

Tarea 3 Ejercicio 2 - Introducción a las Redes Neuronales y Deep Learning

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Curso: INF395, Introducción a las Redes Neuronales y Deep Learning

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Evaluar modelo preentrenado de localización de objetos en imágenes

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

```
In [4]: import torch
# from torchvision.models.detection import FasterRCNN_ResNet50_FPN_Weights # Mas ro
from ultralytics import YOLO # Simple, liviano, apto para tiempo real
```

```
In [5]: # Descargamos el modelo base
model = YOLO("yolo11n.pt")

# Verificamos si se puede con GPU
print(torch.cuda.is_available())
```

False

```
In [6]: # Entrenamos haciendo un Fine-Tuning (Modelamiento mas fino)
train_results = model.train(
    data="coco8.yaml", # Dataset de entrenamiento (Una muestra en este caso)
    epochs=100,
    imgsz=640,
    device="cpu", # 0: GPU
)
```

Ultralytics 8.3.228 Python-3.11.4 torch-2.9.0+cpu CPU (Intel Core i5-9300H 2.40GHz)
engine\trainer: agnostic_nms=False, amp=True, augment=False, auto_augment=randaugmen
t, batch=16, bgr=0.0, box=7.5, cache=False, cfg=None, classes=None, close_mosaic=10,
cls=0.5, compile=False, conf=None, copy_paste=0.0, copy_paste_mode=flip, cos_lr=Fals
e, cutmix=0.0, data=coco8.yaml, degrees=0.0, deterministic=True, device=cpu, dfl=1.
5, dnn=False, dropout=0.0, dynamic=False, embed=None, epochs=100, erasing=0.4, exist
_ok=False, fliplr=0.5, flipud=0.0, format=torchscript, fraction=1.0, freeze=None, ha
lf=False, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, imgsz=640, int8=False, iou=0.7, keras=F
alse, kobj=1.0, line_width=None, lr0=0.01, lrf=0.01, mask_ratio=4, max_det=300, mixu
p=0.0, mode=train, model=yolo11n.pt, momentum=0.937, mosaic=1.0, multi_scale=False,
name=train4, 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, pr
ofile=False, project=None, rect=False, resume=False, retina_masks=False, save=True,
save_conf=False, save_crop=False, save_dir=C:\Users\Bruno\Desktop\INF395 - IRN\tarea
s\tarea_3\runs\detect\ttrain4, save_frames=False, save_json=False, save_period=-1, sa
ve_txt=False, scale=0.5, seed=0, shear=0.0, show=False, show_boxes=True, show_conf=T
rue, show_labels=True, simplify=True, single_cls=False, source=None, split=val, stre
am_buffer=False, task=detect, time=None, tracker=botsort.yaml, translate=0.1, val=Tr
ue, 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

