```
1 C:\Users\stefa\ComputerVision\venv\Scripts\python.exe
   C:\Users\stefa\ComputerVision\HW6_trainYOLO.py
2 New https://pypi.org/project/ultralytics/8.3.50
   available 🚀 Update with 'pip install -U ultralytics'
3 Ultralytics 8.3.48 🚀 Python-3.12.8 torch-2.5.1+cu124
   CUDA:0 (NVIDIA GeForce RTX 4060 Laptop GPU, 8188MiB)
4 engine\trainer: task=detect, mode=train, model=
   yolov5su.pt, data=C:/Users/stefa/ComputerVision/lab6/
   config.yaml, epochs=20, time=None, patience=100,
   batch=16, imgsz=640, save=True, save_period=-1, cache
   =False, device=None, workers=8, project=None, name=
   train5, exist_ok=False, pretrained=True, optimizer=
   auto, verbose=True, seed=0, deterministic=True,
   single_cls=False, rect=False, cos_lr=False,
   close_mosaic=10, resume=False, amp=True, fraction=1.0
   , profile=False, freeze=None, multi_scale=False,
   overlap_mask=True, mask_ratio=4, dropout=0.0, val=
   True, split=val, save_json=False, save_hybrid=False,
   conf=None, iou=0.7, max_det=300, half=False, dnn=
   False, plots=True, source=None, vid_stride=1,
   stream_buffer=False, visualize=False, augment=False,
   agnostic_nms=False, classes=None, retina_masks=False
   , embed=None, show=False, save_frames=False, save_txt
   =False, save_conf=False, save_crop=False, show_labels
   =True, show_conf=True, show_boxes=True, line_width=
   None, format=torchscript, keras=False, optimize=False
   , int8=False, dynamic=False, simplify=True, opset=
   None, workspace=None, nms=False, lr0=0.01, lrf=0.01,
   momentum=0.937, weight_decay=0.0005, warmup_epochs=3.
   0, warmup_momentum=0.8, warmup_bias_lr=0.1, box=7.5,
   cls=0.5, dfl=1.5, pose=12.0, kobj=1.0, nbs=64, hsv_h=
   0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0
   .1, scale=0.5, shear=0.0, perspective=0.0, flipud=0.0
   , fliplr=0.5, bgr=0.0, mosaic=1.0, mixup=0.0,
   copy_paste=0.0, copy_paste_mode=flip, auto_augment=
   randaugment, erasing=0.4, crop_fraction=1.0, cfg=None
   , tracker=botsort.yaml, save_dir=C:\Users\stefa\
   ComputerVision\runs\detect\train5
5 Overriding model.yaml nc=80 with nc=2
6
7                    from  n    params  module
```

7					arguments
8	0	-1	1	3520	ultralytics.nn. modules.conv.Conv [3, 32, 6, 2, 2]
9	1	-1	1	18560	ultralytics.nn. modules.conv.Conv [32, 64, 3, 2]
10	2	-1	1	18816	ultralytics.nn. modules.block.C3 [64, 64, 1]
11	3	-1	1	73984	ultralytics.nn. modules.conv.Conv [64, 128, 3, 2]
12	4	-1	2	115712	ultralytics.nn. modules.block.C3 [128, 128, 2]
13	5	-1	1	295424	ultralytics.nn. modules.conv.Conv [128, 256, 3, 2]
14	6	-1	3	625152	ultralytics.nn. modules.block.C3 [256, 256, 3]
15	7	-1	1	1180672	ultralytics.nn. modules.conv.Conv [256, 512, 3, 2]
16	8	-1	1	1182720	ultralytics.nn. modules.block.C3 [512, 512, 1]
17	9	-1	1	656896	ultralytics.nn. modules.block.SPPF [512, 512, 5]
18	10	-1	1	131584	ultralytics.nn. modules.conv.Conv [512, 256, 1, 1]
19	11	-1	1	0	torch.nn. modules.upsampling.Upsample [None, 2, ' nearest']
20	12	[-1, 6]	1	0	ultralytics.nn. modules.conv.Concat [1]

```
21  13                    -1  1     361984  ultralytics.nn.
