Data Initialization

```
In [1]: from torchvision.datasets import Cityscapes
         import torchvision.transforms as T
         from PIL import Image
         from roboflow import Roboflow
         from ultralytics import YOLO
         import matplotlib.pyplot as plt
         import matplotlib.image as mpimg
         import torch
         import torchvision
         import torch.nn as nn
         import torch.nn.functional as F
         from torchvision import transforms
         import numpy as np
         import cv2
In [4]: # downloading dataset in yolo format
         rf = Roboflow(api key="TbG4o6EFfJ15o6vHSJi8")
         project = rf.workspace("eastsky").project("bdd100k-e3s18")
         version = project.version(1)
         dataset = version.download("yolov11")
       loading Roboflow workspace...
       loading Roboflow project...
       Downloading Dataset Version Zip in bdd100k--1 to yolov11:: 100% 414997/4
       14997 [00:48<00:00, 8537.98it/s]
       Extracting Dataset Version Zip to bdd100k--1 in yolov11:: 100%
       06 [00:41<00:00, 471.41it/s]
In [5]: # downloading dataset in coco format
         rf = Roboflow(api_key="TbG4o6EFfJ15o6vHSJi8")
         project = rf.workspace("eastsky").project("bdd100k-e3s18")
         version = project.version(1)
         dataset = version.download("coco")
       loading Roboflow workspace...
       loading Roboflow project...
In [13]: dspath = dataset.location
         print(dspath)
       D:\ery\School\Jupyter Notebooks\bdd100k--1
In [23]: # Loading some images
         rand_img = mpimg.imread('bdd100k--1/test/images/b1d0a191-2ed2269e_jpg.rf.bd35938271
         plt.imshow(rand_img)
         plt.axis('off')
         plt.show()
```

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3 model object detection benchmark

YOLO 11

```
In [4]: yolo_model = YOLO('yolo11n.pt')
yolo_model.train(data='bdd100k--1/data.yaml', epochs = 20, imgsz=640, batch=16)
```

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New https://pypi.org/project/ultralytics/8.3.109 available Update with 'pip install -U ultralytics'

Ultralytics 8.3.107 Python-3.10.13 torch-2.5.1 CUDA:0 (NVIDIA GeForce RTX 2060 SUPE R, 8192MiB)

engine\trainer: task=detect, mode=train, model=yolo11n.pt, data=bdd100k--1/data.yam 1, epochs=20, time=None, patience=100, batch=16, imgsz=640, save=True, save_period=-1, cache=False, device=None, workers=8, project=None, name=train14, exist_ok=False, pretrained=True, optimizer=auto, verbose=True, seed=0, deterministic=True, single_cl s=False, rect=False, cos lr=False, close mosaic=10, resume=False, amp=True, fraction =1.0, profile=False, freeze=None, multi_scale=False, overlap_mask=True, mask_ratio= 4, dropout=0.0, val=True, split=val, save_json=False, conf=None, iou=0.7, max_det=30 0, half=False, dnn=False, plots=True, source=None, vid_stride=1, stream_buffer=Fals e, visualize=False, augment=False, agnostic_nms=False, classes=None, retina_masks=Fa lse, embed=None, show=False, save_frames=False, save_txt=False, save_conf=False, sav e crop=False, show labels=True, show conf=True, show boxes=True, line width=None, fo rmat=torchscript, keras=False, optimize=False, int8=False, dynamic=False, simplify=T rue, opset=None, workspace=None, nms=False, lr0=0.01, lrf=0.01, momentum=0.937, weig ht_decay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8, warmup_bias_lr=0.1, box=7. 5, cls=0.5, dfl=1.5, pose=12.0, kobj=1.0, nbs=64, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0.1, scale=0.5, shear=0.0, perspective=0.0, flipud=0.0, flipl r=0.5, bgr=0.0, mosaic=1.0, mixup=0.0, copy_paste=0.0, copy_paste_mode=flip, auto_au gment=randaugment, erasing=0.4, crop_fraction=1.0, cfg=None, tracker=botsort.yaml, s ave_dir=runs\detect\train14

Overriding model.yaml nc=80 with nc=7

	from	n	params	module	а
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	6640	ultralytics.nn.modules.block.C3k2	
[32, 64, 1, False,	0.251			, , , , , , , , , , , , , , , , , , ,	
3	-1		36992	ultralytics.nn.modules.conv.Conv	
[64, 64, 3, 2]	_	_	3022	a_c, a_j c_c,	
4	-1	1	26080	ultralytics.nn.modules.block.C3k2	
[64, 128, 1, False			20000	uter dry cres.iiii.iiioddres.brock.esk2	
5		'] 1	147712	ultralytics.nn.modules.conv.Conv	
	-1	_	14//12	ultralycics.iiii.iiiodules.comv.comv	
[128, 128, 3, 2]	1	1	07040	without the managed on block C2k2	
6	-1	1	87040	ultralytics.nn.modules.block.C3k2	
[128, 128, 1, True]	_		205424	1. 1	
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	
≛ ⊤	_	_	0	cor cirrii i modutes apsumpting opsumpte	