	from	n	params	module	a
arguments					
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	6640	ultralytics.nn.modules.block.C3k2	
[32, 64, 1, False, 0.25]					
3	-1	1	36992	ultralytics.nn.modules.conv.Conv	
[64, 64, 3, 2]					
4	-1	1	26080	ultralytics.nn.modules.block.C3k2	
[64, 128, 1, False, 0.25]					
5	-1	1	147712	ultralytics.nn.modules.conv.Conv	
[128, 128, 3, 2]					
6	-1	1	87040	ultralytics.nn.modules.block.C3k2	
[128, 128, 1, True]					
7	-1	1	295424	ultralytics.nn.modules.conv.Conv	
[128, 256, 3, 2]					
8	-1	1	346112	ultralytics.nn.modules.block.C3k2	
[256, 256, 1, True]					
9	-1	1	164608	ultralytics.nn.modules.block.SPPF	
[256, 256, 5]					
10	-1	1	249728	ultralytics.nn.modules.block.C2PSA	
[256, 256, 1]					
11	-1	1	0	torch.nn.modules.upsampling.Upsample	
[None, 2, 'nearest']					
12	[-1, 6]	1	0	ultralytics.nn.modules.conv.Concat	
[1]					
13	-1	1	111296	ultralytics.nn.modules.block.C3k2	
[384, 128, 1, False]					
14	-1	1	0	torch.nn.modules.upsampling.Upsample	
[None, 2, 'nearest']					
15	[-1, 4]	1	0	ultralytics.nn.modules.conv.Concat	
[1]					
16	-1	1	32096	ultralytics.nn.modules.block.C3k2	

```

[256, 64, 1, False]
17          -1  1      36992  ultralytics.nn.modules.conv.Conv
[64, 64, 3, 2]
18          [-1, 13]  1          0  ultralytics.nn.modules.conv.Concat
[1]
19          -1  1      86720  ultralytics.nn.modules.block.C3k2
[192, 128, 1, False]
20          -1  1     147712  ultralytics.nn.modules.conv.Conv
[128, 128, 3, 2]
21          [-1, 10]  1          0  ultralytics.nn.modules.conv.Concat
[1]
22          -1  1     378880  ultralytics.nn.modules.block.C3k2
[384, 256, 1, True]
23          [16, 19, 22]  1     464912  ultralytics.nn.modules.head.Detect
[80, [64, 128, 256]]
YOLO11n summary: 181 layers, 2,624,080 parameters, 2,624,064 gradients, 6.6 GFLOPs

```

Transferred 499/499 items from pretrained weights

Freezing layer 'model.23.dfl.conv.weight'

train: Fast image access (ping: 0.20.0 ms, read: 57.435.3 MB/s, size: 50.0 KB)

train: Scanning C:\Users\Bruno\Desktop\INF395 - IRN\tareas\datasets\coco8\labels\train.cache... 4 images, 0 backgrounds, 0 corrupt: 100% ————— 4/4 2.0Kit/s 0.0s

val: Fast image access (ping: 0.20.0 ms, read: 75.927.9 MB/s, size: 54.0 KB)

val: Scanning C:\Users\Bruno\Desktop\INF395 - IRN\tareas\datasets\coco8\labels\val.cache... 4 images, 0 backgrounds, 0 corrupt: 100% ————— 4/4 4.0Kit/s 0.0s

Plotting labels to C:\Users\Bruno\Desktop\INF395 - IRN\tareas\tarea_3\runs\detect\train4\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=0.000119, momentum=0.9) with parameter groups 81 weight(decay=0.0), 88 weight(decay=0.0005), 87 bias(decay=0.0)

Image sizes 640 train, 640 val

Using 0 dataloader workers

Logging results to C:\Users\Bruno\Desktop\INF395 - IRN\tareas\tarea_3\runs\detect\train4

Starting training for 100 epochs...

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
1/100	0G	0.9853	2.649	1.312	30	640: 100%
<hr/>						
1/1 2.3s/it		2.3s				
	Class	Images	Instances	Box(P	R	mAP50 mAP50
-95): 100%	1/1 1.3it/s		0.7s			
	all	4	17	0.559	0.85	0.878
0.635						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
2/100	0G	1.036	3.263	1.381	30	640: 100%
<hr/>						
1/1 2.0s/it		2.0s				
	Class	Images	Instances	Box(P	R	mAP50 mAP50
-95): 100%	1/1 1.2it/s		0.8s			
	all	4	17	0.556	0.85	0.886
0.635						