    modules.block.C3              [512, 256, 1, False
    ]
22  14                    -1  1      33024  ultralytics.nn.
    modules.conv.Conv            [256, 128, 1, 1
    ]
23  15                    -1  1          0  torch.nn.
    modules.upsampling.Upsample      [None, 2, '
    nearest']
24  16               [-1, 4]  1          0  ultralytics.nn.
    modules.conv.Concat          [1
    ]
25  17                    -1  1      90880  ultralytics.nn.
    modules.block.C3             [256, 128, 1, False
    ]
26  18                    -1  1     147712  ultralytics.nn.
    modules.conv.Conv            [128, 128, 3, 2
    ]
27  19              [-1, 14]  1          0  ultralytics.nn.
    modules.conv.Concat          [1
    ]
28  20                    -1  1     296448  ultralytics.nn.
    modules.block.C3             [256, 256, 1, False
    ]
29  21                    -1  1     590336  ultralytics.nn.
    modules.conv.Conv            [256, 256, 3, 2
    ]
30  22              [-1, 10]  1          0  ultralytics.nn.
    modules.conv.Concat          [1
    ]
31  23                    -1  1    1182720  ultralytics.nn.
    modules.block.C3             [512, 512, 1, False
    ]
32  24          [17, 20, 23]  1    2116822  ultralytics.nn.
    modules.head.Detect          [2, [128, 256, 512
    ]]
33  YOLOv5s summary: 262 layers, 9,122,966 parameters, 9,
    122,950 gradients, 24.0 GFLOPs
34
35  Transferred 421/427 items from pretrained weights
36  TensorBoard: Start with 'tensorboard --logdir C:\
```

```
36 Users\stefa\ComputerVision\runs\detect\train5', view
   at http://localhost:6006/
37 Freezing layer 'model.24.dfl.conv.weight'
38 AMP: running Automatic Mixed Precision (AMP) checks
   ...
39 AMP: checks passed ✓
40 train: Scanning C:\Users\stefa\ComputerVision\lab6\
   train\labels.cache... 210 images, 0 backgrounds, 0
   corrupt: 100%|██████████| 210/210 [00:00<?, ?it/s]
41 val: Scanning C:\Users\stefa\ComputerVision\lab6\test
   \labels... 91 images, 0 backgrounds, 0 corrupt: 100
   %|██████████| 91/91 [00:01<00:00, 54.81it/s]
42 val: New cache created: C:\Users\stefa\ComputerVision
   \lab6\test\labels.cache
43 Plotting labels to C:\Users\stefa\ComputerVision\runs
   \detect\train5\labels.jpg...
44 optimizer: 'optimizer=auto' found, ignoring 'lr0=0.01
   ' and 'momentum=0.937' and determining best '
   optimizer', 'lr0' and 'momentum' automatically...
45 optimizer: AdamW(lr=0.001667, momentum=0.9) with
   parameter groups 69 weight(decay=0.0), 76 weight(
   decay=0.0005), 75 bias(decay=0.0)
46 TensorBoard: model graph visualization added ✓
47 Image sizes 640 train, 640 val
48 Using 8 dataloader workers
49 Logging results to C:\Users\stefa\ComputerVision\runs
   \detect\train5
50 Starting training for 20 epochs...
51
52        Epoch    GPU_mem   box_loss   cls_loss
   dfl_loss  Instances       Size
53        1/20      3.96G      1.042      2.027      0.
   8936         94          640: 100%|██████████| 14/14 [
   00:09<00:00,  1.47it/s]
54                  Class     Images  Instances        Box
   (P          R       mAP50   mAP50-95): 100
   %|██████████| 3/3 [00:02<00:00,  1.47it/s]
55                    all        91        1107        0.
