4.0
  url: https://universe.roboflow.com/tutorial-knlj8/chess-board-detection-uuppk/dataset/4
```

```
In [ ]: import yaml
with open("/content/data.yaml", "r") as stream:
    num_classes = str(yaml.safe_load(stream)["nc"])
```

```
In [ ]: num_classes
```

```
Out[ ]: '12'
```

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

## Training for detection on Chess Data using yolov8s.pt

```
In [ ]: model = YOLO()  
!yolo task=detect mode=train model=yolov8s.pt data= data.yaml epochs=101 imgsz=416 plots=True
```

```
Downloading https://github.com/ultralytics/assets/releases/download/v0.0.0/yolov8n.pt to 'yolov8n.pt'...
```

```
100%|██████████| 6.23M/6.23M [00:00<00:00, 254MB/s]
```

```
Downloading https://github.com/ultralytics/assets/releases/download/v0.0.0/yolov8s.pt to 'yolov8s.pt'...
```

```
100% 21.5M/21.5M [00:00<00:00, 375MB/s]
```

```
Ultralytics YOLOv8.0.211 🚀 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4, 15102MiB)
```

```
engine/trainer: task=detect, mode=train, model=yolov8s.pt, data=data.yaml, epochs=101, patience=50, batch=16, imgsz=416, save=True, save_period=-1, cache=False, device=None, workers=8, project=None, name=train, exist_ok=False, pretrained=True, optimizer=auto, verbose=True, seed=0, deterministic=True, single_cls=False, rect=False, cos_lr=False, close_mosaic=10, resume=False, amp=True, fraction=1.0, profile=False, freeze=None, overlap_mask=True, mask_ratio=4, dropout=0.0, val=True, split=val, save_json=False, save_hybrid=False, conf=None, iou=0.7, max_det=300, half=False, dnn=False, plots=True, source=None, show=False, save_txt=False, save_conf=False, save_crop=False, show_labels=True, show_conf=True, vid_stride=1, stream_buffer=False, line_width=None, visualize=False, augment=False, agnostic_nms=False, classes=None, retina_masks=False, boxes=True, format=torchscript, keras=False, optimize=False, int8=False, dynamic=False, simplify=False, opset=None, workspace=4, nms=False, lr0=0.01, lrf=0.01, momentum=0.937, weight_decay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8, warmup_bias_lr=0.1, box=7.5, cls=0.5, dfl=1.5, pose=12.0, kobj=1.0, label_smoothing=0.0, nbs=64, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0.1, scale=0.5, shear=0.0, perspective=0.0, flipud=0.0, fliplr=0.5, mosaic=1.0, mixup=0.0, copy_paste=0.0, cfg=None, tracker=botsort.yaml, save_dir=runs/detect/train  
Downloading https://ultralytics.com/assets/Arial.ttf to '/root/.config/Ultralytics/Arial.ttf'...
```

```
100% 755k/755k [00:00<00:00, 106MB/s]
```

```
2023-11-17 04:35:23.638656: E tensorflow/compiler/xla/stream_executor/cuda/cuda_dnn.cc:9342] Unable to register cuDNN factory: Attempting to register factory for plugin cuDNN when one has already been registered
```

```
2023-11-17 04:35:23.638707: E tensorflow/compiler/xla/stream_executor/cuda/cuda_fft.cc:609] Unable to register cuFFT factory: Attempting to register factory for plugin cuFFT when one has already been registered
```

```
2023-11-17 04:35:23.638756: E tensorflow/compiler/xla/stream_executor/cuda/cuda_blas.cc:1518] Unable to register cuBLAS factory: Attempting to register factory for plugin cuBLAS when one has already been registered
```