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
3/100	0G	1.375	2.782	1.774	16	640: 100%
<hr/>						
1/1 2.0s/it		2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.551	0.85	0.85	
0.617							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
4/100	0G	1.497	3	2.072	16	640:	100%
1/1	2.1s/it	2.1s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.548	0.85	0.854	
0.638							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
5/100	0G	1.49	3.27	1.938	31	640:	100%
1/1	1.9s/it	1.9s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.539	0.85	0.856	
0.638							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
6/100	0G	1.176	2.707	1.479	34	640:	100%
1/1	2.0s/it	2.0s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.817	0.646	0.859	
0.626							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
7/100	0G	1.161	2.386	1.424	27	640:	100%
1/1	3.4s/it	3.4s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.557	0.85	0.873	
0.626							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
8/100	0G	0.98	2.439	1.239	23	640:	100%
1/1	2.2s/it	2.2s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.8s				
	all	4	17	0.58	0.865	0.86	
0.628							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
9/100	0G	1.118	3.697	1.476	42	640:	100%
1/1	2.5s/it	2.5s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.0it/s	1.0s				
	all	4	17	0.78	0.65	0.894	
0.629							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
10/100	0G	1	2.415	1.243	26	640:	100%
1/1	2.3s/it	2.3s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.1s/it	1.1s					
	all	4	17	0.77	0.65	0.894	
0.631							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
11/100	0G	1.131	2.82	1.395	42	640: 100%	
	1/1 2.1s/it	2.1s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.8s					
	all	4	17	0.657	0.778	0.91	
0.634							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
12/100	0G	0.8918	2.15	1.281	32	640: 100%	
	1/1 2.9s/it	2.9s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.1it/s	0.9s					
	all	4	17	0.661	0.779	0.912	
0.645							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
13/100	0G	0.9101	1.898	1.432	17	640: 100%	
	1/1 2.3s/it	2.3s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.2it/s	0.9s					
	all	4	17	0.657	0.778	0.912	
0.648							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
14/100	0G	0.9912	2.223	1.386	34	640: 100%	
	1/1 2.5s/it	2.5s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.4it/s	0.7s					
	all	4	17	0.706	0.746	0.913	
0.653							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
15/100	0G	1.025	1.86	1.394	32	640: 100%	
	1/1 2.8s/it	2.8s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.8s					
	all	4	17	0.707	0.748	0.913	
0.648							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
16/100	0G	1.046	2.224	1.56	19	640: 100%	
	1/1 2.7s/it	2.7s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.1it/s	0.9s					
	all	4	17	0.811	0.65	0.913	
0.631							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size	
17/100	0G	0.9335	2.226	1.35	22	640: 100%	
	1/1 2.1s/it	2.1s					

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.0it/s	1.0s					
	all	4	17	0.826	0.65	0.913	
0.633							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
18/100	0G	1.148	2.488	1.466	43	640: 100%	
1/1 2.0s/it	2.0s						

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.8s					
	all	4	17	0.826	0.65	0.913	
0.633							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
19/100	0G	1.058	1.514	1.275	34	640: 100%	
1/1 2.8s/it	2.8s						

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3s/it	1.3s					
	all	4	17	0.813	0.65	0.912	
0.625							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
20/100	0G	1.007	1.508	1.286	23	640: 100%	
1/1 2.1s/it	2.1s						

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3s/it	1.3s					
	all	4	17	0.813	0.65	0.912	
0.625							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
21/100	0G	1.164	3.179	1.505	38	640: 100%	
1/1 2.3s/it	2.3s						

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.0s/it	1.0s					
	all	4	17	0.825	0.65	0.911	
0.627							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
22/100	0G	0.9773	1.773	1.497	20	640: 100%	
1/1 1.9s/it	1.9s						

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.8s					
	all	4	17	0.825	0.65	0.911	
0.627							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
23/100	0G	1.044	2.015	1.304	34	640: 100%	
1/1 2.0s/it	2.0s						

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.7s					
	all	4	17	0.825	0.65	0.855	
0.612							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
24/100	0G	1.055	1.653	1.382	28	640: 100%	
1/1 1.8s/it	1.8s						