   556       0.716      0.591      0.398
56
57        Epoch    GPU_mem   box_loss   cls_loss
```

```
57 dfl_loss  Instances       Size
58          2/20      3.86G       0.717       0.6299        0.
   8246        34         640: 100%|          | 14/14 [
   00:04<00:00,  2.91it/s]
59                  Class     Images   Instances        Box
   (P          R      mAP50  mAP50-95): 100
   %|          | 3/3 [00:01<00:00,  2.39it/s]
60                    all         91        1107         0.
   885       0.846       0.934       0.741
61   0%|          | 0/14 [00:00<?, ?it/s]
62       Epoch   GPU_mem    box_loss    cls_loss
   dfl_loss  Instances       Size
63          3/20      3.93G      0.6281       0.5092        0.
   8169        25         640: 100%|          | 14/14 [
   00:04<00:00,  2.97it/s]
64                  Class     Images   Instances        Box
   (P          R      mAP50  mAP50-95): 100
   %|          | 3/3 [00:01<00:00,  2.35it/s]
65                    all         91        1107         0.
   802       0.823        0.86       0.699
66   0%|          | 0/14 [00:00<?, ?it/s]
67       Epoch   GPU_mem    box_loss    cls_loss
   dfl_loss  Instances       Size
68          4/20      3.85G      0.6233       0.4444        0.
   8127        86         640: 100%|          | 14/14 [
   00:04<00:00,  3.10it/s]
69                  Class     Images   Instances        Box
   (P          R      mAP50  mAP50-95): 100
   %|          | 3/3 [00:01<00:00,  2.30it/s]
70                    all         91        1107         0.
   991       0.973       0.988       0.821
71   0%|          | 0/14 [00:00<?, ?it/s]
72       Epoch   GPU_mem    box_loss    cls_loss
   dfl_loss  Instances       Size
73          5/20      3.81G      0.6441       0.4419        0.
   8142        44         640: 100%|          | 14/14 [
   00:04<00:00,  3.08it/s]
74                  Class     Images   Instances        Box
   (P          R      mAP50  mAP50-95): 100
   %|          | 3/3 [00:01<00:00,  2.36it/s]
75                    all         91        1107         0.
```

```
75  974        0.976        0.984        0.817
76
77        Epoch      GPU_mem    box_loss     cls_loss
    dfl_loss  Instances        Size
78          6/20        3.82G        0.6232        0.426     0.
    8195          32        640: 100%|████████| 14/14 [
    00:04<00:00,  3.11it/s]
79                Class      Images   Instances
    Box(P          R      mAP50   mAP50-95): 100
    %|██████| 3/3 [00:01<00:00,  2.26it/s]
80                  all          91        1107        0.
    989        0.965        0.989        0.835
81
82        Epoch      GPU_mem    box_loss     cls_loss
    dfl_loss  Instances        Size
83          7/20        3.94G        0.5556        0.3801     0.
    8115          17        640: 100%|████████| 14/14 [
    00:04<00:00,  3.16it/s]
84                Class      Images   Instances
    Box(P          R      mAP50   mAP50-95): 100
    %|██████| 3/3 [00:01<00:00,  2.30it/s]
85                  all          91        1107        0.
    989        0.973        0.99        0.857
86
87        Epoch      GPU_mem    box_loss     cls_loss
    dfl_loss  Instances        Size
88          8/20        3.93G        0.5898        0.3922     0.
    8111          56        640: 100%|████████| 14/14 [
    00:04<00:00,  3.18it/s]
89                Class      Images   Instances
    Box(P          R      mAP50   mAP50-95): 100
    %|██████| 3/3 [00:01<00:00,  2.40it/s]
90                  all          91        1107        0.
    985        0.973        0.99        0.871
91
92        Epoch      GPU_mem    box_loss     cls_loss
    dfl_loss  Instances        Size
93          9/20        3.92G        0.5808        0.381     0.