```
Overriding model.yaml nc=80 with nc=12
```

	from	n	params	module	arguments
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	2120692	ultralytics.nn.modules.head.Detect	[12, [128, 256, 512]]

Model summary: 225 layers, 11140244 parameters, 11140228 gradients, 28.7 GFLOPs

Transferred 349/355 items from pretrained weights

**TensorBoard:** Start with 'tensorboard --logdir runs/detect/train', view at <http://localhost:6006/>

Freezing layer 'model.22.dfl.conv.weight'

**AMP:** running Automatic Mixed Precision (AMP) checks with YOLOv8n...

**AMP:** checks passed 

**train:** Scanning /content/train/labels... 63 images, 0 backgrounds, 0 corrupt: 100% 63/63 [00:00<00:00, 1538.30it/s]

**train:** New cache created: /content/train/labels.cache

**augmentations:** Blur(p=0.01, blur\_limit=(3, 7)), MedianBlur(p=0.01, blur\_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01, clip\_limit=(1, 4.0), tile\_grid\_size=(8, 8))

**val:** Scanning /content/valid/labels... 6 images, 0 backgrounds, 0 corrupt: 100% 6/6 [00:00<00:00, 1145.72it/s]

**val:** New cache created: /content/valid/labels.cache

Plotting labels to runs/detect/train/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=0.000625, momentum=0.9) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)

Image sizes 416 train, 416 val

Using 2 dataloader workers  
 Logging results to **runs/detect/train**  
 Starting training for 101 epochs...

8s/it]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	1/101	1.84G	1.985	4.808	1.384	456	416: 100% 4/4 [00:07<00:00, 1.78s/it]
		Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:04<00:00, 4.0
		all	6	118	0.036	0.337	0.0408 0.0219
6it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	2/101	1.86G	1.855	4.483	1.296	343	416: 100% 4/4 [00:00<00:00, 4.29it/s]
		Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 7.0
		all	6	118	0.0588	0.411	0.0707 0.0419
7it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	3/101	1.91G	1.708	3.707	1.182	558	416: 100% 4/4 [00:00<00:00, 5.73it/s]
		Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 5.1
		all	6	118	0.0881	0.62	0.136 0.083
5it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	4/101	1.9G	1.582	2.73	1.113	414	416: 100% 4/4 [00:00<00:00, 4.82it/s]
		Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 5.9
		all	6	118	0.259	0.436	0.293 0.18
3it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	5/101	1.91G	1.536	2.18	1.078	499	416: 100% 4/4 [00:01<00:00, 3.71it/s]
		Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 3.5
		all	6	118	0.221	0.595	0.347 0.216
3it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	6/101	1.9G	1.491	2.001	1.068	278	416: 100% 4/4 [00:01<00:00, 3.59it/s]
		Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 4.4
		all	6	118	0.295	0.743	0.433 0.276
	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size

0it/s]	7/101	1.91G	1.504	1.78	1.046	519	416: 100% 4/4 [00:00<00:00, 5.00it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.6
	all		6	118	0.366	0.654	0.471	0.303
8it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	8/101	1.95G	1.468	1.644	1.056	451	416: 100% 4/4 [00:00<00:00, 4.87it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.9
4it/s]	all		6	118	0.304	0.759	0.45	0.287
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	9/101	1.89G	1.472	1.5	1.083	340	416: 100% 4/4 [00:01<00:00, 3.86it/s]	
2it/s]	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 3.8
	all		6	118	0.278	0.751	0.462	0.28
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
2it/s]	10/101	1.9G	1.391	1.373	1.038	400	416: 100% 4/4 [00:00<00:00, 5.64it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.8
	all		6	118	0.401	0.676	0.523	0.318
2it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	11/101	1.95G	1.44	1.367	1.024	496	416: 100% 4/4 [00:00<00:00, 5.24it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.6
9it/s]	all		6	118	0.424	0.627	0.585	0.369
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	12/101	1.88G	1.478	1.275	1.071	425	416: 100% 4/4 [00:00<00:00, 4.62it/s]	
4it/s]	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.5
	all		6	118	0.486	0.533	0.602	0.373
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
4it/s]	13/101	1.89G	1.4	1.205	1.041	366	416: 100% 4/4 [00:01<00:00, 3.56it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 3.7
	all		6	118	0.469	0.752	0.664	0.438

0it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	14/101	1.9G	1.387	1.145	1.02	496	416: 100% 4/4 [00:01<00:00, 3.45it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 4.5
	all		6	118	0.546	0.78	0.697 0.463
9it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	15/101	1.9G	1.324	1.109	1.033	350	416: 100% 4/4 [00:00<00:00, 4.72it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 9.2
	all		6	118	0.502	0.803	0.716 0.463
2it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	16/101	1.93G	1.347	1.06	1.028	367	416: 100% 4/4 [00:00<00:00, 5.06it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 6.4
	all		6	118	0.519	0.809	0.705 0.46
2it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	17/101	1.91G	1.34	1.025	1.033	476	416: 100% 4/4 [00:00<00:00, 5.50it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 5.9
	all		6	118	0.519	0.818	0.705 0.457
6it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	18/101	1.93G	1.405	1.03	1.044	440	416: 100% 4/4 [00:00<00:00, 4.84it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 7.1
	all		6	118	0.676	0.79	0.751 0.484
0it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	19/101	1.89G	1.311	0.9627	0.9913	471	416: 100% 4/4 [00:01<00:00, 3.33it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 5.6
	all		6	118	0.677	0.78	0.772 0.498
6it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	20/101	1.87G	1.317	0.9277	1.027	492	416: 100% 4/4 [00:01<00:00, 3.52it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 4.1
	all		6	118	0.628	0.777	0.783 0.498



	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	21/101	1.95G	1.356	0.9814	1.01	368	416: 100% 4/4 [00:00<00:00, 5.00it/s]
0it/s]	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 7.4
	all		6	118	0.708	0.851	0.835 0.539
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	22/101	1.88G	1.317	0.9503	1.033	361	416: 100% 4/4 [00:00<00:00, 4.67it/s]
5it/s]	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 7.1
	all		6	118	0.792	0.873	0.87 0.553
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	23/101	1.9G	1.273	0.8684	1.001	340	416: 100% 4/4 [00:01<00:00, 3.25it/s]
1it/s]	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 4.4
	all		6	118	0.799	0.838	0.886 0.576
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	24/101	1.92G	1.281	0.8037	1.03	318	416: 100% 4/4 [00:00<00:00, 5.37it/s]
7it/s]	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 6.4
	all		6	118	0.808	0.834	0.886 0.588
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	25/101	1.88G	1.247	0.8384	0.9827	450	416: 100% 4/4 [00:00<00:00, 4.89it/s]
2it/s]	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 6.2
	all		6	118	0.775	0.871	0.876 0.583
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	26/101	1.9G	1.248	0.816	0.9979	539	416: 100% 4/4 [00:00<00:00, 5.21it/s]
0it/s]	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 6.6
	all		6	118	0.754	0.926	0.891 0.574
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	27/101	1.87G	1.229	0.7699	0.9757	596	416: 100% 4/4 [00:00<00:00, 4.67it/s]
1it/s]	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 6.5

	all	6	118	0.774	0.864	0.871	0.555
2it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	28/101	1.89G	1.225	0.7594	0.9933	432	416: 100% 4/4 [00:00<00:00, 5.61it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 3.7
	all	6	118	0.768	0.835	0.887	0.578
4it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	29/101	1.91G	1.194	0.7404	0.9912	494	416: 100% 4/4 [00:00<00:00, 4.60it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 3.9
	all	6	118	0.78	0.876	0.906	0.575
2it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	30/101	1.97G	1.245	0.7598	0.9853	632	416: 100% 4/4 [00:01<00:00, 3.35it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.0
	all	6	118	0.828	0.88	0.916	0.528
9it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	31/101	1.99G	1.197	0.7495	0.9728	539	416: 100% 4/4 [00:00<00:00, 4.59it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 8.5
	all	6	118	0.863	0.789	0.901	0.512
1it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	32/101	1.92G	1.211	0.7352	0.9909	439	416: 100% 4/4 [00:00<00:00, 5.46it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.2
	all	6	118	0.858	0.846	0.913	0.536
4it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	33/101	1.96G	1.176	0.7116	0.9774	456	416: 100% 4/4 [00:00<00:00, 5.99it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 9.0
	all	6	118	0.866	0.843	0.915	0.549
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	34/101	1.91G	1.195	0.7128	0.973	616	416: 100% 4/4 [00:00<00:00, 4.99it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 15.4

7it/s]	all	6	118	0.859	0.839	0.914	0.527
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
35/101	1.93G	1.176	0.7031	0.9811	411	416: 100% 4/4 [00:00<00:00,	4.89it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.6
1it/s]	all	6	118	0.896	0.853	0.918	0.523
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
36/101	1.94G	1.151	0.6751	0.9569	479	416: 100% 4/4 [00:01<00:00,	3.67it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 4.2
6it/s]	all	6	118	0.854	0.813	0.894	0.532
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
37/101	1.89G	1.146	0.664	0.9777	396	416: 100% 4/4 [00:01<00:00,	3.60it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.1
0it/s]	all	6	118	0.809	0.784	0.865	0.523
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
38/101	1.91G	1.157	0.6675	0.9528	555	416: 100% 4/4 [00:00<00:00,	5.31it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.6
9it/s]	all	6	118	0.73	0.831	0.86	0.518
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
39/101	1.88G	1.089	0.6261	0.957	418	416: 100% 4/4 [00:00<00:00,	5.49it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.8
5it/s]	all	6	118	0.729	0.86	0.865	0.516
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
40/101	1.89G	1.079	0.6288	0.96	403	416: 100% 4/4 [00:00<00:00,	6.27it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.4
8it/s]	all	6	118	0.805	0.881	0.885	0.542
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
41/101	1.96G	1.104	0.637	0.9554	480	416: 100% 4/4 [00:00<00:00,	6.06it/s]

	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00,	6.1
9it/s]	all	6	118	0.802	0.86	0.89	0.549	
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
42/101	1.91G	1.064	0.6353	0.928	563	416: 100% 4/4 [00:01<00:00,	3.58it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00,	4.2
3it/s]	all	6	118	0.799	0.864	0.895	0.524	
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
43/101	1.92G	1.1	0.6339	0.9512	414	416: 100% 4/4 [00:00<00:00,	4.55it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00,	4.1
5it/s]	all	6	118	0.774	0.903	0.901	0.548	
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
44/101	1.97G	1.076	0.6078	0.9319	506	416: 100% 4/4 [00:00<00:00,	5.13it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00,	7.5
9it/s]	all	6	118	0.791	0.875	0.896	0.568	
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
45/101	1.86G	1.051	0.6328	0.9487	492	416: 100% 4/4 [00:00<00:00,	5.18it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00,	8.9
1it/s]	all	6	118	0.813	0.866	0.9	0.573	
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