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.7s				
	all	4	17	0.825	0.65	0.855	
0.612							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
25/100	0G	0.8872	1.985	1.252	25	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.9s				
	all	4	17	0.829	0.65	0.855	
0.6							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
26/100	0G	0.9622	1.6	1.398	30	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.829	0.65	0.855	
0.6							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
27/100	0G	0.8908	1.543	1.239	38	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.827	0.65	0.855	
0.6							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
28/100	0G	0.8649	1.51	1.225	31	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.9s				
	all	4	17	0.827	0.65	0.855	
0.6							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
29/100	0G	1.217	1.757	1.423	23	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.5it/s	0.7s				
	all	4	17	0.801	0.65	0.852	
0.599							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
30/100	0G	0.7865	1.375	1.141	42	640: 100%
1/1	1.8s/it	1.8s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.801	0.65	0.852	
0.599							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
31/100	0G	0.8638	1.452	1.266	32	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.794	0.65	0.774	
0.523							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
32/100	0G	0.9842	1.376	1.267	33	640: 100%
1/1	1.8s/it	1.8s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.7s				
	all	4	17	0.794	0.65	0.774	
0.523							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
33/100	0G	0.8453	1.556	1.314	30	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.781	0.65	0.767	
0.524							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
34/100	0G	0.7734	1.429	1.24	20	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.8s				
	all	4	17	0.781	0.65	0.767	
0.524							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
35/100	0G	0.8991	1.489	1.194	39	640: 100%
1/1	2.6s/it	2.6s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4s/it	1.4s				
	all	4	17	0.784	0.65	0.767	
0.524							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
36/100	0G	0.7814	1.429	1.161	49	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.784	0.65	0.767	
0.524							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
37/100	0G	0.9138	1.36	1.358	16	640: 100%
1/1	2.4s/it	2.4s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.77	0.65	0.736	
0.499							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
38/100	0G	1.003	1.702	1.339	43	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.77	0.65	0.736	
0.499							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
39/100	0G	1.006	2.117	1.417	33	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.656	0.687	0.709	
0.473							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
40/100	0G	1.04	1.139	1.45	11	640: 100%
1/1	1.8s/it	1.8s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.656	0.687	0.709	
0.473							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
41/100	0G	0.7884	1.227	1.153	31	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.649	0.7	0.7	
0.482							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
42/100	0G	0.9144	1.293	1.298	28	640: 100%
1/1	1.8s/it	1.8s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.649	0.7	0.7	
0.482							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
43/100	0G	0.5248	2.463	1.107	13	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.57	0.517	0.585	
0.368							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
44/100	0G	0.9218	1.06	1.271	26	640: 100%
1/1	1.8s/it	1.8s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.8s				
	all	4	17	0.57	0.517	0.585	
0.368							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
45/100	0G	0.6535	0.8938	1.157	23	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.8s					
	all	4	17	0.595	0.483	0.528	
0.302							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
46/100	0G	0.9411	1.261	1.438	20	640: 100%
1/1	1.8s/it	1.8s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.4it/s	0.7s					
	all	4	17	0.595	0.483	0.528	
0.302							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
47/100	0G	0.844	0.8524	1.122	28	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.8s					
	all	4	17	0.584	0.483	0.527	
0.311							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
48/100	0G	0.7341	1.071	1.132	44	640: 100%
1/1	2.5s/it	2.5s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.1s/it	1.1s					
	all	4	17	0.584	0.483	0.527	
0.311							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
49/100	0G	0.9238	1.159	1.262	25	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.2it/s	0.8s					
	all	4	17	0.6	0.498	0.525	
0.308							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
50/100	0G	0.8365	0.9124	1.182	32	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.4it/s	0.7s					
	all	4	17	0.6	0.498	0.525	
0.308							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
51/100	0G	0.7772	1.058	1.16	40	640: 100%
1/1	2.2s/it	2.2s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.1it/s	0.9s					
	all	4	17	0.601	0.498	0.525	
0.307							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
52/100	0G	0.8283	0.8986	1.173	26	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.8s				
	all	4	17	0.601	0.498	0.525	
0.307							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
53/100	0G	0.6579	0.7836	1.187	20	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.601	0.498	0.525	
0.307							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
54/100	0G	0.8406	1.172	1.24	22	640: 100%
1/1	2.6s/it	2.6s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.8s				
	all	4	17	0.767	0.5	0.525	
0.309							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
55/100	0G	0.8968	0.7855	1.189	45	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.9s				
	all	4	17	0.767	0.5	0.525	