    8071          66        640: 100%|████████| 14/14 [
    00:04<00:00,  3.11it/s]
94                Class      Images   Instances
```

```
 94 Box(P            R        mAP50  mAP50-95): 100
    %|▮▮▮▮▮▮▮| 3/3 [00:01<00:00,  2.34it/s]
 95                     all         91        1107       0.
    982       0.974        0.99       0.853
 96
 97       Epoch    GPU_mem   box_loss    cls_loss
    dfl_loss  Instances       Size
 98       10/20       3.9G      0.5384       0.356       0.
    8027        62        640: 100%|▮▮▮▮▮▮▮| 14/14 [
    00:04<00:00,  3.15it/s]
 99                   Class      Images  Instances
    Box(P            R        mAP50  mAP50-95): 100
    %|▮▮▮▮▮▮▮| 3/3 [00:01<00:00,  2.40it/s]
100                     all         91        1107       0.
    975       0.982        0.99       0.877
101 Closing dataloader mosaic
102
103       Epoch    GPU_mem   box_loss    cls_loss
    dfl_loss  Instances       Size
104       11/20      3.94G      0.4958      0.3588       0.
    7896        24        640: 100%|▮▮▮▮▮▮▮| 14/14 [
    00:05<00:00,  2.73it/s]
105                   Class      Images  Instances
    Box(P            R        mAP50  mAP50-95): 100
    %|▮▮▮▮▮▮▮| 3/3 [00:01<00:00,  2.10it/s]
106                     all         91        1107       0.
    987       0.992       0.994        0.88
107
108       Epoch    GPU_mem   box_loss    cls_loss
    dfl_loss  Instances       Size
109       12/20      3.95G      0.467       0.336       0.
    7855        21        640: 100%|▮▮▮▮▮▮▮| 14/14 [
    00:04<00:00,  3.08it/s]
110                   Class      Images  Instances
    Box(P            R        mAP50  mAP50-95): 100
    %|▮▮▮▮▮▮▮| 3/3 [00:01<00:00,  1.90it/s]
111                     all         91        1107       0.
    986        0.99       0.994       0.882
112
113       Epoch    GPU_mem   box_loss    cls_loss
    dfl_loss  Instances         Size
```

```
114        13/20        3.93G        0.4675        0.3156        0.
    783        28            640: 100%|          | 14/14 [
    00:04<00:00,  3.20it/s]
115                    Class        Images        Instances
    Box(P        R        mAP50  mAP50-95): 100
    %|          | 3/3 [00:01<00:00,  2.45it/s]
116                      all            91          1107        0.
    989        0.987        0.99        0.863
117
118        Epoch        GPU_mem        box_loss        cls_loss
    dfl_loss  Instances        Size
119        14/20        3.95G        0.4622        0.3125        0.
    7858        19            640: 100%|          | 14/14 [
    00:04<00:00,  3.18it/s]
120                    Class        Images        Instances
    Box(P        R        mAP50  mAP50-95): 100
    %|          | 3/3 [00:01<00:00,  2.26it/s]
121                      all            91          1107        0.
    994        0.979        0.991        0.862
122   0%|          | 0/14 [00:00<?, ?it/s]
123        Epoch        GPU_mem        box_loss        cls_loss
    dfl_loss  Instances        Size
124        15/20        3.93G        0.4676        0.3118        0.
    7897        22            640: 100%|          | 14/14 [
    00:04<00:00,  3.32it/s]
125                    Class        Images        Instances
    Box(P        R        mAP50  mAP50-95): 100
    %|          | 3/3 [00:01<00:00,  2.46it/s]
126                      all            91          1107        0.
    992        0.982        0.994        0.898
127
128        Epoch        GPU_mem        box_loss        cls_loss
    dfl_loss  Instances        Size
129        16/20        3.95G        0.4385        0.2952        0.