46/101	1.91G	1.052	0.5966	0.9376	505	416: 100% 4/4 [00:00<00:00,	5.67it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00,	6.0
1it/s]	all	6	118	0.815	0.9	0.917	0.578	
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		
47/101	1.92G	1.067	0.5997	0.9396	496	416: 100% 4/4 [00:00<00:00,	5.73it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00,	7.0
7it/s]	all	6	118	0.854	0.91	0.933	0.59	
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size		

2it/s]	48/101	1.9G	1.035	0.5946	0.9482	476	416: 100% 4/4 [00:00<00:00, 4.13it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 4.6
	all		6	118	0.858	0.911	0.932	0.591
5it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	49/101	1.87G	1.009	0.5796	0.9431	424	416: 100% 4/4 [00:00<00:00, 5.58it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.7
	all		6	118	0.916	0.857	0.939	0.593
5it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	50/101	1.93G	1.077	0.6266	0.9486	337	416: 100% 4/4 [00:00<00:00, 6.18it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 9.8
	all		6	118	0.895	0.884	0.942	0.59
6it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	51/101	1.87G	1.022	0.5871	0.9319	372	416: 100% 4/4 [00:00<00:00, 6.13it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.4
	all		6	118	0.901	0.876	0.942	0.558
1it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	52/101	1.87G	1.019	0.5945	0.9296	392	416: 100% 4/4 [00:00<00:00, 4.68it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.6
	all		6	118	0.903	0.88	0.941	0.553
1it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	53/101	1.99G	1.01	0.586	0.9229	412	416: 100% 4/4 [00:00<00:00, 5.11it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 7.1
	all		6	118	0.899	0.881	0.937	0.567
5it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	54/101	1.94G	0.9874	0.5738	0.9259	426	416: 100% 4/4 [00:01<00:00, 3.70it/s]	
	Class		Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 3.7
	all		6	118	0.899	0.884	0.929	0.584

4it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	55/101	1.87G	0.9768	0.5453	0.9324	364	416: 100% 4/4 [00:01<00:00, 3.97it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 4.9
	all		6	118	0.892	0.875	0.92 0.59
4it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	56/101	1.91G	1.037	0.577	0.9431	451	416: 100% 4/4 [00:00<00:00, 4.98it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 6.5
	all		6	118	0.874	0.849	0.896 0.566
4it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	57/101	1.93G	0.9642	0.5602	0.9122	411	416: 100% 4/4 [00:00<00:00, 4.97it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 5.9
	all		6	118	0.866	0.87	0.902 0.521
7it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	58/101	1.88G	0.9974	0.5693	0.9236	391	416: 100% 4/4 [00:00<00:00, 5.67it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 5.2
	all		6	118	0.861	0.869	0.9 0.498
6it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	59/101	1.89G	1.027	0.5668	0.9329	345	416: 100% 4/4 [00:00<00:00, 4.96it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 6.2
	all		6	118	0.86	0.867	0.899 0.502
7it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	60/101	1.9G	0.9912	0.5649	0.919	528	416: 100% 4/4 [00:01<00:00, 3.45it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 3.8
	all		6	118	0.856	0.871	0.899 0.511
8it/s]	Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
	61/101	1.88G	0.9528	0.5352	0.9217	425	416: 100% 4/4 [00:01<00:00, 3.87it/s]
	Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 4.1
	all		6	118	0.866	0.87	0.901 0.545

	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	62/101	1.88G	0.9374	0.5449	0.9194	426	416: 100% 4/4 [00:00<00:00, 5.13it/s]	
		Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.9
7it/s]		all	6	118	0.828	0.889	0.893	0.56
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	63/101	1.9G	0.9709	0.5542	0.9084	556	416: 100% 4/4 [00:00<00:00, 6.58it/s]	
		Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.2
7it/s]		all	6	118	0.866	0.868	0.919	0.57
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	64/101	1.9G	0.9427	0.5301	0.9075	501	416: 100% 4/4 [00:00<00:00, 5.35it/s]	
		Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 8.4
0it/s]		all	6	118	0.867	0.864	0.92	0.566
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	65/101	1.92G	0.9282	0.5494	0.908	408	416: 100% 4/4 [00:00<00:00, 4.91it/s]	
		Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 9.8
9it/s]		all	6	118	0.849	0.905	0.916	0.559
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	66/101	1.87G	0.9415	0.5358	0.9189	458	416: 100% 4/4 [00:01<00:00, 3.52it/s]	
		Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 4.0
2it/s]		all	6	118	0.836	0.909	0.915	0.569
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	67/101	1.89G	0.9393	0.5293	0.9156	372	416: 100% 4/4 [00:01<00:00, 3.83it/s]	
		Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 4.2
3it/s]		all	6	118	0.826	0.91	0.916	0.576
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	68/101	1.93G	0.9167	0.5465	0.9111	388	416: 100% 4/4 [00:00<00:00, 6.96it/s]	
		Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 8.2
9it/s]								

	all	6	118	0.899	0.827	0.909	0.582
9it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	69/101	1.93G	0.9049	0.5439	0.8912	417	416: 100% 4/4 [00:00<00:00, 5.93it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 7.5
	all	6	118	0.909	0.841	0.922	0.578
0it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	70/101	1.89G	0.8661	0.5192	0.9102	402	416: 100% 4/4 [00:00<00:00, 5.28it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.0
	all	6	118	0.904	0.835	0.916	0.572
8it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	71/101	1.94G	0.9245	0.5313	0.8976	517	416: 100% 4/4 [00:00<00:00, 5.21it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.4
	all	6	118	0.903	0.834	0.918	0.569
5it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	72/101	1.89G	0.8951	0.5125	0.9033	429	416: 100% 4/4 [00:01<00:00, 3.91it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 4.9
	all	6	118	0.9	0.833	0.908	0.56
8it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	73/101	1.91G	0.9053	0.5195	0.8962	469	416: 100% 4/4 [00:01<00:00, 3.34it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 4.3
	all	6	118	0.877	0.85	0.913	0.568
0it/s]	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	74/101	1.93G	0.8894	0.5352	0.9052	369	416: 100% 4/4 [00:00<00:00, 4.98it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.6
	all	6	118	0.883	0.852	0.913	0.568
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
	75/101	1.96G	0.8641	0.5092	0.8922	378	416: 100% 4/4 [00:00<00:00, 4.72it/s]
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 14.0



2it/s]	all	6	118	0.888	0.861	0.91	0.562
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
76/101	1.94G	0.8738	0.5085	0.8786	361	416: 100% 4/4 [00:00<00:00, 4.83it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 7.1
0it/s]	all	6	118	0.892	0.853	0.912	0.567
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
77/101	1.88G	0.8477	0.5007	0.8856	661	416: 100% 4/4 [00:00<00:00, 5.58it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.4
2it/s]	all	6	118	0.862	0.881	0.911	0.557
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
78/101	1.88G	0.8538	0.508	0.8999	333	416: 100% 4/4 [00:01<00:00, 3.25it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 3.2
8it/s]	all	6	118	0.919	0.809	0.919	0.547
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
79/101	1.88G	0.8711	0.5164	0.8783	488	416: 100% 4/4 [00:01<00:00, 3.29it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 4.8
8it/s]	all	6	118	0.891	0.817	0.916	0.549
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
80/101	1.9G	0.863	0.5051	0.8848	507	416: 100% 4/4 [00:00<00:00, 4.63it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 8.1
7it/s]	all	6	118	0.902	0.796	0.915	0.548
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
81/101	1.89G	0.8694	0.5272	0.8941	385	416: 100% 4/4 [00:00<00:00, 5.70it/s]	
	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.2
4it/s]	all	6	118	0.918	0.78	0.908	0.544
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
82/101	1.9G	0.8301	0.4965	0.879	543	416: 100% 4/4 [00:00<00:00, 5.06it/s]	

8it/s]	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 12.6	
	all	6	118	0.91	0.781	0.906	0.542	
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size		
	83/101	1.9G	0.8144	0.4885	414	416:	100% 4/4 [00:00<00:00, 5.48it/s]	
0it/s]	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.9	
	all	6	118	0.796	0.897	0.899	0.547	
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size		
	84/101	1.92G	0.8293	0.4848	502	416:	100% 4/4 [00:00<00:00, 4.16it/s]	
1it/s]	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 3.7	
	all	6	118	0.83	0.877	0.905	0.551	
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size		
	85/101	1.88G	0.8429	0.4957	475	416:	100% 4/4 [00:01<00:00, 3.69it/s]	
4it/s]	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 4.4	
	all	6	118	0.848	0.875	0.907	0.556	
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size		
	86/101	1.89G	0.8344	0.4914	504	416:	100% 4/4 [00:01<00:00, 3.63it/s]	
6it/s]	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 5.7	
	all	6	118	0.871	0.881	0.912	0.552	
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size		
	87/101	1.91G	0.798	0.4857	385	416:	100% 4/4 [00:00<00:00, 5.02it/s]	
0it/s]	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 7.1	
	all	6	118	0.876	0.847	0.905	0.548	
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size		
	88/101	1.89G	0.7939	0.477	406	416:	100% 4/4 [00:00<00:00, 4.93it/s]	
0it/s]	Class	Images	Instances	Box(P	R	mAP50	mAP50-95): 100% 1/1 [00:00<00:00, 6.4	
	all	6	118	0.883	0.865	0.906	0.555	
Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size		

89/101	1.96G	0.7975	0.4748	0.8767	402	416: 100% 4/4 [00:00<00:00, 4.62it/s]
Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 7.3
7it/s]	all	6	118	0.883	0.863	0.906 0.563
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
90/101	1.93G	0.7964	0.4805	0.8717	441	416: 100% 4/4 [00:00<00:00, 4.91it/s]
Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 6.0
6it/s]	all	6	118	0.884	0.862	0.911 0.568
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
91/101	1.94G	0.7844	0.4756	0.8704	350	416: 100% 4/4 [00:01<00:00, 3.55it/s]
Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 3.4
9it/s]	all	6	118	0.891	0.843	0.909 0.568

Closing dataloader mosaic

**albumentations:** Blur(p=0.01, blur\_limit=(3, 7)), MedianBlur(p=0.01, blur\_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01, clip\_limit=(1, 4.0), tile\_grid\_size=(8, 8))

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
92/101	1.95G	0.7509	0.4487	0.8844	351	416: 100% 4/4 [00:03<00:00, 1.18it/s]
Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:02<00:00, 2.5
9s/it]	all	6	118	0.9	0.844	0.912 0.577
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
93/101	1.82G	0.7275	0.4337	0.8703	318	416: 100% 4/4 [00:00<00:00, 5.71it/s]
Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 7.4
4it/s]	all	6	118	0.907	0.847	0.91 0.564
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
94/101	1.83G	0.7189	0.4265	0.8725	255	416: 100% 4/4 [00:00<00:00, 6.48it/s]
Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 4.9
8it/s]	all	6	118	0.907	0.85	0.909 0.573
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
95/101	1.83G	0.7361	0.4457	0.8618	230	416: 100% 4/4 [00:00<00:00, 4.33it/s]
Class		Images	Instances	Box(P	R	mAP50 mAP50-95): 100% 1/1 [00:00<00:00, 3.6