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```
CPE313_FinalProject_MultiObjectDetection
[None, 2, 'nearest']
                                  0 ultralytics.nn.modules.conv.Concat
               [-1, 4] 1
[1]
                    -1 1
16
                              32096 ultralytics.nn.modules.block.C3k2
[256, 64, 1, False]
                              36992 ultralytics.nn.modules.conv.Conv
                    -1 1
17
[64, 64, 3, 2]
18
              [-1, 13] 1
                                  0 ultralytics.nn.modules.conv.Concat
[1]
                    -1 1
                              86720 ultralytics.nn.modules.block.C3k2
19
[192, 128, 1, False]
                             147712 ultralytics.nn.modules.conv.Conv
20
                    -1 1
[128, 128, 3, 2]
21
              [-1, 10] 1
                                  0 ultralytics.nn.modules.conv.Concat
[1]
                    -1 1
                             378880 ultralytics.nn.modules.block.C3k2
22
[384, 256, 1, True]
          [16, 19, 22] 1 432037 ultralytics.nn.modules.head.Detect
23
[7, [64, 128, 256]]
YOLO11n summary: 181 layers, 2,591,205 parameters, 2,591,189 gradients, 6.4 GFLOPs
Transferred 448/499 items from pretrained weights
TensorBoard: Start with 'tensorboard --logdir runs\detect\train14', view at http://l
ocalhost:6006/
Freezing layer 'model.23.dfl.conv.weight'
AMP: running Automatic Mixed Precision (AMP) checks...
AMP: checks passed
train: Scanning D:\ery\School\Jupyter Notebooks\bdd100k--1\train\labels.cache... 685
7 images, 0 backgrounds, 0 corrupt: 100% 6857/6857 [00:00<?, ?it/s]
images, 0 backgrounds, 0 corrupt: 100% | 1960/1960 [00:00<?, ?it/s]
Plotting labels to runs\detect\train14\labels.jpg...
rmining best 'optimizer', 'lr0' and 'momentum' automatically...
0), 88 weight(decay=0.0005), 87 bias(decay=0.0)
TensorBoard: model graph visualization added
```

val: Scanning D:\ery\School\Jupyter Notebooks\bdd100k--1\valid\labels.cache... 1960 optimizer: 'optimizer=auto' found, ignoring 'lr0=0.01' and 'momentum=0.937' and dete optimizer: AdamW(lr=0.000909, momentum=0.9) with parameter groups 81 weight(decay=0. Image sizes 640 train, 640 val Using 8 dataloader workers Logging results to runs\detect\train14 Starting training for 20 epochs...

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
1/20	3.06G	1.587	1.892	1.178	79	640:	100%
	429/429 [01	:51<00:00,	3.84it/s]				
	Class	Images	Instances	Box(P	R	mAP50	mAP50
-95): 100%		62/62 [00:2	1<00:00,	2.82it/s]			
	all	1960	24550	0.685	0.193	0.193	
0.109							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
2/20	3.06G	1.505	1.294	1.158	173	640:	100%
	429/429 [01	:36<00:00,	4.46it/s]				•
	Class	-	Instances		R	mAP50	mAP50
-95): 100%		62/62 [00:1	8<00:00,	3.28it/sl			

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0.107		all	1960	24550	0.386	0.24	0.199	
	Epoch	GPU mem	box loss	cls_loss	dfl loss	Instances	Size	
	3/20	3.06G		1.186		180		100%
-95):		Class	Images 62/62 [00:1	Instances 18<00:00, 3	•		mAP50	mAP50
0.124		all	1960	24550	0.478	0.22	0.228	
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	4/20			1.138	1.147	247	640:	100%
		Class	_	Instances	•	R	mAP50	mAP50
-95):	100%	all	_	1 <mark>7<00:00, 3</mark> 24550	-	0.243	0.24	
0.133								
	Epoch		_	cls_loss			Size	
	5/20		1.447 1:31<00:00,	1.078 4.71it/s]	1.132	169	640:	100%
-95).		Class	Images	Instances L8<00:00, 3	•		mAP50	mAP50
-22).	100%	all	_	-	0.47		0.26	
0.143								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	6/20	3.06G	1.425	1.038	1.12		Size 640:	100%
	6/20	3.06G 429/429 [03	1.425 1:30<00:00,	1.038 4.73it/s]	1.12	157	640:	·
-95):	6/20	3.06G 429/429 [03 Class	1.425 1:30<00:00, Images	1.038	1.12 Box(P	157	640:	·
-95): 0.155	6/20	3.06G 429/429 [03 Class	1.425 1:30<00:00, Images	1.038 4.73it/s] Instances 17<00:00, 3	1.12 Box(P	157	640:	·
,	6/20	3.06G 429/429 [0: Class	1.425 1:30<00:00, Images 62/62 [00:1 1960	1.038 4.73it/s] Instances	Box(P 6.49it/s] 0.347	157 R 0.306	640: mAP50 0.278	·
,	6/20 100% Epoch	3.06G 429/429 [03 Class all GPU_mem 3.06G	1.425 1:30<00:00, Images 62/62 [00:1 1960 box_loss	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018	Box(P 3.49it/s] 0.347 dfl_loss	157 R 0.306 Instances	640: mAP50 0.278 Size	·
0.155	6/20 100% Epoch 7/20	3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class	1.425 1:30<00:00, Images 62/62 [00:1 1960 box_loss 1.41 1:29<00:00, Images	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018 4.77it/s] Instances	Box(P 8.49it/s] 0.347 dfl_loss 1.117 Box(P	157 R 0.306 Instances 174	640: mAP50 0.278 Size	mAP50
0.155	6/20 100% Epoch	3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class	1.425 1:30<00:00, Images 62/62 [00:1 1960 box_loss 1.41 1:29<00:00, Images	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018 4.77it/s] Instances 18<00:00, 3	Box(P 8.49it/s] 0.347 dfl_loss 1.117 Box(P	157 R 0.306 Instances 174	640: mAP50 0.278 Size 640: mAP50	mAP50
0.155	6/20 100% Epoch 7/20	3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class	1.425 1:30<00:00, Images 62/62 [00:1 1960 box_loss 1.41 1:29<00:00, Images 62/62 [00:1	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018 4.77it/s] Instances 18<00:00, 3	Box(P 4.49it/s] 0.347 dfl_loss 1.117 Box(P	157 R 0.306 Instances 174 R	640: mAP50 0.278 Size 640: mAP50	mAP50
0.155-95):	6/20 100% Epoch 7/20 100%	3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class	1.425 1:30<00:00, Images 62/62 [00:1 1960 box_loss 1.41 1:29<00:00, Images 62/62 [00:1	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018 4.77it/s] Instances 18<00:00, 3	Box(P 3.49it/s] 0.347 dfl_loss 1.117 Box(P 3.38it/s] 0.392	157 R 0.306 Instances 174 R 0.293	640: mAP50 0.278 Size 640: mAP50 0.274	mAP50
0.155-95):	6/20 100% Epoch 7/20 100% Epoch 8/20	3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class all GPU_mem 3.06G	1.425 1:30<00:00,	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018 4.77it/s] Instances 1.8<00:00, 3 24550 cls_loss 1.003	Box(P 8.49it/s] 0.347 dfl_loss 1.117 Box(P 8.38it/s] 0.392 dfl_loss	R 0.306 Instances 174 R 0.293	640: mAP50 0.278 Size 640: mAP50 0.274 Size	mAP50
0.155 -95): 0.15	6/20 100% Epoch 7/20 100% Epoch 8/20	3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class Class GPU_mem 3.06G	1.425 1:30<00:00,	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018 4.77it/s] Instances 1.8<00:00, 3 24550 cls_loss 1.003 4.75it/s] Instances	Box(P 3.49it/s] 0.347 dfl_loss 1.117 Box(P 3.38it/s] 0.392 dfl_loss 1.11 Box(P	157 R 0.306 Instances 174 R 0.293 Instances	640: mAP50 0.278 Size 640: mAP50 0.274 Size 640:	mAP50 100% mAP50
0.155 -95): 0.15	6/20 100% Epoch 7/20 100% Epoch 8/20	3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class Class GPU_mem 3.06G	1.425 1:30<00:00,	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018 4.77it/s] Instances 18<00:00, 3 24550 cls_loss 1.003 4.75it/s]	Box(P 3.49it/s] 0.347 dfl_loss 1.117 Box(P 3.38it/s] 0.392 dfl_loss 1.11 Box(P	157 R 0.306 Instances 174 R 0.293 Instances	640: mAP50 0.278 Size 640: mAP50 0.274 Size 640:	mAP50 100% mAP50
0.155 -95): 0.15	6/20 100% Epoch 7/20 100% Epoch 8/20	3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class all GPU_mem 3.06G 429/429 [03 Class	1.425 1:30<00:00,	1.038 4.73it/s] Instances 17<00:00, 3 24550 cls_loss 1.018 4.77it/s] Instances 18<00:00, 3 24550 cls_loss 1.003 4.75it/s] Instances 17<00:00, 3	Box(P 3.49it/s] 0.347 dfl_loss 1.117 Box(P 3.38it/s] 0.392 dfl_loss 1.11 Box(P	157 R 0.306 Instances 174 R 0.293 Instances 152 R	640: mAP50 0.278 Size 640: mAP50 0.274 Size 640: mAP50	mAP50 100% mAP50

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	9/20			0.9746		290	640:	100%
		429/429 [0 Class	1:31<00:00,	4.71it/s] Instances		R	mAP50	mADEQ
-95):	100%		62/62 [00:1		•	N.	IIIAPOU	IIIAPSU
•		all	_	-	0.399	0.328	0.307	
0.174								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	10/20	3.06G	1.367	0.9569	1.097	192	640:	100%
		_	1:29<00:00,	_				
QE).	100%	Class	Images 62/62 [00:1	Instances	•	R	mAP50	mAP50
-95).	100%	all	_	-	0.405	0.351	0.33	
0.185								
Closi	ng data	aloader mos	aic					
	Epoch	GPU mem	box_loss	cls loss	dfl loss	Instances	Size	
	11/20	_	_	0.9142	_	96		100%
			1:24<00:00,					
05)	4000/1	Class	_	Instances	•	R	mAP50	mAP50
-95):	100%	all	62/62 [00:1 1960	-	_	0.333	0.34	
0.193		all.	1300	24330	0.433	0.555	0.54	
			_					
		_	box_loss	_	_			
	12/20		1.373 1:23<00:00,	0.8985 5 15i+/cl	1.089	117	640:	100%
		Class		Instances	Box(P	R	mAP50	mAP50
-95):	100%		62/62 [00:3	-	-			
0.194		all	1960	24550	0.444	0.356	0.351	
0.194								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	13/20			0.8829	1.082	80	640:	100%
		_	1:23<00:00,	5.16it/s] Instances	Pov/D	D	mADEQ.	m A D F O
-95):	100%	Class	62/62 [00:1		•	R	mAP50	MAPSO
- /		all	_	-	0.461	0.35	0.354	
0.198								
	Epoch	GPU mem	box_loss	cls loss	dfl loss	Instances	Size	
	14/20			0.8663				100%
		429/429 [0	1:23<00:00,	5.14it/s]				
٥٤١.	100%	Class	•	Instances	•	R	mAP50	mAP50
-95):	100%	all	62/62 [00:1 1960	-	0.55	0.349	0.375	
0.21		411	1500	21330	0.33	0.515	0.373	
	Epoch			_	dfl_loss			4000/1
	15/20	3.06G 429/429 [0	1.338 1:24<00:00,	0.8562 5.07it/sl	1.072	95	640:	100%
		Class		Instances	Box(P	R	mAP50	mAP50
-95):	100%		62/62 [00:3		•			

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0.211	all	1960	24550	0.485	0.364	0.37	
Epoch	GPU mem	box loss	cls_loss	dfl loss	Instances	Size	
16/20	3.06G	1.334	0.844 5.15it/s]	1.067		640:	100%
-95): 100%	Class	Images	Instances	Box(P	R	mAP50	mAP50
0.218	all	1960	24550	0.572	0.347	0.387	
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
17/20	3.06G		0.8286		106	640:	100%
-95): 100%	Class	Images	5.16it/s] Instances	Box(P	R	mAP50	mAP50
-93). 100%	all	1960	-	0.585	0.341	0.382	
0.221							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
18/20	129/429 [01	:24<00:00,				640:	100%
-95): 100%	Class	•	Instances 17<00:00, 3	•		mAP50	mAP50
0.225	all	1960	-	0.516		0.384	
0.225							
Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
19/20			0.8085 5.07it/s]	1.054	123	640:	100%
4	129/429 [01 Class	:24<00:00, Images	5.07it/s] Instances	Box(P	123 R		·
<u> </u>	129/429 [01 Class	:24<00:00, Images 62/62 [00:1	5.07it/s] Instances .7<00:00, 3	Box(P	R	mAP50	·
4	129/429 [01 Class	.:24<00:00, Images 62/62 [00:1	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s]	R	mAP50	·
-95): 100% -	129/429 [01 Class	.:24<00:00, Images 62/62 [00:1	5.07it/s] Instances .7<00:00, 3 24550	Box(P .54it/s]	R	mAP50	·
-95): 100% 0.228 Epoch 20/20	129/429 [01 Class all GPU_mem 3.06G	:24<00:00, Images 62/62 [00:1 1960 box_loss 1.294	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s] 0.57	R 0.344	mAP50 0.388 Size	·
-95): 100% 0.228 Epoch 20/20	A29/429 [01 Class all GPU_mem 3.06G A29/429 [01 Class	:24<00:00,	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s] 0.57 dfl_loss 1.049 Box(P	R 0.344 Instances	mAP50 0.388 Size	mAP50
-95): 100% 0.228 Epoch 20/20 -95): 100% 4	A29/429 [01 Class all GPU_mem 3.06G A29/429 [01 Class	:24<00:00,	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s] 0.57 dfl_loss 1.049 Box(P	R 0.344 Instances 127	mAP50 0.388 Size 640:	mAP50
-95): 100% 0.228 Epoch 20/20	A29/429 [01 Class all GPU_mem 3.06G A29/429 [01 Class	:24<00:00,	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s] 0.57 dfl_loss 1.049 Box(P .53it/s]	R 0.344 Instances 127 R	mAP50 0.388 Size 640: mAP50	mAP50
-95): 100% 0.228 Epoch 20/20 -95): 100% 4	GPU_mem 3.06G 129/429 [01 GRU_mem 3.06G 129/429 [01 Class all all	:24<00:00,	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s] 0.57 dfl_loss 1.049 Box(P .53it/s] 0.568	R 0.344 Instances 127 R 0.358	mAP50 0.388 Size 640: mAP50	mAP50
-95): 100% 0.228 Epoch 20/20 -95): 100% 0.233 20 epochs com Optimizer str Optimizer str Validating ru Ultralytics 8	GPU_mem 3.06G 129/429 [01 Class all class all inpleted in ripped from	:24<00:00,	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s] 0.57 dfl_loss 1.049 Box(P .53it/s] 0.568 eights\last	R 0.344 Instances 127 R 0.358	mAP50 0.388 Size 640: mAP50 0.398	mAP50 100% mAP50
-95): 100% 0.228 Epoch 20/20 -95): 100% 0.233 20 epochs com Optimizer str Optimizer str Validating ru Ultralytics 8 R, 8192MiB)	GPU_mem 3.06G 429/429 [01 Class 41 Class 429/429 [01 Class 41 all mpleted in ripped from ripped from ripped from uns\detect\ 3.3.107 Py	:24<00:00,	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s]	R 0.344 Instances 127 R 0.358 .pt, 5.5MB .pt, 5.5MB	mAP50 0.388 Size 640: mAP50 0.398	100% mAP50
-95): 100% 0.228 Epoch 20/20 -95): 100% 0.233 20 epochs com Optimizer str Optimizer str Validating ru Ultralytics 8	GPU_mem 3.06G 129/429 [01 Class 1.11 GPU_mem 3.06G 129/429 [01 Class Inpleted in ripped from ripped from uns\detect\ 3.3.107 Py ary (fused) Class	:24<00:00,	5.07it/s] Instances .7<00:00, 3	Box(P .54it/s]	R 0.344 Instances 127 R 0.358 .pt, 5.5MB .pt, 5.5MB	mAP50 0.388 Size 640: mAP50 0.398	100% mAP50

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0.000	all	1960	24550	0.553	0.362	0.398	
0.233	bike	121	221	0.473	0.294	0.289	
0.136	bus	227	309	0.565	0.391	0.437	
0.318	car	1956	20327	0.704	0.659	0.719	
0.44	motor	67	90	0.63	0.151	0.223	
0.106					0.428		
0.215	person	639	2626	0.563		0.462	
0829	rider	104	133	0.398	0.158	0.182	0.
0.332	truck	526	844	0.539	0.454	0.472	

Speed: 0.2ms preprocess, 2.0ms inference, 0.0ms loss, 1.6ms postprocess per image Results saved to runs\detect\train14

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Out[4]: ultralytics.utils.metrics.DetMetrics object with attributes:

ap_class_index: array([0, 1, 2, 3, 4, 5, 6]) box: ultralytics.utils.metrics.Metric object confusion_matrix: <ultralytics.utils.metrics.ConfusionMatrix object at 0x000002127 C82CBB0> curves: ['Precision-Recall(B)', 'F1-Confidence(B)', 'Precision-Confidence(B)', 'Re call-Confidence(B)'] curves_results: [[array([0, 0.001001, 0.002002, 0.003003, 0. 004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.009009, 0.010 01, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015, 0.016016, 0.017017, 0.018018, 0.019019, 0.02002, 0.021021, 0.022022, 0.02 3023, 0.024024, 0.025025, 0.026026, 0.027027, 0.028028, 0.02902 0.03003, 0.031031, 0.032032, 0.033033, 0.034034, 0.035035, 9, 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 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 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 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 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 0.21121, 0.21221, 0.21321, 0.21421, 0.21522, 0.21622, 0.21722, 0.21822, 0.21922, 0.22022, 0.2212 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 0.23524, 0.23624, 0.23724, 0.23824, 0.23924, 0.24024, 0.24124, 0.24224, 0.24324, 0.24424, 423, 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 0.25926, 0.26026, 0.26126, 0.26226, 0.26326, 0.26426, 0.26527, 0.26627, 0.26727, 0.26827, 0.2692 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

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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 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, 0.57658, 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, 0.6967, 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 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,

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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 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 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 0.88388, 0.88488, 0.88589, 0.88689, 0.88789, 0.88889, 0.88989, 0.89089, 0.89189, 0.89289, 0.8938 288. 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, 9, 0.99099, 0.99199, 0.99299, 0.99399, 0.99499, 0.996, 0.997, 0.998, 0.999, 1]), array([[0.64253, 0.64253, 0.63348, ..., 0, 0], [0.88997, 0.88997, 0.85761, ..., 0, 0, 0], [0.86939, 0.86939, 0.86575, ..., 0, 0, 0], [0.78941, 0.78941. 0.78142, ..., 0, 0, 0], [0.58647, 0.58647, 0.57895, ..., 0, 0, 0], 0.88863, 0.88863, 0.87678, ..., 0, 0, 0]]), 'Confidence', 'Recall']] fitness: 0.24928209358732775 keys: ['metrics/precision(B)', 'metrics/recall(B)', 'metrics/mAP50(B)', 'metrics/m AP50-95(B)']

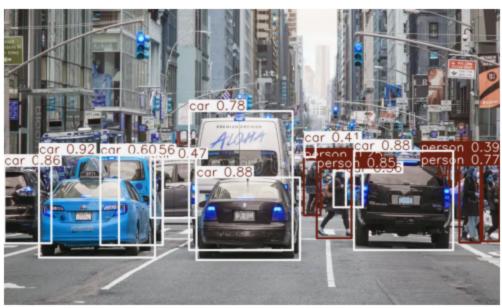
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```
maps: array([ 0.13567,
                             0.31803,
                                        0.44004,
                                                       0.10584,
                                                                    0.21512,
0.082854,
             0.33188])
names: {0: 'bike', 1: 'bus', 2: 'car', 3: 'motor', 4: 'person', 5: 'rider', 6: 'tr
uck'}
plot: True
results_dict: {'metrics/precision(B)': 0.5530464812207251, 'metrics/recall(B)': 0.
36218608893693144, 'metrics/mAP50(B)': 0.39783847997026917, 'metrics/mAP50-95(B)':
0.2327758284336676, 'fitness': 0.24928209358732775}
save dir: WindowsPath('runs/detect/train14')
speed: {'preprocess': 0.18187285714906912, 'inference': 1.973027040819906, 'loss':
0.0004967346823683997, 'postprocess': 1.571432704088006}
task: 'detect'
```

```
In [10]: pred_test = yolo_model('street-traffic-new-york-typical-street-view-manhattan-manha
    plt.imshow(pred_test[0].plot())
    plt.axis('off')
    plt.show()
```