    7853        27            640: 100%|          | 14/14 [
    00:04<00:00,  3.26it/s]
130                    Class        Images        Instances
    Box(P        R        mAP50  mAP50-95): 100
    %|          | 3/3 [00:01<00:00,  2.48it/s]
131                      all            91          1107        0.
    994        0.973        0.994        0.897
```

```
132
133         Epoch     GPU_mem   box_loss    cls_loss
    dfl_loss  Instances       Size
134        17/20       3.93G      0.4208       0.2881        0.
    7796        20          640: 100%|▆▆▆▆▆▆▆| 14/14 [
    00:04<00:00,  3.30it/s]
135                   Class      Images   Instances
    Box(P          R       mAP50  mAP50-95): 100
    %|▆▆▆▆▆▆| 3/3 [00:01<00:00,  2.58it/s]
136                     all          91        1107        0.
    995      0.976        0.994        0.906
137
138         Epoch     GPU_mem   box_loss    cls_loss
    dfl_loss  Instances       Size
139        18/20       3.95G      0.4039       0.2737        0.
    7851        22          640: 100%|▆▆▆▆▆▆▆| 14/14 [
    00:04<00:00,  3.26it/s]
140                   Class      Images   Instances
    Box(P          R       mAP50  mAP50-95): 100
    %|▆▆▆▆▆▆| 3/3 [00:01<00:00,  2.43it/s]
141                     all          91        1107        0.
    987      0.978        0.994        0.905
142   0%|         | 0/14 [00:00<?, ?it/s]
143         Epoch     GPU_mem   box_loss    cls_loss
    dfl_loss  Instances       Size
144        19/20       3.93G      0.4085       0.2744        0.
    7762        28          640: 100%|▆▆▆▆▆▆▆| 14/14 [
    00:04<00:00,  3.32it/s]
145                   Class      Images   Instances
    Box(P          R       mAP50  mAP50-95): 100
    %|▆▆▆▆▆▆| 3/3 [00:01<00:00,  2.50it/s]
146                     all          91        1107        0.
    994      0.978        0.994        0.911
147
148         Epoch     GPU_mem   box_loss    cls_loss
    dfl_loss  Instances       Size
149        20/20       3.95G      0.3672       0.2538        0.
    7856        25          640: 100%|▆▆▆▆▆▆▆| 14/14 [
    00:04<00:00,  3.25it/s]
150                   Class      Images   Instances
    Box(P          R       mAP50  mAP50-95): 100
```

```
150 %|          | 3/3 [00:01<00:00,  2.31it/s]
151                    all         91        1107        0.
    991      0.981      0.994       0.926
152
153 20 epochs completed in 0.060 hours.
154 Optimizer stripped from C:\Users\stefa\
    ComputerVision\runs\detect\train5\weights\last.pt,
    18.5MB
155 Optimizer stripped from C:\Users\stefa\
    ComputerVision\runs\detect\train5\weights\best.pt,
    18.5MB
156
157 Validating C:\Users\stefa\ComputerVision\runs\detect
    \train5\weights\best.pt...
158 Ultralytics 8.3.48 🚀 Python-3.12.8 torch-2.5.1+cu124
     CUDA:0 (NVIDIA GeForce RTX 4060 Laptop GPU, 8188MiB
    )
159 YOLOv5s summary (fused): 193 layers, 9,112,310
    parameters, 0 gradients, 23.8 GFLOPs
160                  Class      Images  Instances
    Box(P          R       mAP50  mAP50-95): 100
    %|          | 3/3 [00:02<00:00,  1.12it/s]
161                    all         91        1107        0.
    991      0.981      0.994       0.927
162                    car         91        1039        0.
    988      0.961      0.994       0.903
163                minivan         68          68        0.
    995          1      0.995       0.951
164 Speed: 0.3ms preprocess, 5.0ms inference, 0.0ms loss
    , 2.7ms postprocess per image
165 Results saved to C:\Users\stefa\ComputerVision\runs\
    detect\train5
166
167 Process finished with exit code 0
168
```