```

8it/s]
      all          6          118          0.87          0.852          0.906          0.572

      Epoch  GPU_mem  box_loss  cls_loss  dfl_loss  Instances  Size
      96/101   1.82G    0.7388    0.435    0.8783      267      416: 100% 4/4 [00:00<00:00,  4.26it/s]
      Class    Images  Instances  Box(P      R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  4.0
0it/s]
      all          6          118          0.872          0.848          0.906          0.569

      Epoch  GPU_mem  box_loss  cls_loss  dfl_loss  Instances  Size
      97/101   1.83G    0.7255    0.4482    0.8744      317      416: 100% 4/4 [00:00<00:00,  4.86it/s]
      Class    Images  Instances  Box(P      R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00, 10.8
6it/s]
      all          6          118          0.87          0.848          0.899          0.562

      Epoch  GPU_mem  box_loss  cls_loss  dfl_loss  Instances  Size
      98/101   1.83G    0.7024    0.4196    0.8596      274      416: 100% 4/4 [00:00<00:00,  5.48it/s]
      Class    Images  Instances  Box(P      R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00, 10.0
1it/s]
      all          6          118          0.876          0.854          0.903          0.563

      Epoch  GPU_mem  box_loss  cls_loss  dfl_loss  Instances  Size
      99/101   1.83G    0.6968    0.4229    0.8593      321      416: 100% 4/4 [00:00<00:00,  4.76it/s]
      Class    Images  Instances  Box(P      R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00, 15.4
7it/s]
      all          6          118          0.872          0.817          0.895          0.556
Stopping training early as no improvement observed in last 50 epochs. Best results observed at epoch 49, best model saved as best.pt.
To update EarlyStopping(patience=50) pass a new patience value, i.e. `patience=300` or use `patience=0` to disable EarlyStopping.