0.309							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
56/100	0G	0.7981	1.036	1.14	23	640: 100%
1/1	2.2s/it	2.2s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.767	0.5	0.525	
0.309							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
57/100	0G	0.6324	0.8528	1.065	39	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.756	0.5	0.526	
0.306							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
58/100	0G	0.6974	0.7232	1.145	34	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.756	0.5	0.526	
0.306							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
59/100	0G	0.8325	0.9796	1.241	20	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.756	0.5	0.526	
0.306							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
60/100	0G	1.016	1.117	1.418	26	640: 100%
1/1	3.3s/it	3.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.755	0.5	0.518	
0.305							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
61/100	0G	0.6297	0.8029	1.092	37	640: 100%
1/1	2.4s/it	2.4s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.9s				
	all	4	17	0.755	0.5	0.518	
0.305							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
62/100	0G	0.6612	0.7211	1.126	21	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.4it/s	0.7s				
	all	4	17	0.755	0.5	0.518	
0.305							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
63/100	0G	1.356	1.7	1.775	16	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.764	0.5	0.521	
0.303							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
64/100	0G	0.7941	0.9336	1.147	45	640: 100%
1/1	2.2s/it	2.2s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.764	0.5	0.521	
0.303							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
65/100	0G	0.8658	0.7239	1.152	26	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.764	0.5	0.521	
0.303							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
66/100	0G	0.7033	0.6873	1.156	25	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.1it/s	0.9s					
	all	4	17	0.756	0.5	0.519	
0.302							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
67/100	0G	0.6801	0.5971	1.043	44	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.2s/it	1.2s					
	all	4	17	0.756	0.5	0.519	
0.302							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
68/100	0G	0.8983	1.028	1.245	33	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.8s					
	all	4	17	0.756	0.5	0.519	
0.302							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
69/100	0G	0.7341	0.717	1.151	25	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.2s/it	1.2s					
	all	4	17	0.771	0.5	0.518	
0.298							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
70/100	0G	1.081	1.258	1.481	17	640: 100%
1/1	2.2s/it	2.2s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.3it/s	0.8s					
	all	4	17	0.771	0.5	0.518	
0.298							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
71/100	0G	0.6288	0.6687	1.024	25	640: 100%
1/1	2.4s/it	2.4s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.2it/s	0.8s					
	all	4	17	0.771	0.5	0.518	
0.298							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
72/100	0G	0.806	0.6084	1.039	25	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1 1.0s/it	1.0s					
	all	4	17	0.696	0.453	0.473	
0.297							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
73/100	0G	0.7385	0.8473	1.141	40	640: 100%
1/1	2.4s/it	2.4s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.696	0.453	0.473	
0.297							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
74/100	0G	0.7806	0.7593	1.162	39	640: 100%
1/1	3.0s/it	3.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1s/it	1.1s				
	all	4	17	0.696	0.453	0.473	
0.297							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
75/100	0G	0.8782	0.7467	1.334	24	640: 100%
1/1	2.5s/it	2.5s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.7s				
	all	4	17	0.7	0.453	0.475	
0.291							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
76/100	0G	0.6992	0.6736	1.082	36	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.7	0.453	0.475	
0.291							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
77/100	0G	0.6813	0.6758	1.13	30	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.0it/s	1.0s				
	all	4	17	0.7	0.453	0.475	
0.291							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
78/100	0G	0.892	1.074	1.262	44	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.9	0.372	0.461	
0.287							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
79/100	0G	0.6628	0.6705	1.047	33	640: 100%
1/1	2.2s/it	2.2s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.9	0.372	0.461	
0.287							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
80/100	0G	0.6333	0.5855	0.9879	28	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.8s				
	all	4	17	0.9	0.372	0.461	
0.287							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
81/100	0G	0.6988	0.8724	1.215	25	640: 100%
1/1	2.9s/it	2.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1s/it	1.1s				
	all	4	17	0.703	0.449	0.475	
0.294							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
82/100	0G	0.6251	0.5093	1.087	29	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.703	0.449	0.475	
0.294							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
83/100	0G	0.7288	0.8696	1.134	27	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1it/s	0.9s				
	all	4	17	0.703	0.449	0.475	
0.294							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
84/100	0G	0.4932	0.5399	1.007	24	640: 100%
1/1	2.5s/it	2.5s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.2it/s	0.8s				
	all	4	17	0.903	0.371	0.458	
0.285							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
85/100	0G	0.6806	0.828	1.072	45	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.1s/it	1.1s				
	all	4	17	0.903	0.371	0.458	
0.285							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
86/100	0G	0.9212	0.9609	1.43	18	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.3it/s	0.8s				
	all	4	17	0.903	0.371	0.458	
0.285							