image 1/1 D:\ery\School\Jupyter Notebooks\street-traffic-new-york-typical-street-vie
w-manhattan-manhattan-new-york-april-92272598.webp: 384x640 11 cars, 6 persons, 69.1
ms

Speed: 3.3ms preprocess, 69.1ms inference, 2.4ms postprocess per image at shape (1, 3, 384, 640)



```
In [11]: # saving the model in onnx
yolo_model.export(format='onnx')
```

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```
Ultralytics 8.3.107 Python-3.10.13 torch-2.5.1 CPU (AMD Ryzen 5 2600 Six-Core Proce
        ssor)
        PyTorch: starting from 'runs\detect\train14\weights\best.pt' with input shape (1, 3,
        640, 640) BCHW and output shape(s) (1, 11, 8400) (5.2 MB)
        ONNX: starting export with onnx 1.17.0 opset 19...
        ONNX: slimming with onnxslim 0.1.50...
        ONNX: export success 6.0s, saved as 'runs\detect\train14\weights\best.onnx' (10.1 M
        B)
        Export complete (7.0s)
        Results saved to D:\ery\School\Jupyter Notebooks\runs\detect\train14\weights
                         yolo predict task=detect model=runs\detect\train14\weights\best.onn
        Predict:
        x imgsz=640
        Validate:
                         yolo val task=detect model=runs\detect\train14\weights\best.onnx im
        gsz=640 data=bdd100k--1/data.yaml
        Visualize:
                         https://netron.app
Out[11]: 'runs\\detect\\train14\\weights\\best.onnx'
         dataset.location
In [12]:
```

YOLOv8

Out[12]: 'D:\\ery\\School\\Jupyter Notebooks\\bdd100k--1'