99 epochs completed in 0.077 hours.
Optimizer stripped from runs/detect/train/weights/last.pt, 22.5MB
Optimizer stripped from runs/detect/train/weights/best.pt, 22.5MB

Validating runs/detect/train/weights/best.pt...
Ultralytics YOLOv8.0.211 🚀 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4, 15102MiB)
Model summary (fused): 168 layers, 11130228 parameters, 0 gradients, 28.5 GFLOPs
      Class    Images  Instances  Box(P      R      mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  5.9
3it/s]
      all          6          118          0.917          0.857          0.939          0.593

```

black-camel	6	10	1	0.675	0.951	0.555
black-elephant	6	9	0.864	0.889	0.975	0.502
black-horse	6	10	0.951	0.8	0.926	0.576
black-king	6	5	1	0.983	0.995	0.647
black-pawn	6	34	0.97	0.953	0.954	0.578
black-queen	6	4	0.742	0.726	0.849	0.546
white-camel	6	8	1	0.838	0.907	0.631
white-elephant	6	6	0.902	1	0.995	0.65
white-horse	6	8	0.942	0.875	0.962	0.691
white-king	6	3	1	0.697	0.995	0.651
white-pawn	6	18	0.891	0.907	0.93	0.604
white-queen	6	3	0.737	0.947	0.83	0.489

Speed: 0.1ms preprocess, 4.0ms inference, 0.0ms loss, 3.0ms postprocess per image

Results saved to **runs/detect/train**

💡 Learn more at <https://docs.ultralytics.com/modes/train>

Prediction on test Images

```
In [ ]: model = YOLO("/content/runs/detect/train/weights/best.pt")
        model.predict(source = "/content/test/images", show=True, save=True, show_labels=True, show_conf=True, conf=0.5, save
```

WARNING ⚠ Environment does not support cv2.imshow() or PIL Image.show()

image 1/5 /content/test/images/20230315\_193509\_jpg.rf.6a788bb87d85fc2661fdec5a6f4c0a6b.jpg: 416x416 2 white-camels, 1 white-elephant, 2 white-horses, 1 white-king, 8 white-pawns, 10.5ms

image 2/5 /content/test/images/20230315\_194307\_jpg.rf.20dcc57ba2dcfdd1ca6c921cd3fc6c14.jpg: 416x416 2 black-camels, 2 black-elephants, 2 black-horses, 1 black-king, 2 black-pawns, 1 black-queen, 1 white-camel, 2 white-elephants, 2 white-horses, 1 white-king, 2 white-pawns, 11.0ms

image 3/5 /content/test/images/20230315\_195331\_jpg.rf.d4e8d549a869a7b3cf03aa58b18ecb85.jpg: 416x416 1 black-camel, 2 black-elephants, 2 black-horses, 1 white-camel, 2 white-elephants, 2 white-horses, 10.5ms

image 4/5 /content/test/images/20230315\_195425\_jpg.rf.ade863ff45e600f66303e669849b0ff9.jpg: 416x416 2 black-camels, 2 black-elephants, 2 black-horses, 1 black-queen, 3 white-camels, 1 white-elephant, 2 white-horses, 1 white-king, 10.4ms

image 5/5 /content/test/images/photo\_2023-03-07-12-31-27\_jpeg.rf.f0e8a63e3376386e3163dd79d7499054.jpg: 320x416 1 black-camel, 2 black-elephants, 2 black-horses, 1 black-king, 8 black-pawns, 1 black-queen, 2 white-camels, 2 white-elephants, 2 white-horses, 1 white-king, 8 white-pawns, 1 white-queen, 71.1ms

Speed: 4.0ms preprocess, 22.7ms inference, 1.5ms postprocess per image at shape (1, 3, 320, 416)

Results saved to **runs/detect/predict2**

Out[ ]: [ultralitics.engine.results.Results object with attributes:

```
boxes: ultralitics.engine.results.Boxes object
keypoints: None
masks: None
names: {0: 'black-camel', 1: 'black-elephant', 2: 'black-horse', 3: 'black-king', 4: 'black-pawn', 5: 'black-queen', 6: 'white-camel', 7: 'white-elephant', 8: 'white-horse', 9: 'white-king', 10: 'white-pawn', 11: 'white-queen'}
orig_img: array([[[10, 10, 10],
                  [10, 10, 10],
                  [10, 10, 10],
                  ...,
                  [21, 19, 19],
                  [22, 20, 20],
                  [23, 21, 21]],
                 [[10, 10, 10],
                  [10, 10, 10],
                  [10, 10, 10],
                  ...,
                  [20, 18, 18],
                  [20, 18, 18],
                  [21, 19, 19]],
                 [[10, 10, 10],
                  [10, 10, 10],
                  [10, 10, 10],
                  ...,
                  [21, 19, 19],
                  [21, 19, 19],
                  [21, 19, 19]],
                 ...,
                 [[35, 29, 22],
                  [39, 33, 26],
                  [40, 34, 27],
                  ...,
                  [37, 31, 26],
                  [31, 25, 20],
                  [22, 16, 11]],
```

```

[[[34, 28, 23],
  [40, 34, 29],
  [41, 35, 30],
  ...,
  [37, 31, 26],
  [34, 28, 23],
  [25, 19, 14]],