Epoch	GPU_mem	box_loss	cls_loss	df1_loss	Instances	Size
87/100	0G	0.8915	0.9405	1.268	41	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	all	1/1 1.2it/s	0.8s	0.903	0.371	0.458	
0.285							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
88/100	0G	0.7884	0.6187	1.24	20	640: 100%
1/1	2.0s/it	2.0s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	all	1/1 1.4it/s	0.7s	0.906	0.371	0.456	
0.285							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
89/100	0G	0.8578	0.8715	1.211	22	640: 100%
1/1	1.9s/it	1.9s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	all	1/1 1.3it/s	0.7s	0.906	0.371	0.456	
0.285							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
90/100	0G	0.7057	0.7937	1.049	50	640: 100%
1/1	2.2s/it	2.2s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	all	1/1 1.2it/s	0.8s	0.906	0.371	0.456	
0.285							

Closing dataloader mosaic

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
91/100	0G	0.5423	0.5974	1.122	13	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	all	1/1 1.2it/s	0.9s	0.906	0.371	0.456	
0.285							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
92/100	0G	0.4571	0.4354	0.8671	13	640: 100%
1/1	2.3s/it	2.3s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	all	1/1 1.3it/s	0.8s	0.794	0.5	0.512	
0.293							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
93/100	0G	0.6399	0.5526	1.249	13	640: 100%
1/1	2.1s/it	2.1s				

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	all	1/1 1.0s/it	1.0s	0.794	0.5	0.512	
0.293							

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
94/100	0G	0.6205	0.5001	1.02	13	640: 100%


```

1/1 1.8s/it 1.8s
Class Images Instances Box(P R mAP50 mAP50
-95): 100% 1/1 1.3it/s 0.8s
all 4 17 0.794 0.5 0.512
0.293

```

```

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
95/100 0G 0.7542 0.6787 1.262 13 640: 100%
1/1 2.1s/it 2.1s
Class Images Instances Box(P R mAP50 mAP50
-95): 100% 1/1 1.3it/s 0.8s
all 4 17 0.794 0.5 0.512
0.293

```

```

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
96/100 0G 0.5652 0.5755 1.049 13 640: 100%
1/1 2.1s/it 2.1s
Class Images Instances Box(P R mAP50 mAP50
-95): 100% 1/1 1.3it/s 0.8s
all 4 17 0.794 0.5 0.52
0.293

```

```

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
97/100 0G 0.4713 0.5284 0.9375 13 640: 100%
1/1 2.0s/it 2.0s
Class Images Instances Box(P R mAP50 mAP50
-95): 100% 1/1 1.3it/s 0.8s
all 4 17 0.794 0.5 0.52
0.293