```
In [4]: yolov8_model = YOLO('yolov8n.yaml')
yolov8_model.train(data='bdd100k--1/data.yaml', epochs=50, imgsz=640, batch=16)
```

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New https://pypi.org/project/ultralytics/8.3.109 available Update with 'pip install -U ultralytics'

Ultralytics 8.3.107 Python-3.10.13 torch-2.5.1 CUDA:0 (NVIDIA GeForce RTX 2060 SUPE R, 8192MiB)

engine\trainer: task=detect, mode=train, model=yolov8n.yaml, data=bdd100k--1/data.ya ml, epochs=50, time=None, patience=100, batch=16, imgsz=640, save=True, save_period= -1, cache=False, device=None, workers=8, project=None, name=train18, exist_ok=False, pretrained=True, optimizer=auto, verbose=True, seed=0, deterministic=True, single_cl s=False, rect=False, cos lr=False, close mosaic=10, resume=False, amp=True, fraction =1.0, profile=False, freeze=None, multi_scale=False, overlap_mask=True, mask_ratio= 4, dropout=0.0, val=True, split=val, save_json=False, conf=None, iou=0.7, max_det=30 0, half=False, dnn=False, plots=True, source=None, vid_stride=1, stream_buffer=False e, visualize=False, augment=False, agnostic_nms=False, classes=None, retina_masks=Fa lse, embed=None, show=False, save_frames=False, save_txt=False, save_conf=False, sav e crop=False, show labels=True, show conf=True, show boxes=True, line width=None, fo rmat=torchscript, keras=False, optimize=False, int8=False, dynamic=False, simplify=T rue, opset=None, workspace=None, nms=False, lr0=0.01, lrf=0.01, momentum=0.937, weig ht_decay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8, warmup_bias_lr=0.1, box=7. 5, cls=0.5, dfl=1.5, pose=12.0, kobj=1.0, nbs=64, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0.1, scale=0.5, shear=0.0, perspective=0.0, flipud=0.0, flipl r=0.5, bgr=0.0, mosaic=1.0, mixup=0.0, copy_paste=0.0, copy_paste_mode=flip, auto_au gment=randaugment, erasing=0.4, crop_fraction=1.0, cfg=None, tracker=botsort.yaml, s ave_dir=runs\detect\train18

Overriding model.yaml nc=80 with nc=7

	from	n	params	module	а
rguments	-1	1	464	ultualuties un modulos conv. Conv.	
0 [3, 16, 3, 2]	-1	1	464	ultralytics.nn.modules.conv.Conv	
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]	_	_	7500	artialytics.mi.modules.block.czi	
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 [128, 256, 3, 2]	-1	1	295424	ultralytics.nn.modules.conv.Conv	
8	-1	1	460288	ultralytics.nn.modules.block.C2f	
[256, 256, 1, True		1	164600	ultualutics un modulos block CDDF	
[256, 256, 5]	-1	1	164608	ultralytics.nn.modules.block.SPPF	
10	-1	1	0	torch.nn.modules.upsampling.Upsample	
[None, 2, 'nearest	'] 1, 6]	1	0	ultralytics.nn.modules.conv.Concat	
[1]	1, 0]	-	O	uttralycles.mr.modules.comv.concac	
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	

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```
[1]
                              37248 ultralytics.nn.modules.block.C2f
15
                    -1 1
[192, 64, 1]
                    -1 1
                              36992 ultralytics.nn.modules.conv.Conv
16
[64, 64, 3, 2]
                                  0 ultralytics.nn.modules.conv.Concat
17
              [-1, 12] 1
[1]
18
                    -1 1
                             123648 ultralytics.nn.modules.block.C2f
[192, 128, 1]
                             147712 ultralytics.nn.modules.conv.Conv
19
                    -1 1
[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]
          [15, 18, 21] 1 752677 ultralytics.nn.modules.head.Detect
22
[7, [64, 128, 256]]
YOLOv8n summary: 129 layers, 3,012,213 parameters, 3,012,197 gradients, 8.2 GFLOPs
```

TensorBoard: Start with 'tensorboard --logdir runs\detect\train18', view at http://l
ocalhost:6006/

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

AMP: running Automatic Mixed Precision (AMP) checks...

AMP: checks passed

train: Scanning D:\ery\School\Jupyter Notebooks\bdd100k--1\train\labels.cache... 685
7 images, 0 backgrounds, 0 corrupt: 100%| 6857/6857 [00:00<?, ?it/s]
val: Scanning D:\ery\School\Jupyter Notebooks\bdd100k--1\valid\labels.cache... 1960
images, 0 backgrounds, 0 corrupt: 100%| 1960/1960 [00:00<?, ?it/s]
Plotting labels to runs\detect\train18\labels.jpg...</pre>

optimizer: 'optimizer=auto' found, ignoring 'lr0=0.01' and 'momentum=0.937' and dete
rmining best 'optimizer', 'lr0' and 'momentum' automatically...

optimizer: AdamW(lr=0.000909, momentum=0.9) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)

TensorBoard: model graph visualization added

Image sizes 640 train, 640 val

Using 8 dataloader workers

Logging results to runs\detect\train18

Starting training for 50 epochs...

	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	1/50	2.83G	3.63	3.819	3.478	79	640:	100%
		429/429 [02	2:16<00:00,	3.14it/s]				
		Class	Images	Instances	Box(P	R	mAP50	mAP50
-95):	100%		62/62 [00:2	1<00:00,	2.91it/s]			
		all	1960	24550	0.879	0.0184	0.0115	0.0
0369								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	2/50	2.85G	2.707	2.414	2.143	173	640:	100%
		429/429 [01	:24<00:00,	5.06it/s]				·
		Class	Images	Instances	Box(P	R	mAP50	mAP50
-95):	100%		62/62 [00:1	9<00:00.	3.22it/sl			

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0208		all	1960	24550	0.629	0.0449	0.0498	0.
	Epoch	GPU mem	box loss	cls_loss	dfl loss	Instances	Size	
	3/50	_	_	1.918	_			100%
		429/429 [01			_,,,,,		0.00	
				Instances	•	R	mAP50	mAP50
-95):	100%		_	19<00:00, 3	_			
0343		all	1960	24550	0.546	0.0916	0.0745	0.
05.5								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	4/50			1.719	1.602	247	640:	100%
		429/429 [01	-	-		_		
QE).	100%	Class		Instances 19<00:00, 3	•	R	mAP50	mAP50
-95).	100%	all	1960		0.577	0.124	0.103	0.
0503								
	Epoch	-	_	cls_loss	-			
	5/50			1.568	1.52	169	640:	100%
		429/429 [01 Class	-	5.3/it/s] Instances	Roy (P	R	mAP50	mAD50
-95):	100%		•	103 cances 18<00:00, 3	•		IIIAF JO	IIIAF JO
,		all	1960		_	0.141	0.124	0.
0608								
	Enoch	GDII mom	hov loss	cle loce	dfl loss	Instances	Sizo	
		_	_	cls_loss	_			100%
	6/50	2.85G	1.858	1.46	1.46		Size 640:	100%
-	6/50	2.85G 429/429 [01	1.858 1:20<00:00,	_	1.46	157	640:	100% mAP50
	6/50	2.85G 429/429 [01 Class	1.858 1:20<00:00, Images 62/62 [00:1	1.46 5.36it/s]	1.46 Box(P	157 R	640: mAP50	·
-95):	6/50	2.85G 429/429 [01 Class	1.858 1:20<00:00, Images	1.46 5.36it/s] Instances	1.46 Box(P	157 R	640:	·
	6/50	2.85G 429/429 [01 Class	1.858 1:20<00:00, Images 62/62 [00:1	1.46 5.36it/s] Instances 19<00:00, 3	1.46 Box(P	157 R	640: mAP50	mAP50
-95):	6/50	2.85G 429/429 [01 Class	1.858 1:20<00:00, Images 62/62 [00:1	1.46 5.36it/s] Instances 19<00:00, 3 24550	Box(P 3.14it/s] 0.463	157 R 0.149	640: mAP50 0.135	mAP50
-95):	6/50 100%	2.85G 429/429 [01 Class all	1.858 1:20<00:00, Images 62/62 [00:1 1960 box_loss	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss	Box(P 3.14it/s] 0.463 dfl_loss	157 R 0.149 Instances	640: mAP50 0.135 Size	mAP50
-95):	6/50 100% Epoch	2.85G 429/429 [01 Class all	1.858 1:20<00:00, Images 62/62 [00:1 1960 box_loss	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409	Box(P 3.14it/s] 0.463 dfl_loss	157 R 0.149 Instances	640: mAP50 0.135 Size	mAP50
-95): 0681	6/50 100% Epoch 7/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.858 1:20<00:00, Images 62/62 [00:1 1960 box_loss 1.8 1:22<00:00, Images	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances	Box(P 1.46 Box(P 1.411/s] 0.463 dfl_loss 1.427 Box(P	157 R 0.149 Instances 174	640: mAP50 0.135 Size	mAP50 0. 100%
-95): 0681	6/50 100% Epoch	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.858 1:20<00:00, Images 62/62 [00:1 1960 box_loss 1.8 1:22<00:00, Images 62/62 [00:1	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 18<00:00, 3	1.46 Box(P 3.14it/s] 0.463 dfl_loss 1.427 Box(P 3.27it/s]	157 R 0.149 Instances 174 R	640: mAP50 0.135 Size 640: mAP50	mAP50 0. 100% mAP50
-95): 0681	6/50 100% Epoch 7/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.858 1:20<00:00, Images 62/62 [00:1 1960 box_loss 1.8 1:22<00:00, Images	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 18<00:00, 3	Box(P 1.46 Box(P 1.411/s] 0.463 dfl_loss 1.427 Box(P	157 R 0.149 Instances 174	640: mAP50 0.135 Size 640: mAP50	mAP50 0. 100%
-95): 0681	6/50 100% Epoch 7/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.858 1:20<00:00, Images 62/62 [00:1 1960 box_loss 1.8 1:22<00:00, Images 62/62 [00:1	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 18<00:00, 3	1.46 Box(P 3.14it/s] 0.463 dfl_loss 1.427 Box(P 3.27it/s]	157 R 0.149 Instances 174 R	640: mAP50 0.135 Size 640: mAP50	mAP50 0. 100% mAP50
-95): 0681	6/50 100% Epoch 7/50 100%	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.858 1:20<00:00, Images 62/62 [00:1 1960 box_loss 1.8 1:22<00:00, Images 62/62 [00:1	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 18<00:00, 3	1.46 Box(P 3.14it/s] 0.463 dfl_loss 1.427 Box(P 3.27it/s] 0.482	157 R 0.149 Instances 174 R 0.165	640: mAP50 0.135 Size 640: mAP50 0.146	mAP50 0. 100% mAP50
-95): 0681	6/50 100% Epoch 7/50 100% Epoch 8/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class all GPU_mem 2.85G	1.858 1:20<00:00,	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 1.8<00:00, 3 24550 cls_loss 1.351	Box(P 8.14it/s] 0.463 dfl_loss 1.427 Box(P 8.27it/s] 0.482 dfl_loss	R 0.149 Instances 174 R 0.165 Instances	640: mAP50 0.135 Size 640: mAP50 0.146 Size	mAP50 0. 100% mAP50
-95): 0681	6/50 100% Epoch 7/50 100% Epoch 8/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [02 Class	1.858 1:20<00:00,	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 18<00:00, 3 24550 cls_loss 1.351 5.24it/s]	Box(P 1.463 dfl_loss 1.427 Box(P 2.27it/s] 0.482 dfl_loss 1.387	157 R 0.149 Instances 174 R 0.165 Instances 152	640: mAP50 0.135 Size 640: mAP50 0.146 Size 640:	mAP50 0. 100% mAP50 0.
-95): 0681 -95): 0723	6/50 100% Epoch 7/50 100% Epoch 8/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class	1.858 1:20<00:00,	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 1.8<00:00, 3 24550 cls_loss 1.351 5.24it/s] Instances	Box(P 1.46 Box(P 1.41/s] 0.463 dfl_loss 1.427 Box(P 2.27it/s] 0.482 dfl_loss 1.387 Box(P	157 R 0.149 Instances 174 R 0.165 Instances 152	640: mAP50 0.135 Size 640: mAP50 0.146 Size 640:	mAP50 0. 100% mAP50 0.
-95): 0681 -95): 0723	6/50 100% Epoch 7/50 100% Epoch 8/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class	1.858 1:20<00:00,	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 18<00:00, 3 24550 cls_loss 1.351 5.24it/s] Instances 18<00:00, 3	Box(P 1.46 Box(P 1.41/s] 0.463 dfl_loss 1.427 Box(P 1.427 Box(P 1.427 Box(P 1.427 Box(P 1.427	157 R 0.149 Instances 174 R 0.165 Instances 152 R	640: mAP50 0.135 Size 640: mAP50 0.146 Size 640:	mAP50 0. 100% mAP50 0.
-95): 0681 -95): 0723	6/50 100% Epoch 7/50 100% Epoch 8/50 100%	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class	1.858 1:20<00:00,	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 18<00:00, 3 24550 cls_loss 1.351 5.24it/s] Instances 18<00:00, 3	Box(P 1.46 Box(P 1.41/s] 0.463 dfl_loss 1.427 Box(P 1.427 Box(P 1.427 Box(P 1.427 Box(P 1.427	157 R 0.149 Instances 174 R 0.165 Instances 152 R	640: mAP50 0.135 Size 640: mAP50 0.146 Size 640: mAP50	mAP50 0. 100% mAP50 0.
-95): 0681 -95): 0723	6/50 100% Epoch 7/50 100% Epoch 8/50 100%	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class 411	1.858 1:20<00:00,	1.46 5.36it/s] Instances 19<00:00, 3 24550 cls_loss 1.409 5.22it/s] Instances 18<00:00, 3 24550 cls_loss 1.351 5.24it/s] Instances 18<00:00, 3	Box(P 1.46 Box(P 1.41/s] 0.463 dfl_loss 1.427 Box(P 1.27it/s] 0.482 dfl_loss 1.387 Box(P 1.387 Box(P 1.387	157 R 0.149 Instances 174 R 0.165 Instances 152 R 0.197	640: mAP50 0.135 Size 640: mAP50 0.146 Size 640: mAP50	mAP50 0. 100% mAP50 0.