[[[31, 25, 20],
  [37, 31, 26],
  [40, 34, 29],
  ...,
  [38, 32, 27],
  [35, 29, 24],
  [27, 21, 16]]], dtype=uint8)
orig_shape: (640, 640)
path: '/content/test/images/20230315_193509_jpg.rf.6a788bb87d85fc2661fdec5a6f4c0a6b.jpg'
probs: None
save_dir: 'runs/detect/predict2'
speed: {'preprocess': 14.227151870727539, 'inference': 10.537147521972656, 'postprocess': 1.8682479858398438},
ultralytics.engine.results.Results object with attributes:

boxes: ultralytics.engine.results.Boxes object
keypoints: None
masks: None
names: {0: 'black-camel', 1: 'black-elephant', 2: 'black-horse', 3: 'black-king', 4: 'black-pawn', 5: 'black-queen', 6: 'white-camel', 7: 'white-elephant', 8: 'white-horse', 9: 'white-king', 10: 'white-pawn', 11: 'white-queen'}
orig_img: array([[37, 36, 38],
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  [61, 58, 54]],

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  [58, 57, 59],
  ...,
  [58, 55, 51],

```

```

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        [59, 56, 52]],

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        ...,

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         [57, 55, 47],
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         [21, 18, 13],
         [25, 22, 17]],

        [[52, 50, 42],
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         ...,
         [37, 34, 29],
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         [28, 25, 20]],

        [[54, 52, 44],
         [54, 52, 44],
         [53, 51, 43],
         ...,
         [41, 38, 33],
         [36, 33, 28],
         [28, 25, 20]]], dtype=uint8)
orig_shape: (640, 640)
path: '/content/test/images/20230315_194307_jpg.rf.20dcc57ba2dcfdd1ca6c921cd3fc6c14.jpg'
probs: None
save_dir: 'runs/detect/predict2'
speed: {'preprocess': 1.9292831420898438, 'inference': 10.974407196044922, 'postprocess': 1.6875267028808594},

```



ultralitics.engine.results.Results object with attributes:

boxes: ultralytics.engine.results.Boxes object

keypoints: None

masks: None

names: {0: 'black-camel', 1: 'black-elephant', 2: 'black-horse', 3: 'black-king', 4: 'black-pawn', 5: 'black-queen', 6: 'white-camel', 7: 'white-elephant', 8: 'white-horse', 9: 'white-king', 10: 'white-pawn', 11: 'white-queen'}

orig\_img: array([[14, 14, 14],

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[14, 14, 14],

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[21, 21, 21]],

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[21, 21, 21]],

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[14, 14, 14],

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[21, 21, 21]],

...,

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[37, 33, 28],

...,

[30, 24, 13],

[29, 23, 12],

[27, 21, 10]],

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 [30, 24, 13],
 [28, 22, 11]],

[[39, 35, 30],
 [30, 26, 21],
 [28, 24, 19],
 ...,
 [33, 27, 16],
 [31, 25, 14],
 [29, 23, 12]]], dtype=uint8)
orig_shape: (640, 640)
path: '/content/test/images/20230315_195331_jpg.rf.d4e8d549a869a7b3cf03aa58b18ecb85.jpg'
probs: None
save_dir: 'runs/detect/predict2'
speed: {'preprocess': 1.3680458068847656, 'inference': 10.47658920288086, 'postprocess': 1.2540817260742188},
ultralytics.engine.results.Results object with attributes:

boxes: ultralytics.engine.results.Boxes object
keypoints: None
masks: None
names: {0: 'black-camel', 1: 'black-elephant', 2: 'black-horse', 3: 'black-king', 4: 'black-pawn', 5: 'black-queen', 6: 'white-camel', 7: 'white-elephant', 8: 'white-horse', 9: 'white-king', 10: 'white-pawn', 11: 'white-queen'}
orig_img: array([[[25, 25, 25],
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 [33, 33, 33]],

[[25, 25, 25],
 [25, 25, 25],
 [26, 26, 26],
 ...,
 [27, 27, 27],
 [31, 31, 31],

```

```

        [33, 33, 33]],

        [[25, 25, 25],
         [25, 25, 25],
         [27, 27, 27],
         ...,
         [29, 29, 29],
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         [33, 33, 33]],

        ...,

        [[40, 37, 32],
         [35, 32, 27],
         [33, 30, 25],
         ...,
         [43, 37, 32],
         [47, 41, 36],
         [49, 43, 38]],

        [[51, 48, 43],
         [44, 41, 36],
         [38, 35, 30],
         ...,
         [49, 43, 38],
         [52, 46, 41],
         [51, 45, 40]],

        [[36, 33, 28],
         [31, 28, 23],
         [27, 24, 19],
         ...,
         [51, 45, 40],
         [52, 46, 41],
         [49, 43, 38]]], dtype=uint8)
orig_shape: (640, 640)
path: '/content/test/images/20230315_195425_jpg.rf.ade863ff45e600f66303e669849b0ff9.jpg'
probs: None
save_dir: 'runs/detect/predict2'
speed: {'preprocess': 1.3494491577148438, 'inference': 10.445117950439453, 'postprocess': 1.233816146850586},
ultralytics.engine.results.Results object with attributes:

```

```
boxes: ultralytics.engine.results.Boxes object
keypoints: None
masks: None
names: {0: 'black-camel', 1: 'black-elephant', 2: 'black-horse', 3: 'black-king', 4: 'black-pawn', 5: 'black-queen', 6: 'white-camel', 7: 'white-elephant', 8: 'white-horse', 9: 'white-king', 10: 'white-pawn', 11: 'white-queen'}
orig_img: array([[[ 40,  28,  22],
                   [ 42,  30,  24],
                   [ 45,  33,  29],
                   ...,
                   [ 87, 158, 192],
                   [ 87, 158, 192],
                   [ 87, 158, 192]],

                  [[ 47,  35,  29],
                   [ 49,  37,  31],
                   [ 51,  39,  33],
                   ...,
                   [ 87, 158, 192],
                   [ 87, 158, 192],
                   [ 87, 158, 192]],

                  [[ 59,  46,  38],
                   [ 60,  47,  39],
                   [ 62,  49,  41],
                   ...,
                   [ 87, 158, 192],
                   [ 87, 158, 192],
                   [ 87, 158, 192]],

                  ...,

                  [[105, 184, 225],
                   [105, 184, 225],
                   [105, 184, 225],
                   ...,
                   [ 40,  95, 138],
                   [ 41,  96, 139],
                   [ 42,  97, 140]],

                  [[105, 184, 225],
```

```

[[105, 184, 225],
 [105, 184, 225],
 ...,
 [ 42,  95, 138],
 [ 44,  97, 140],
 [ 45,  98, 141]],

[[105, 184, 225],
 [105, 184, 225],
 [105, 184, 225],
 ...,
 [ 43,  96, 139],
 [ 44,  97, 140],
 [ 45,  98, 141]]], dtype=uint8)
orig_shape: (958, 1280)
path: '/content/test/images/photo_2023-03-07-12-31-27_jpeg.rf.f0e8a63e3376386e3163dd79d7499054.jpg'
probs: None
save_dir: 'runs/detect/predict2'
speed: {'preprocess': 1.2297630310058594, 'inference': 71.10810279846191, 'postprocess': 1.3577938079833984}]

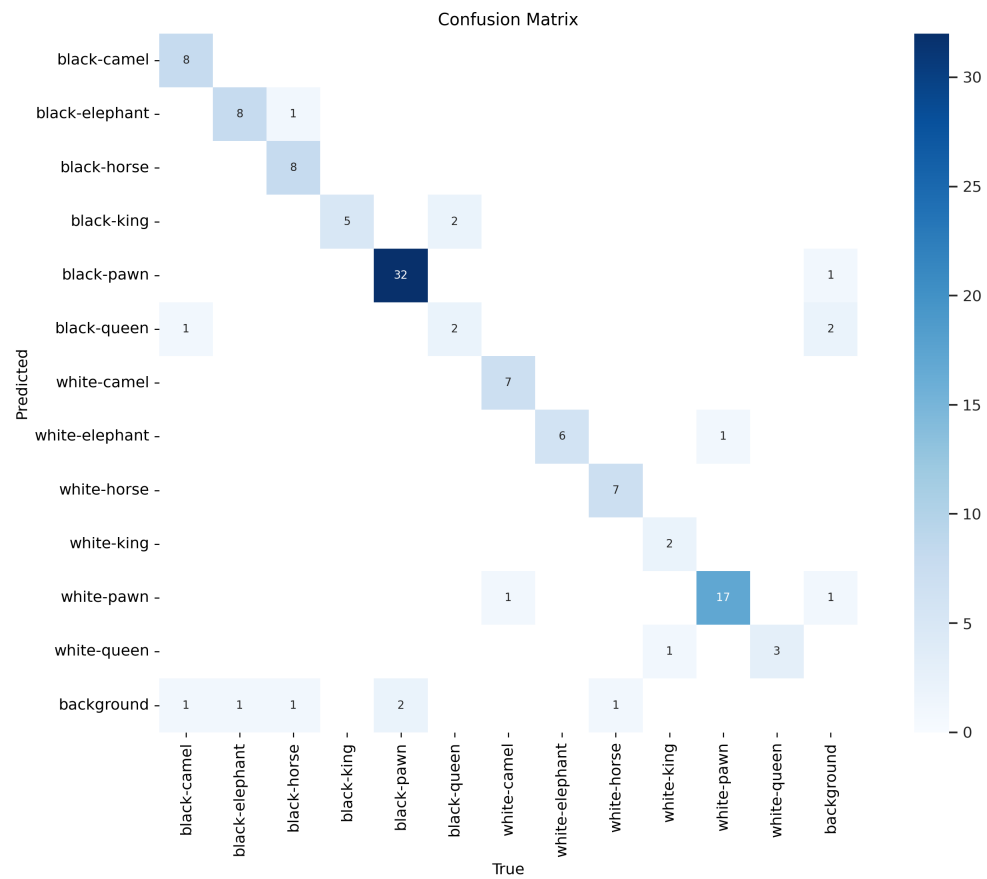
```

```

In [ ]: # Confusion matrix
from IPython.display import display, Image
Image(filename="/content/runs/detect/train/confusion_matrix.png", width=600)

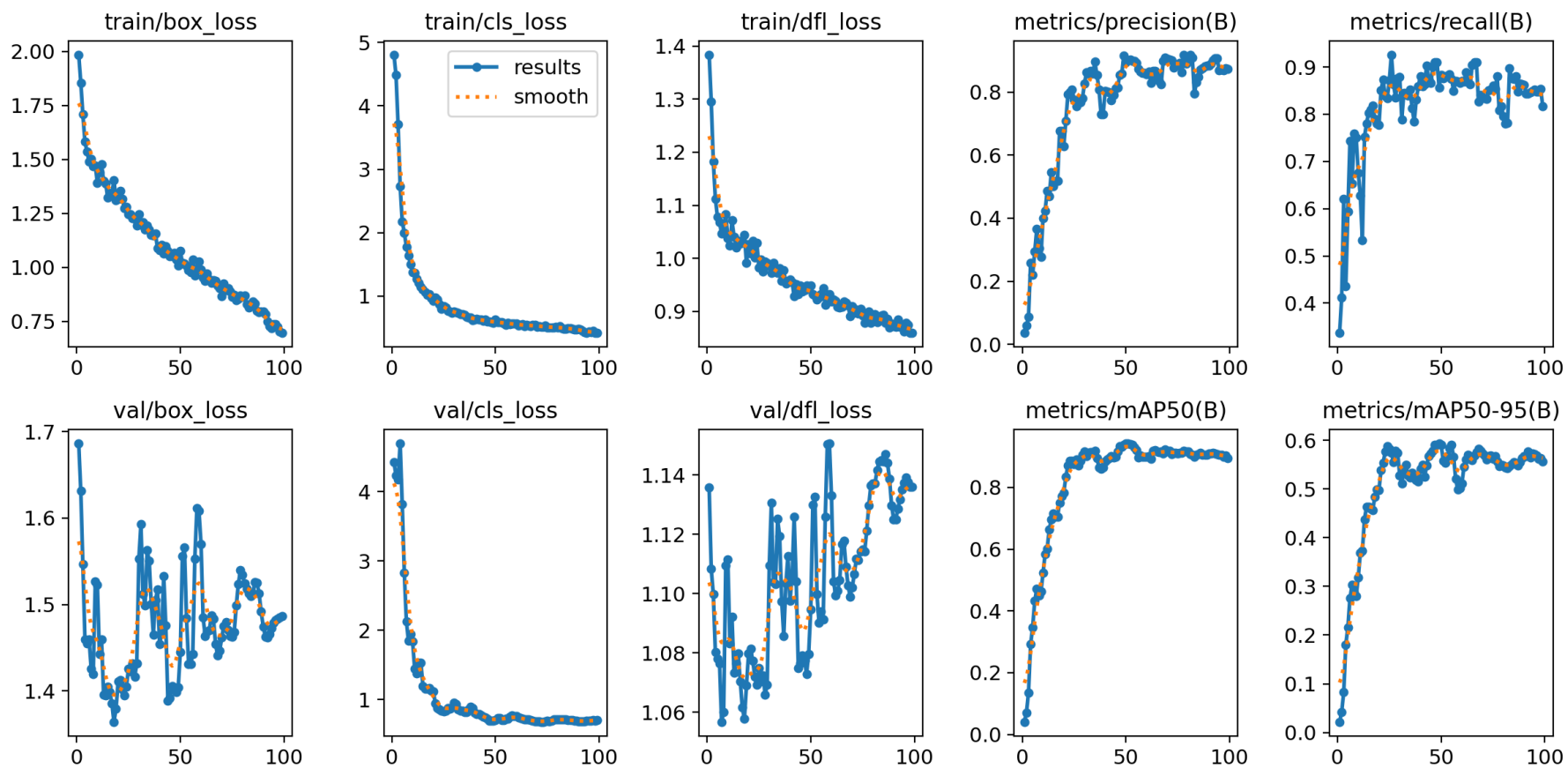
```