```

```

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
98/100 0G 0.6284 0.5569 1.137 13 640: 100%
1/1 1.9s/it 1.9s
Class Images Instances Box(P R mAP50 mAP50
-95): 100% 1/1 1.4it/s 0.7s
all 4 17 0.794 0.5 0.52
0.293

```

```

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
99/100 0G 0.4799 0.4264 0.8893 13 640: 100%
1/1 1.8s/it 1.8s
Class Images Instances Box(P R mAP50 mAP50
-95): 100% 1/1 1.2it/s 0.8s
all 4 17 0.794 0.5 0.52
0.293

```

```

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
100/100 0G 0.4918 0.4533 0.9362 13 640: 100%
1/1 2.3s/it 2.3s
Class Images Instances Box(P R mAP50 mAP50
-95): 100% 1/1 1.1it/s 0.9s
all 4 17 0.783 0.5 0.508
0.284

```

100 epochs completed in 0.098 hours.
Optimizer stripped from C:\Users\Bruno\Desktop\INF395 - IRN\tareas\tarea_3\runs\dete

```
ct\train4\weights\last.pt, 5.5MB
Optimizer stripped from C:\Users\Bruno\Desktop\INF395 - IRN\tareas\tarea_3\runs\dete
ct\train4\weights\best.pt, 5.5MB
```

```
Validating C:\Users\Bruno\Desktop\INF395 - IRN\tareas\tarea_3\runs\detect\train4\wei
ghts\best.pt...
```

```
Ultralytics 8.3.228 Python-3.11.4 torch-2.9.0+cpu CPU (Intel Core i5-9300H 2.40GHz)
YOLO11n summary (fused): 100 layers, 2,616,248 parameters, 0 gradients, 6.5 GFLOPs
```

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.6it/s	0.6s				
	all	4	17	0.705	0.746	0.912	
0.652	person	3	10	0.764	0.65	0.666	
0.33	dog	1	1	0.532	1	0.995	
0.796	horse	1	2	0.722	1	0.995	
0.676	elephant	1	2	0.608	0.825	0.828	
0.322	umbrella	1	1	0.604	1	0.995	
0.895	potted plant	1	1	1	0	0.995	

```
0.895
Speed: 2.6ms preprocess, 128.5ms inference, 0.0ms loss, 3.0ms postprocess per image
Results saved to C:\Users\Bruno\Desktop\INF395 - IRN\tareas\tarea_3\runs\detect\train4
```

```
In [7]: # Evaluamos el rendimiento
        metrics = model.val()
```

```
Ultralytics 8.3.228 Python-3.11.4 torch-2.9.0+cpu CPU (Intel Core i5-9300H 2.40GHz)
YOLO11n summary (fused): 100 layers, 2,616,248 parameters, 0 gradients, 6.5 GFLOPs
```

```
val: Fast image access (ping: 0.10.0 ms, read: 211.9134.7 MB/s, size: 54.0 KB)
val: Scanning C:\Users\Bruno\Desktop\INF395 - IRN\tareas\datasets\coco8\labels\val.c
ache... 4 images, 0 backgrounds, 0 corrupt: 100% 4/4 4.0Kit/s 0.0s
```

	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%	1/1	1.6it/s	0.6s				
	all	4	17	0.705	0.746	0.912	
0.652	person	3	10	0.764	0.65	0.666	
0.33	dog	1	1	0.532	1	0.995	
0.796	horse	1	2	0.722	1	0.995	
0.676	elephant	1	2	0.608	0.825	0.828	
0.322	umbrella	1	1	0.604	1	0.995	
0.895	potted plant	1	1	1	0	0.995	

```
0.895
Speed: 1.9ms preprocess, 129.5ms inference, 0.0ms loss, 3.7ms postprocess per image
Results saved to C:\Users\Bruno\Desktop\INF395 - IRN\tareas\tarea_3\runs\detect\val3
```

```
In [11]: from PIL import Image
from IPython.display import display

# Ejemplo con mi perra "Negra" (La quiero mucho)
ruta_a_imagen_de_prueba = "negra.jpg"

# Mostramos la imagen original
original_image = Image.open(ruta_a_imagen_de_prueba)
print("Mostrando la imagen original:")
display(original_image)

# Ejecutamos la deteccion
results = model(ruta_a_imagen_de_prueba)

# Convervimos a un array para poder hacerle display en el notebook
im_array = results[0].plot()
im_pil = Image.fromarray(im_array)

# Mostramos en el notebook la prediccion
print("Mostrando la imagen con la detección INLINE:")
display(im_pil)
```

Mostrando la imagen original:





image 1/1 c:\Users\Bruno\Desktop\INF395 - IRN\tareas\tarea_3\negra.jpg: 640x384 1 dog, 1 potted plant, 143.1ms

Speed: 5.8ms preprocess, 143.1ms inference, 1.4ms postprocess per image at shape (1, 3, 640, 384)

Mostrando la imagen con la detección INLINE:

potted plant 0.26

dog 0.93



Resultados de la Evaluación del Modelo YOLOv8n

La evaluación se realizó sobre el conjunto de validación del mini-dataset **COCO8** utilizando un modelo **YOLOv8n** ajustado (fine-tuned) y ejecutándose en CPU.

1. Métricas de Precisión

Las métricas mAP (mean Average Precision) indican el rendimiento del modelo en la localización y clasificación de objetos.

Métrica	Descripción	Valor
mAP50-95	Precisión Promedio Media en umbrales de Intersection over Union (IoU) desde 50% hasta 95% (Métrica estricta).	0.652
mAP50	Precisión Promedio Media con umbral de IoU de 50% (Métrica más relajada).	0.912
Precisión (P)	Proporción de predicciones correctas sobre el total de predicciones.	0.705
Recall (R)	Proporción de objetos reales detectados sobre el total de objetos reales.	0.746

Conclusión de Precisión: El modelo mantiene un rendimiento muy alto en detección básica (mAP50: 91.2%) y su rendimiento general en localización estricta es sólido (mAP50-95: 65.2%). En esta ejecución, la Precisión (0.705) mejoró ligeramente respecto al Recall (0.746).

2. Rendimiento por Clase (Detalle)

Clase	Imágenes	Instancias	mAP50-95	Notas Relevantes
all	4	17	0.652	Rendimiento promedio global.
person	3	10	0.330	Muestra el mAP más bajo, indicando dificultad en la localización precisa.
dog	1	1	0.796	Alta precisión y recall perfecto (1.0).

Clase	Imágenes	Instancias	mAP50-95	Notas Relevantes
horse	1	2	0.676	Buen rendimiento general.
elephant	1	2	0.322	Muestra dificultad con las clases más escasas o complejas.
umbrella	1	1	0.895	Excelente rendimiento.
potted plant	1	1	0.895	Excelente rendimiento.

3. Conclusiones

Conclusión 1: Es muy probable que la baja precisión se deba a que se hizo el entrenamiento con los "weights" básicos del modelo, y luego con un entrenamiento a 100 épocas sobre un dataset llamado COCO, pero solo 8 muestras del mismo, por lo que es esperable que el rendimiento no sea el mejor.

Conclusión 2: A su vez, YOLO es una arquitectura muy liviana y sencilla, lo que provoca que a su vez no sea tan robusta, por lo que se prioriza velocidad por sobre precisión, por eso las métricas de precisión son bajas.

Conclusión 3: A pesar de su baja precisión, su velocidad es superior, lo que genera que se puedan hacer detecciones en vivo, en webcams o videos, lo cual hace que YOLO siga siendo una opción muy interesante.