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	9/50			1.297		290	640:	100%
		_	L:19<00:00,	_				
05).	100%	Class		Instances	Box(P 3.31it/s]		mAP50	mAP50
-95):	100%	all	1960		_		0.168	0.
0866		all	1500	24330	0.320	0.104	0.100	0.
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	10/50	2.85G	1.663	1.261	1.338	192	640:	100%
		429/429 [01	L:23<00:00,	5.13it/s]				
	_	Class	_		Box(P	R	mAP50	mAP50
-95):	100%		62/62 [00:1		_			
0 001		all	1960	24550	0.336	0.219	0.178	
0.091								
	Epoch	GPU mem	box loss	cls loss	dfl_loss	Instances	Size	
	11/50		_	_	1.325		640:	100%
			l:18<00:00,			173	040.	100/01
		Class	-	-	Box(P	R	mAP50	mAP50
-95):	100%		62/62 [00:1	7<00:00,	3.45it/s]			
		all	1960	24550	0.545	0.195	0.18	0.
0942								
	Г l	CDII mam	hav. 1aaa	-1- 1	461 1000	Tueteness	C:	
	•	_	_	_	dfl_loss			
	12/50		1.616 L:18<00:00,		1.304	229	640:	100%
		Class	-	-	Box(P	R	mAP50	mΔP50
-95):	100%		62/62 [00:1		•	IX.	IIIAI 30	IIIAI 30
- /		all	1960	-	_	0.187	0.191	0.
0989								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss			
	13/50		1.61		1.299	167	640:	100%
			l:17<00:00,		5 (5		4050	4050
-05).	100%	Class	1mages 62/62 [00:1	Instances	•	R	mAP50	MAP50
-33).	100%	all	1960		_	0.213	0.196	
0.102		V				3122	0,120	
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	14/50	2.85G	1.584	1.172	1.287	162	640:	100%
		-	l:17<00:00,	-				
>		Class	_	Instances	•	R	mAP50	mAP50
-95):	100%		62/62 [00:1		_	0.226	0.197	
0.103		all	1960	24550	0.377	0.226	0.197	
3.103								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	15/50	2.85G	1.582	1.169	1.278	118	640:	100%
			L:17<00:00,					
		Class	•	Instances	•	R	mAP50	mAP50
-95):	100%		62/62 [00:1	7<00:00,	3.47it/s]			

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0.107		all	1960	24550	0.396	0.219	0.208	
	Epoch	GPU mem	box_loss	cls loss	dfl loss	Instances	Size	
	16/50	2.85G		1.148				100%
-95):	100%		Images 62/62 [00:1	7<00:00, 3	•			mAP50
0.108		all	1960	24550	0.3	0.222	0.205	
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
		2.85G		1.128	1.255	97	640:	100%
		_	1:17<00:00, Images	_	Pov/P	D	mAP50	mADEQ
-95):	100%		62/62 [00:1		•	r.	IIIAPOU	IIIAPOU
		all	1960	24550	0.313	0.227	0.211	
0.112								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	18/50	2.85G	1.543	1.117	1.246	188	640:	100%
		-	1:17<00:00,	-	_	_		
-95):	100%	Class	Images 62/62 [00:1	Instances	•		mAP50	mAP50
22/.	200/01	all	1960		0.337		0.215	
0.116								
	Epoch	GPU mem	box loss	cls loss	dfl loss	Instances	Size	
	-	_	box_loss	_	_			100%
	19/50	2.85G	_	1.115	dfl_loss 1.241			100%
05)	19/50	2.85G 429/429 [03 Class	1.545 1:17<00:00, Images	1.115 5.55it/s] Instances	1.241 Box(P	161	640:	·
-95):	19/50	2.85G 429/429 [03 Class	1.545 1:17<00:00, Images 62/62 [00:1	1.115 5.55it/s] Instances	1.241 Box(P	161 R	640: mAP50	·
-95): 0.116	19/50	2.85G 429/429 [03 Class	1.545 1:17<00:00, Images	1.115 5.55it/s] Instances	1.241 Box(P	161	640:	·
,	19/50	2.85G 429/429 [0: Class	1.545 1:17<00:00, Images 62/62 [00:1	1.115 5.55it/s] Instances .7<00:00, 3 24550	Box(P .53it/s] 0.337	161 R 0.257	640: mAP50 0.214	·
,	19/50 100% Epoch 20/50	2.85G 429/429 [03 Class all GPU_mem 2.85G	1.545 1:17<00:00, Images 62/62 [00:1 1960 box_loss	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099	Box(P .53it/s] 0.337 dfl_loss	161 R 0.257 Instances	640: mAP50 0.214 Size	·
,	19/50 100% Epoch 20/50	2.85G 429/429 [03 Class all all GPU_mem 2.85G 429/429 [03	1.545 1:17<00:00, Images 62/62 [00:1 1960 box_loss 1.533 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s]	Box(P .53it/s] 0.337 dfl_loss 1.235	161 R 0.257 Instances 115	640: mAP50 0.214 Size 640:	mAP50
0.116	19/50 100% Epoch 20/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class	1.545 1:17<00:00, Images 62/62 [00:1 1960 box_loss 1.533 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances	Box(P .53it/s] 0.337 dfl_loss 1.235 Box(P	161 R 0.257 Instances 115	640: mAP50 0.214 Size 640:	mAP50
0.116-95):	19/50 100% Epoch 20/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class	1.545 1:17<00:00, Images 62/62 [00:1 1960 box_loss 1.533 1:17<00:00, Images	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances 7<00:00, 3	Box(P .53it/s] 0.337 dfl_loss 1.235 Box(P	161 R 0.257 Instances 115	640: mAP50 0.214 Size 640: mAP50	mAP50
0.116	19/50 100% Epoch 20/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class	1.545 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances 7<00:00, 3	1.241 Box(P .53it/s] 0.337 dfl_loss 1.235 Box(P .49it/s]	161 R 0.257 Instances 115 R	640: mAP50 0.214 Size 640: mAP50	mAP50
0.116-95):	19/50 100% Epoch 20/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class	1.545 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances 7<00:00, 3 24550	1.241 Box(P 5.53it/s] 0.337 dfl_loss 1.235 Box(P 5.49it/s] 0.363	161 R 0.257 Instances 115 R 0.228	640: mAP50 0.214 Size 640: mAP50 0.218	mAP50
0.116-95):	19/50 100% Epoch 20/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class	1.545 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances 7<00:00, 3 24550 cls_loss	Box(P .53it/s] 0.337 dfl_loss 1.235 Box(P .49it/s] 0.363 dfl_loss	161 R 0.257 Instances 115 R 0.228 Instances	640: mAP50 0.214 Size 640: mAP50 0.218	mAP50
0.116-95):	19/50 100% Epoch 20/50 100% Epoch 21/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 429/429 [03	1.545 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.098 5.54it/s]	Box(P .53it/s] 0.337 dfl_loss 1.235 Box(P .49it/s] 0.363 dfl_loss 1.235	161 R 0.257 Instances 115 R 0.228 Instances	640: mAP50 0.214 Size 640: mAP50 0.218 Size 640:	mAP50 100% mAP50
0.116 -95): 0.117	19/50 100% Epoch 20/50 100% Epoch 21/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class 429/429 [03 Class 429/429 [03	1.545 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.098 5.54it/s] Instances	Box(P .53it/s] 0.337 dfl_loss 1.235 Box(P .49it/s] 0.363 dfl_loss 1.235 Box(P	161 R 0.257 Instances 115 R 0.228 Instances	640: mAP50 0.214 Size 640: mAP50 0.218 Size 640:	mAP50 100% mAP50
0.116 -95): 0.117	19/50 100% Epoch 20/50 100% Epoch 21/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class 429/429 [03 Class 429/429 [03	1.545 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.098 5.54it/s] Instances	Box(P .53it/s] 0.337 dfl_loss 1.235 Box(P .49it/s] 0.363 dfl_loss 1.235 Box(P	161 R 0.257 Instances 115 R 0.228 Instances	640: mAP50 0.214 Size 640: mAP50 0.218 Size 640:	mAP50 100% mAP50
0.116 -95): 0.117	19/50 100% Epoch 20/50 100% Epoch 21/50	2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class all GPU_mem 2.85G 429/429 [03 Class 429/429 [03 Class	1.545 1:17<00:00,	1.115 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.099 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.098 5.54it/s] Instances 8.54it/s] Instances	Box(P .53it/s] 0.337 dfl_loss 1.235 Box(P .49it/s] 0.363 dfl_loss 1.235 Box(P	161 R 0.257 Instances 115 R 0.228 Instances 152 R	640: mAP50 0.214 Size 640: mAP50 0.218 Size 640: mAP50	mAP50 100% mAP50

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	22/50			1.079	1.223	136	640:	100%
		_	1:17<00:00, Images	_	Box(P	R	mAP50	mΛD50
-95):	100%		62/62 [00:1				IIIAI 30	IIIAI JO
,		all	1960		_		0.224	
0.12								
	F l.	CDII	h 1	-1- 1	JC1 1	T	C:	
	•	_	box_loss					
	23/50				1.212	196	640:	100%
		-	1:17<00:00, Images	-	Boy (P	R	mAP50	mΔP50
-95):	100%		62/62 [00:1		•	· ·	IIIAI 30	IIIAI 30
- /		all	_	24550	_	0.263	0.234	
0.125								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	24/50		1.497		1.215	190	640:	100%
		-	1:17<00:00,	-	D(D		ADE0	
-95).	100%	Class	1mages 62/62 [00:1		Box(P		mAP50	MAP50
-22).	100/0	all	1960		_	0.279	0.233	
0.124								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	25/50	2.85G	1.489	1.057	1.207	251	640:	100%
		_	1:16<00:00,	_				
05)	4000/1	Class	_		Box(P	R	mAP50	mAP50
-95):	100%	all	62/62 [00:1 1960		_	0.285	0.236	
0.126		all	1900	24330	0.555	0.283	0.230	
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	26/50	2.85G	1.484	1.052	1.203	191	640:	100%
		429/429 [03	1:17<00:00,	5.53it/s]				
		Class	•	Instances	•	R	mAP50	mAP50
-95):	100%		62/62 [00:1			0.260	0.220	
0.129		all	1960	24550	0.345	0.268	0.239	
0.123								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	27/50	2.85G	1.487	1.047	1.201	137	640:	100%
		429/429 [03	1:17<00:00,					·
	_	Class	_	Instances	•	R	mAP50	mAP50
-95):	100%		62/62 [00:1		_			
0 124		all	1960	24550	0.373	0.298	0.25	
0.134								
	Epoch	GPU mem	box_loss	cls loss	dfl loss	Instances	Size	
	28/50	_	_		_			100%
			1:18<00:00,		=:=:			
		Class	Images	Instances	•	R	mAP50	mAP50
-95):	100%		62/62 [00:1	7<00:00,	3.59it/s]			

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0.133	ł	all	1960	24550	0.382	0.288	0.248	
0.133								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	29/50	2.85G 429/429 [01		1.026 5.54it/s]	1.192	192	640:	100%
-95):	100%	Class	U	Instances 17<00:00, 3	•	R	mAP50	mAP50
		all	1960	24550	0.359	0.291	0.251	
0.138	}							
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	30/50	2.85G	1.458	1.02	1.187	115	640:	100%
		429/429 [01		_				
05)	4000/1		_	Instances		R	mAP50	mAP50
-95):	100%	all	1960	.7<00:00, 3 24550	.531T/S] 0.355	0.285	0.258	
0.141		all	1900	24330	0.555	0.203	0.238	
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	31/50	2.85G	1.457	1.019	1.187	169	640:	100%
		429/429 [01		_				
	4		_	Instances	•	R	mAP50	mAP50
-95):	100%		_	7<00:00, 3	_	a 200	0.252	
0.135		all	1900	24550	0.347	0.299	0.253	
0.133								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	Epoch 32/50	_	_	cls_loss 1.011	_	Instances 186	Size 640:	100%
	32/50	2.85G 429/429 [01	1.446 ::17<00:00,	1.011 5.54it/s]	1.181	186	640:	·
	32/50	2.85G 429/429 [01 Class	1.446 ::17<00:00, Images	1.011 5.54it/s] Instances	1.181 Box(P	186 R	640:	·
	32/50	2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1	1.011 5.54it/s] Instances 7<00:00, 3	1.181 Box(P	186 R	640: mAP50	·
-95):	32/50 32/50 100%	2.85G 429/429 [01 Class	1.446 ::17<00:00, Images	1.011 5.54it/s] Instances	1.181 Box(P	186 R	640:	·
	32/50 32/50 100%	2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1	1.011 5.54it/s] Instances 7<00:00, 3	1.181 Box(P	186 R	640: mAP50	·
-95):	32/50 100%	2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1	1.011 5.54it/s] Instances 7<00:00, 3	Box(P.55it/s] 0.376	186 R 0.289	640: mAP50	·
-95):	32/50 100%	2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss	1.011 5.54it/s] Instances .7<00:00, 3 24550 cls_loss	Box(P .55it/s] 0.376	186 R 0.289	640: mAP50 0.261 Size	·
-95):	32/50 100% Epoch	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442	1.011 5.54it/s] Instances .7<00:00, 3 24550 cls_loss 1.005 5.55it/s]	1.181 Box(P .55it/s] 0.376 dfl_loss 1.174	186 R 0.289 Instances 142	640: mAP50 0.261 Size 640:	mAP50
-95): 0.142	32/50 100% Epoch 33/50	2.85G 429/429 [01 Class all all GPU_mem 2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances	1.181 Box(P .55it/s] 0.376 dfl_loss 1.174 Box(P	186 R 0.289 Instances	640: mAP50 0.261 Size	mAP50
-95): 0.142	32/50 100% Epoch	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images 62/62 [00:1	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances 7<00:00, 3	1.181 Box(P .55it/s] 0.376 dfl_loss 1.174 Box(P .58it/s]	186 R 0.289 Instances 142 R	640: mAP50 0.261 Size 640: mAP50	mAP50
-95): 0.142	32/50 100% Epoch 33/50	2.85G 429/429 [01 Class all all GPU_mem 2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances	1.181 Box(P .55it/s] 0.376 dfl_loss 1.174 Box(P	186 R 0.289 Instances 142	640: mAP50 0.261 Size 640:	mAP50
-95): 0.142	32/50 100% Epoch 33/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images 62/62 [00:1	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances 7<00:00, 3	1.181 Box(P .55it/s] 0.376 dfl_loss 1.174 Box(P .58it/s]	186 R 0.289 Instances 142 R	640: mAP50 0.261 Size 640: mAP50	mAP50
-95): 0.142	32/50 100% Epoch 33/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images 62/62 [00:1	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances 7<00:00, 3	1.181 Box(P.55it/s] 0.376 dfl_loss 1.174 Box(P.58it/s] 0.383	186 R 0.289 Instances 142 R 0.306	640: mAP50 0.261 Size 640: mAP50	mAP50
-95): 0.142	32/50 100% Epoch 33/50 100% Epoch 34/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances 7<00:00, 3 24550 cls_loss	Box(P.55it/s] 0.376 dfl_loss 1.174 Box(P.58it/s] 0.383 dfl_loss	186 R 0.289 Instances 142 R 0.306	640: mAP50 0.261 Size 640: mAP50 0.267	mAP50
-95): 0.142 -95): 0.144	32/50 100% Epoch 33/50 100% Epoch 34/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.007 5.54it/s] Instances	1.181 Box(P.55it/s] 0.376 dfl_loss 1.174 Box(P.58it/s] 0.383 dfl_loss 1.18 Box(P	186 R 0.289 Instances 142 R 0.306 Instances	640: mAP50 0.261 Size 640: mAP50 0.267	100% mAP50
-95): 0.142 -95): 0.144	32/50 100% Epoch 33/50 100% Epoch 34/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class	1.446 ::17<00:00,	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.007 5.54it/s] Instances 7<00:00, 3	1.181 Box(P.55it/s] 0.376 dfl_loss 1.174 Box(P.58it/s] 0.383 dfl_loss 1.18 Box(P.55it/s]	186 R 0.289 Instances 142 R 0.306 Instances 160 R	640: mAP50 0.261 Size 640: mAP50 0.267 Size 640: mAP50	mAP50 100% mAP50
-95): 0.142 -95): 0.144	32/50 100% Epoch 33/50 100% Epoch 34/50 100%	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class	1.446 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images 62/62 [00:1 1960 box_loss 1.442 ::17<00:00, Images	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.007 5.54it/s] Instances	1.181 Box(P.55it/s] 0.376 dfl_loss 1.174 Box(P.58it/s] 0.383 dfl_loss 1.18 Box(P	186 R 0.289 Instances 142 R 0.306 Instances 160	640: mAP50 0.261 Size 640: mAP50 0.267 Size 640:	mAP50 100% mAP50
-95): 0.142 -95): 0.144	32/50 100% Epoch 33/50 100% Epoch 34/50 100%	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class 429/429 [01 Class	1.446 ::17<00:00,	1.011 5.54it/s] Instances 7<00:00, 3 24550 cls_loss 1.005 5.55it/s] Instances 7<00:00, 3 24550 cls_loss 1.007 5.54it/s] Instances 7<00:00, 3	1.181 Box(P.55it/s] 0.376 dfl_loss 1.174 Box(P.58it/s] 0.383 dfl_loss 1.18 Box(P.55it/s]	186 R 0.289 Instances 142 R 0.306 Instances 160 R	640: mAP50 0.261 Size 640: mAP50 0.267 Size 640: mAP50	mAP50 100% mAP50

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	35/50			0.9914	1.17	196	640:	100%
		429/429 [0 Class	1:17<00:00,	5.53it/s] Instances	Box(P	R	mAP50	mΔP50
-95):	100%		U	17<00:00, 3	•	K	IIIAI 30	IIIAI 30
0 145		all	1960	24550	0.365	0.296	0.266	
0.145								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	36/50			0.9922	1.171	80	640:	100%
		429/429 [0 Class	1:17<00:00, Images	5.551t/s] Instances	Box (P	R	mAP50	mAP50
-95):	100%		62/62 [00:1	17<00:00, 3	•			
0.147		all	1960	24550	0.385	0.306	0.273	
0.147								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	37/50			0.9817	1.167	152	640:	100%
		429/429 [0 Class	1:17<00:00, Tmages	5.55it/s] Instances	Box (P	R	mAP50	mAP50
-95):	100%			17<00:00, 3	•		50	50
0.149		all	1960	24550	0.363	0.318	0.276	
0.149								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	38/50			0.9774	1.164	148	640:	100%
		429/429 [0 Class	1:17<00:00, Images	Instances	Box(P	R	mAP50	mAP50
-95):	100%			17<00:00, 3	•			
0.149		all	1960	24550	0.393	0.294	0.271	
0.149								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	39/50			0.9732	1.162	214	640:	100%
		429/429 [0 Class	1:17<00:00, Images	Instances	Box(P	R	mAP50	mAP50
-95):	100%		62/62 [00:1	17<00:00, 3	.58it/s]			
0.148		all	1960	24550	0.378	0.299	0.271	
0.140								
	Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
	40/50	2.85G	1.416 1:17<00:00,		1.162	133	640:	100%
		Class		Instances	Box(P	R	mAP50	mAP50
-95):	100%			17<00:00, 3	_			
0.15		all	1960	24550	0.367	0.319	0.278	
	ng dat	aloader mos	aic					
	Г h	CDII mam	hav lass	-1- 1	461 1	Tuetenese	C:	
	41/50	GPU_mem 2.85G	_	cls_loss 0.9134	1.152	Instances 75	Size	100%
			1:407		1.152	/5	040:	100%
		Class	Images	Instances	•	R	mAP50	mAP50
-95):	100%		62/62 [00:1	L7<00:00, 3	.54it/s]			

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0.153		all	1960	24550	0.367	0.323	0.282	
	Enoch	GPU_mem	hov loss	ala loss	dfl loss	Instances	Size	
	42/50	_	_	0.9022	_		640:	100%
		429/429 [01			1.143	101	040.	100/01
٥٢١.	100%	Class	0	Instances	•		mAP50	mAP50
-95):	100%	all	1960	-	0.371		0.285	
0.157								
	Epoch	GPU_mem	box loss	cls loss	dfl loss	Instances	Size	
	43/50	_	_	0.8976	_		640:	100%
		429/429 [01	l:12<00:00,	5.93it/s]				·
-05).	100%	Class	Images		•	R	mAP50	mAP50
-33).	100%	all	1960		_	0.305	0.29	
0.16								
	Fnoch	GPU_mem	hox loss	cls loss	dfl loss	Instances	Size	
	44/50	2.85G	_	0.8954	_		640:	100%
		429/429 [01	l:11<00:00,	5.99it/s]				
-05).	100%	Class	Images 62/62 [00:1	Instances	•	R	mAP50	mAP50
-95).	100%	all	1960		0.379	0.328	0.287	
0.157								
	Epoch	GPU mem	box loss	cls loss	dfl loss	Instances	Size	
	Epoch 45/50	GPU_mem	box_loss				Size 640:	100%
	45/50	2.85G 429/429 [01	1.394 L:11<00:00,	0.8929 5.98it/s]	1.14	101	640:	·
	45/50	2.85G 429/429 [01 Class	1.394 L:11<00:00, Images	0.8929 5.98it/s] Instances	1.14 Box(P	101 R	640:	·
	45/50	2.85G 429/429 [01 Class	1.394 L:11<00:00,	0.8929 5.98it/s] Instances	1.14 Box(P	101 R	640:	·
	45/50 45/50 100%	2.85G 429/429 [01 Class	1.394 1:11<00:00, Images 62/62 [00:1	0.8929 5.98it/s] Instances	1.14 Box(P	101 R	640: mAP50	·
-95):	45/50 100%	2.85G 429/429 [01 Class	1.394 1:11<00:00, Images 62/62 [00:1	0.8929 5.98it/s] Instances 17<00:00, 3 24550	Box(P 6.61it/s] 0.373	101 R 0.326	640: mAP50 0.29	·
-95):	45/50 100% Epoch	2.85G 429/429 [01 Class all	1.394 1:11<00:00, Images 62/62 [00:1 1960 box_loss	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss	Box(P 6.61it/s] 0.373 dfl_loss	101 R 0.326 Instances	640: mAP50 0.29 Size	mAP50
-95):	45/50 100% Epoch 46/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01	1.394 1:11<00:00, Images 62/62 [00:1 1960 box_loss 1.385	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s]	Box(P 6.61it/s] 0.373 dfl_loss 1.139	101 R 0.326 Instances 101	640: mAP50 0.29 Size 640:	mAP50
-95): 0.159	45/50 100% Epoch 46/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.394 1:11<00:00,	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances	Box(P 6.61it/s] 0.373 dfl_loss 1.139 Box(P	101 R 0.326 Instances	640: mAP50 0.29 Size	mAP50
-95): 0.159	45/50 100% Epoch 46/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.394 1:11<00:00, Images 62/62 [00:1 1960 box_loss 1.385	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances 17<00:00, 3	Box(P 0.373 dfl_loss 1.139 Box(P	101 R 0.326 Instances 101	640: mAP50 0.29 Size 640:	mAP50
-95): 0.159	45/50 100% Epoch 46/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.394 1:11<00:00,	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances 17<00:00, 3	1.14 Box(P 6.61it/s] 0.373 dfl_loss 1.139 Box(P 6.53it/s]	101 R 0.326 Instances 101 R	640: mAP50 0.29 Size 640: mAP50	mAP50
-95): 0.159	45/50 100% Epoch 46/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.394 1:11<00:00,	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances 17<00:00, 3 24550	Box(P 6.61it/s] 0.373 dfl_loss 1.139 Box(P 6.53it/s] 0.376	101 R 0.326 Instances 101 R 0.329	640: mAP50 0.29 Size 640: mAP50 0.292	mAP50
-95): 0.159	45/50 100% Epoch 46/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.394 1:11<00:00,	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances 17<00:00, 3 24550 cls_loss	Box(P 6.61it/s] 0.373 dfl_loss 1.139 Box(P 6.53it/s] 0.376 dfl_loss	101 R 0.326 Instances 101 R 0.329 Instances	640: mAP50 0.29 Size 640: mAP50 0.292 Size	100% mAP50
-95): 0.159	45/50 100% Epoch 46/50 100% Epoch 47/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [02 Class	1.394 1:11<00:00,	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances 17<00:00, 3 24550 cls_loss 0.88 5.96it/s]	Box(P 6.61it/s] 0.373 dfl_loss 1.139 Box(P 6.53it/s] 0.376 dfl_loss 1.137	101 R 0.326 Instances 101 R 0.329 Instances 100	640: mAP50 0.29 Size 640: mAP50 0.292 Size 640:	100% mAP50
-95): 0.159 -95): 0.159	45/50 100% Epoch 46/50 100% Epoch 47/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [02 Class 429/429 [03 Class	1.394 1:11<00:00,	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances 17<00:00, 3 24550 cls_loss 0.88 5.96it/s] Instances	Box(P 6.61it/s] 0.373 dfl_loss 1.139 Box(P 6.53it/s] 0.376 dfl_loss 1.137 Box(P	101 R 0.326 Instances 101 R 0.329 Instances 100	640: mAP50 0.29 Size 640: mAP50 0.292 Size 640:	100% mAP50
-95): 0.159 -95): 0.159	45/50 100% Epoch 46/50 100% Epoch 47/50	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [02 Class 429/429 [03 Class	1.394 1:11<00:00,	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances 17<00:00, 3 24550 cls_loss 0.88 5.96it/s] Instances 17<00:00, 3	Box(P 6.61it/s] 0.373 dfl_loss 1.139 Box(P 6.53it/s] 0.376 dfl_loss 1.137 Box(P	101 R 0.326 Instances 101 R 0.329 Instances 100	640: mAP50 0.29 Size 640: mAP50 0.292 Size 640:	100% mAP50
-95): 0.159 -95): 0.159	45/50 100% Epoch 46/50 100% Epoch 47/50 100%	2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class all GPU_mem 2.85G 429/429 [01 Class	1.394 1:11<00:00,	0.8929 5.98it/s] Instances 17<00:00, 3 24550 cls_loss 0.8846 5.96it/s] Instances 17<00:00, 3 24550 cls_loss 0.88 5.96it/s] Instances 17<00:00, 3	Box(P 6.61it/s] 0.373 dfl_loss 1.139 Box(P 6.53it/s] 0.376 dfl_loss 1.137 Box(P	101 R 0.326 Instances 101 R 0.329 Instances 100 R	640: mAP50 0.29 Size 640: mAP50 0.292 Size 640: mAP50	100% mAP50

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48			1.38 L:12<00:00,		1.134	94	640:	100%
-95): 10		Class	Images 62/62 [00:1	Instances	Box(P 3.61it/s]	R	mAP50	mAP50
0.161		all	1960	24550	0.383	0.333	0.295	
Ер	och	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
49	/50		1.378 l:11<00:00,	0.8749 5 97i+/s1	1.135	102	640:	100%
-95): 10		Class	Images 62/62 [00:1	Instances	•	R	mAP50	mAP50
0.161		all	1960	24550	0.372	0.334	0.295	
Ер	och	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size	
50	/50 	2.85G 429/429 [01	1.373 l:11<00:00,	0.8701 5.97it/s]	1.132	90	640:	100%
-95): 10	0%		Images 62/62 [00:1		•	R	mAP50	mAP50
0.161		all	1960	24550	0.367	0.339	0.295	

50 epochs completed in 1.381 hours.

Optimizer stripped from runs\detect\train18\weights\last.pt, 6.3MB Optimizer stripped from runs\detect\train18\weights\best.pt, 6.3MB

Validating runs\detect\train18\weights\best.pt...

Ultralytics 8.3.107 Python-3.10.13 torch-2.5.1 CUDA:0 (NVIDIA GeForce RTX 2060 SUPE R, 8192MiB)

YOLOv8n summary (fused): 72 layers, 3,007,013 parameters, 0 gradients, 8.1 GFLOPs

-95): 100% 	Class	Images 62/62 [00:2	Instances 3<00:00, 2	•	R	mAP50	mAP50
, , , ,	all	1960	24550	0.367	0.337	0.295	
0.161							
0.50.6	bike	121	221	0.335	0.167	0.146	0.
0526	bus	227	309	0.297	0.385	0.233	
0.16	bus	221	209	0.237	0.585	0.233	
	car	1956	20327	0.555	0.681	0.685	
0.412							
	motor	67	90	0.332	0.132	0.13	0.
0543		630	2626	0.252	0.407	0.252	
0.148	person	639	2626	0.353	0.407	0.352	
0.140	rider	104	133	0.289	0.138	0.129	
0.046							
	truck	526	844	0.407	0.451	0.392	
0.257							

Speed: 0.2ms preprocess, 2.0ms inference, 0.0ms loss, 1.6ms postprocess per image Results saved to runs\detect\train18

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Out[4]: ultralytics.utils.metrics.DetMetrics object with attributes:

ap_class_index: array([0, 1, 2, 3, 4, 5, 6]) box: ultralytics.utils.metrics.Metric object confusion_matrix: <ultralytics.utils.metrics.ConfusionMatrix object at 0x000001EA0 9B67970> curves: ['Precision-Recall(B)', 'F1-Confidence(B)', 'Precision-Confidence(B)', 'Re call-Confidence(B)'] curves_results: [[array([0, 0.001001, 0.002002, 0.003003, 0. 004004, 0.005005, 0.006006, 0.007007, 0.008008, 0.009009, 0.010 01, 0.011011, 0.012012, 0.013013, 0.014014, 0.015015, 0.016016, 0.017017, 0.018018, 0.019019, 0.02002, 0.021021, 0.022022, 0.02 3023, 0.024024, 0.025025, 0.026026, 0.027027, 0.028028, 0.02902 0.03003, 0.031031, 0.032032, 0.033033, 0.034034, 0.035035, 9, 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 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 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 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 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 0.21121, 0.21221, 0.21321, 0.21421, 0.21522, 0.21622, 0.21722, 0.21822, 0.21922, 0.22022, 0.2212 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 0.23524, 0.23624, 0.23724, 0.23824, 0.23924, 0.24024, 0.24124, 0.24224, 0.24324, 0.24424, 423, 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 0.25926, 0.26026, 0.26126, 0.26226, 0.26326, 0.26426, 0.26527, 0.26627, 0.26727, 0.26827, 0.2692 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

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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 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, 0.57658, 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 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,

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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 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 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 0.88388, 0.88488, 0.88589, 0.88689, 0.88789, 0.88889, 0.88989, 0.89089, 0.89189, 0.89289, 0.8938 288. 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([[0.60633, 0.60633, 0.60181, ..., 0, 0], [0.84466, 0.84466, 0.81877, ..., 0, 0, 0], [0.84818, 0.84818, 0.84503, ..., 0, 0, 0], [0.74067, 0.74067, 0.73229, ..., 0, 0, 0], 0.6015, 0.6015, 0.59398, ..., 0, 0, 0], [0.84597, 0.84597, 0.82346, ..., 0, 0, 0]]), 'Confidence', 'Recall']] fitness: 0.1747544493089012 keys: ['metrics/precision(B)', 'metrics/recall(B)', 'metrics/mAP50(B)', 'metrics/m AP50-95(B)']

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```
maps: array([ 0.052563,  0.15961,  0.41154,  0.054297,  0.14828,  0.045995,  0.25722])
names: {0: 'bike', 1: 'bus', 2: 'car', 3: 'motor', 4: 'person', 5: 'rider', 6: 'truck'}
plot: True
results_dict: {'metrics/precision(B)': 0.36682696683544125, 'metrics/recall(B)': 0.3373418069088779, 'metrics/mAP50(B)': 0.2953229422494526, 'metrics/mAP50-95(B)': 0.16135795009328435, 'fitness': 0.1747544493089012}
save_dir: WindowsPath('runs/detect/train18')
speed: {'preprocess': 0.18735515306839168, 'inference': 1.9962698469480158, 'loss': 0.0005832653038609982, 'postprocess': 1.552517499970106}
task: 'detect'
```

```
In [6]: predv8_test = yolov8_model('street-traffic-new-york-typical-street-view-manhattan-m
    plt.imshow(predv8_test[0].plot())
    plt.axis('off')
    plt.show()
```

image 1/1 D:\ery\School\Jupyter Notebooks\street-traffic-new-york-typical-street-vie
w-manhattan-manhattan-new-york-april-92272598.webp: 384x640 7 cars, 1 person, 176.6m
s

Speed: 10.5ms preprocess, 176.6ms inference, 30.6ms postprocess per image at shape (1, 3, 384, 640)



```
In [5]: yolov8_model.export(format='onnx')
```

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```
Ultralytics 8.3.107 Python-3.10.13 torch-2.5.1 CPU (AMD Ryzen 5 2600 Six-Core Proce
       YOLOv8n summary (fused): 72 layers, 3,007,013 parameters, 0 gradients, 8.1 GFLOPs
       PyTorch: starting from 'runs\detect\train18\weights\best.pt' with input shape (1, 3,
       640, 640) BCHW and output shape(s) (1, 11, 8400) (6.0 MB)
       ONNX: starting export with onnx 1.17.0 opset 19...
       ONNX: slimming with onnxslim 0.1.50...
       ONNX: export success 5.0s, saved as 'runs\detect\train18\weights\best.onnx' (11.7 M
       B)
       Export complete (6.3s)
       Results saved to D:\ery\School\Jupyter Notebooks\runs\detect\train18\weights
       Predict:
                        yolo predict task=detect model=runs\detect\train18\weights\best.onn
       x imgsz=640
       Validate:
                        yolo val task=detect model=runs\detect\train18\weights\best.onnx im
       gsz=640 data=bdd100k--1/data.yaml
       Visualize:
                        https://netron.app
Out[5]: 'runs\\detect\\train18\\weights\\best.onnx'
```

faster rcnn

In []:

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