Out[ ]:



In [ ]: `Image(filename="/content/runs/detect/train/results.png")`

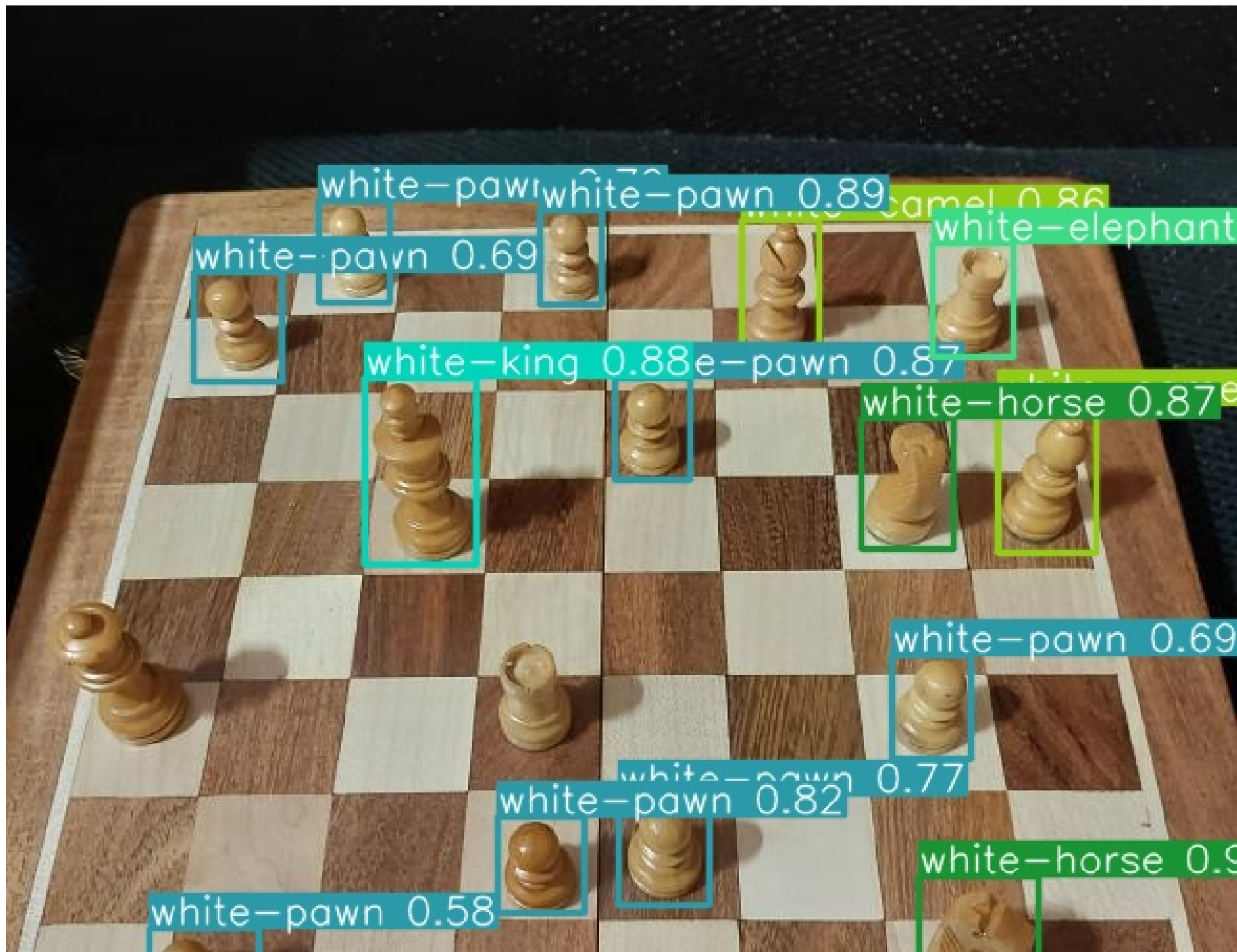
Out[ ]:



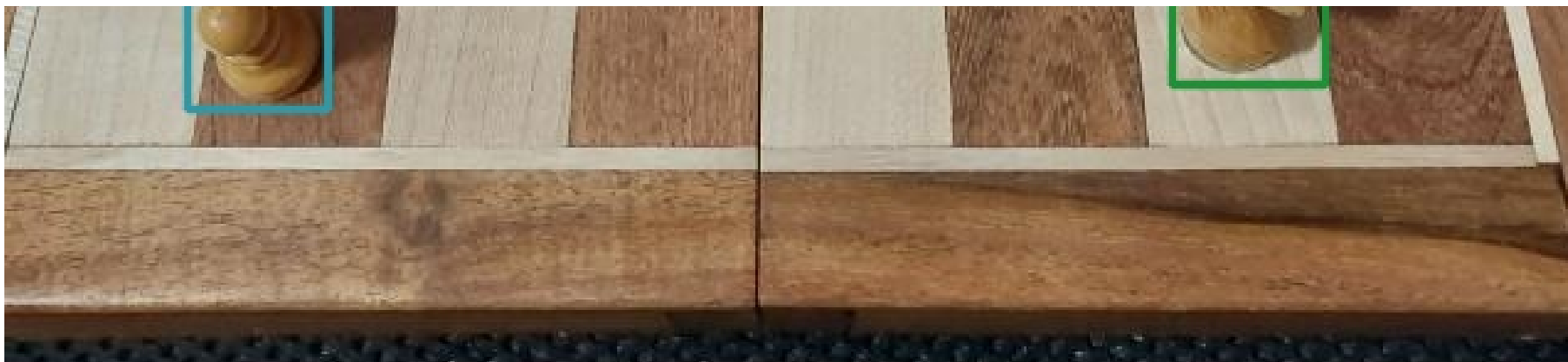
Predicted Image 1

In [ ]: `Image(filename="/content/runs/detect/predict2/20230315_193509_jpg.rf.6a788bb87d85fc2661fdec5a6f4c0a6b.jpg",width=100`

Out[ ]:







Predicted Image 2

```
In [ ]: Image(filename="/content/runs/detect/predict2/20230315_194307_jpg.rf.20dcc57ba2dcfdd1ca6c921cd3fc6c14.jpg",width=1000,height=1000)
```

Out[ ]:



