Министерство образования Республики Беларусь
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«Брестский Государственный технический университет»
Кафедра ИИТ

Лабораторная работа №3

По дисциплине «обработка изображений в ИС»

Тема: «Обучение детекторов объектов»

Выполнил:
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Цель работы: осуществлять обучение нейросетевого детектора для решения задачи обнаружения заданных объектов.

Общее задание:
1. Базируясь на своем варианте, ознакомится с выборкой для обучения детектора, выполнить необходимые преобразования данных для организации процесса обучения (если это нужно!);

2. Для заданной архитектуры нейросетевого детектора организовать процесс обучения для своей выборки. Оценить эффективность обучения на тестовой выборке (mAP);

3. Реализовать визуализацию работы детектора из пункта 1;

4. Оформить отчет по выполненной работе, залить исходный код и отчет в соответствующий репозиторий на github.

В-т	Детектор	Датасет
1	YOLOv10n	**Люди:** https://universe.roboflow.com/leo-ueno/people-detection-o4rdr/dataset/10

Код программы:

```
!pip install roboflow ultralytics supervision

from roboflow import Roboflow
import os

# --- Roboflow загрузка датасета ---rf = Roboflow(api_key="2OFRWtLUJqdrNuwZhhPk")
workspace = rf.workspace("leo-ueno")
project = workspace.project("people-detection-o4rdr")

dataset = project.version(10).download("yolov8")
dataset_path = dataset.location
data_yaml_path = os.path.join(dataset_path, "data.yaml")

# Вывод содержимого YAMLwith open(data_yaml_path, 'r') as file:
    print("Содержимое data.yaml:")
    print(file.read())
```

```
# Информация о датасететrain_images_count = len(os.listdir(os.path.join(dataset_path, "train", "images")))
valid_images_count = len(os.listdir(os.path.join(dataset_path, "valid", "images")))
test_dir = os.path.join(dataset_path, "test", "images")
test_images_count = len(os.listdir(test_dir)) if os.path.exists(test_dir) else 0print("\nРазмеры датасета:")
print(f"Train: {train_images_count} изображений")
print(f"Valid: {valid_images_count} изображений")
print(f"Test: {test_images_count} изображений")
print("\nКлассы: person")

# --- Обучение YOLOv10 ---from ultralytics import YOLO

yolo_model = YOLO("yolov10n.pt")

# Колаб может быть без GPU → выбираем устройство автоматическиdevice = 0 if torch.cuda.is_available() else "cpu"print("Используем устройство:", device)

train_results = yolo_model.train(
    data=data_yaml_path,
    epochs=30,
    imgsz=640,
    batch=16,
    name="yolov10n_people_detection",
    device=device
)

# --- Валидация ---val_metrics = yolo_model.val(data=data_yaml_path)

print("Метрики валидации:")
print(f"mAP@0.5: {val_metrics.box.map50:.4f}")
print(f"mAP@0.5:0.95: {val_metrics.box.map:.4f}")
print("\nПолные метрики:")
print(val_metrics)

# --- Визуализация результата ---import supervision as sv
from PIL import Image
import matplotlib.pyplot as plt

# Выбор тестового изображенияif os.path.exists(test_dir):
```

```
    test_images_list = os.listdir(test_dir)
    sample_img_path = os.path.join(test_dir, test_images_list[0])
else:
    valid_dir = os.path.join(dataset_path, "valid", "images")
    valid_images_list = os.listdir(valid_dir)
    sample_img_path = os.path.join(valid_dir, valid_images_list[0])

# YOLO предсказаниеprediction_results = yolo_model(sample_img_path)
result = prediction_results[0]  # Берём первый результат# --- Сохранение YOLO-
визуализации ---result_plotted = result.plot()
yolo_output_file =
"yolo_prediction.jpg"Image.fromarray(result_plotted).save(yolo_output_file)
print(f"YOLO-визуализация сохранена: {yolo_output_file}")

# --- Ручная отрисовка рамок ---plt.figure(figsize=(10, 10))
image = Image.open(sample_img_path)
plt.imshow(image)
plt.axis('off')

for box in result.boxes:
    x1, y1, x2, y2 = box.xyxy[0].cpu().numpy()
    conf = float(box.conf[0])
    label = f"person {conf:.2f}"    plt.gca().add_patch(
        plt.Rectangle(
            (x1, y1),
            x2 - x1,
            y2 - y1,
            fill=False,
            edgecolor='red',
            linewidth=2        )
    )
    plt.text(
        x1,
        y1 - 10,
        label,
        color='red',
        fontsize=12,
        bbox=dict(boxstyle='round', facecolor='white', alpha=0.8)
    )
```

plt.title("Детекции на тестовом изображении")

manual_output_file = "yolo_boxes_overlay.png"plt.savefig(manual_output_file, dpi=200)
plt.close()
print(f"Ручная визуализация сохранена: {manual_output_file}")

Результат программы:

3/50 5.26G 3.203 3.271 2.639 119 640: 100% ━━━━━━━━━━━━ 951/951 2.9it/s 5:25
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.3it/s 10.6s
all 1431 10660 0.587 0.43 0.448 0.206
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
4/50 5.27G 3.249 3.229 2.689 100 640: 100% ━━━━━━━━━━━━ 951/951 2.9it/s 5:23
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.2it/s 10.8s
all 1431 10660 0.637 0.438 0.474 0.235
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
5/50 5.28G 3.145 3.028 2.625 108 640: 100% ━━━━━━━━━━━━ 951/951 2.9it/s 5:26
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.0it/s 11.4s
all 1431 10660 0.653 0.464 0.501 0.251
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
6/50 5.28G 3.06 2.895 2.585 106 640: 100% ━━━━━━━━━━━━ 951/951 2.9it/s 5:25
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.0it/s 11.4s
all 1431 10660 0.68 0.441 0.489 0.262
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
7/50 5.3G 2.993 2.799 2.55 79 640: 100% ━━━━━━━━━━━━ 951/951 2.9it/s 5:25
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 3.9it/s 11.5s
all 1431 10660 0.699 0.462 0.51 0.272
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
8/50 5.31G 2.934 2.716 2.522 103 640: 100% ━━━━━━━━━━━━ 951/951 2.9it/s 5:23
Class Images Instances Box(P R mAP50 mAP50-95):

100% ━━━━━━━━━━━━ 45/45 4.0it/s 11.2s
all 1431 10660 0.674 0.509 0.559 0.3

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
9/50 5.32G 2.884 2.649 2.498 94 640: 100% ━━━━━━━━━━━━ 951/951 2.9it/s 5:24
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 3.9it/s 11.4s
all 1431 10660 0.663 0.517 0.571 0.312
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
10/50 5.32G 2.861 2.59 2.471 79 640: 100% ━━━━━━━━━━━━ 951/951 2.9it/s 5:24
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.0it/s 11.4s
all 1431 10660 0.69 0.52 0.587 0.319
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
11/50 5.34G 2.829 2.553 2.461 124 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:19
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 11.0s
all 1431 10660 0.694 0.536 0.601 0.337
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
12/50 5.35G 2.789 2.489 2.438 122 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:20
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 11.1s
all 1431 10660 0.715 0.543 0.608 0.34
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
13/50 5.36G 2.774 2.467 2.43 208 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:20
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 10.9s
all 1431 10660 0.699 0.555 0.618 0.348
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
14/50 5.36G 2.743 2.427 2.412 160 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:18
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.0it/s 11.2s
all 1431 10660 0.706 0.552 0.617 0.35

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
15/50 5.38G 2.72 2.412 2.4 134 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:18
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.2it/s 10.8s
all 1431 10660 0.719 0.559 0.633 0.358
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
16/50 5.39G 2.688 2.376 2.388 148 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:18
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 10.9s
all 1431 10660 0.731 0.565 0.643 0.37
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
17/50 5.4G 2.671 2.333 2.366 75 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:17
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 3.9it/s 11.5s
all 1431 10660 0.717 0.564 0.633 0.371
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
18/50 5.4G 2.646 2.321 2.361 137 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:17
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 10.9s
all 1431 10660 0.74 0.584 0.649 0.367
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
19/50 5.42G 2.625 2.287 2.355 83 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:17
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 10.9s
all 1431 10660 0.745 0.577 0.655 0.377
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
20/50 5.43G 2.619 2.266 2.342 94 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:16
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 11.0s

all 1431 10660 0.755 0.582 0.659 0.381
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
21/50 5.44G 2.582 2.234 2.329 114 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:17
Class Images Instances Box(P R mAP50 mAP50-95):

100% ━━━━━━━━━━━━ 45/45 4.1it/s 11.1s
all 1431 10660 0.737 0.578 0.657 0.387
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
22/50 5.44G 2.573 2.209 2.318 89 640: 100% ━━
━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 10.9s
all 1431 10660 0.744 0.594 0.667 0.393
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
23/50 5.46G 2.57 2.203 2.316 169 640: 100% ━━
━━━━━━━━━━ 951/951 3.0it/s 5:13
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.2it/s 10.6s
all 1431 10660 0.757 0.584 0.667 0.396
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
24/50 5.47G 2.55 2.182 2.307 137 640: 100% ━━
━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.4it/s 10.2s
all 1431 10660 0.756 0.591 0.668 0.393
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
25/50 5.48G 2.521 2.154 2.296 120 640: 100% ━━
━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.3it/s 10.4s
all 1431 10660 0.766 0.584 0.67 0.4
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
26/50 5.48G 2.517 2.135 2.287 87 640: 100% ━━
━━━━━━━━━━ 951/951 3.0it/s 5:17

Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.2it/s 10.8s
all 1431 10660 0.748 0.606 0.681 0.408
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
27/50 5.51G 2.511 2.107 2.282 178 640: 100% ━━
━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 10.9s
all 1431 10660 0.755 0.605 0.683 0.412
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
28/50 5.52G 2.491 2.103 2.272 146 640: 100% ━━

━━━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.0it/s 11.2s
all 1431 10660 0.756 0.609 0.682 0.414
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
29/50 5.53G 2.468 2.078 2.266 106 640: 100% ━━━━
━━━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.2it/s 10.7s
all 1431 10660 0.763 0.608 0.687 0.419
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
30/50 5.53G 2.458 2.059 2.254 79 640: 100% ━━━━
━━━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.0it/s 11.2s
all 1431 10660 0.76 0.61 0.692 0.423
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
31/50 5.55G 2.435 2.041 2.249 225 640: 100% ━━━━
━━━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.1it/s 11.0s
all 1431 10660 0.753 0.61 0.69 0.423
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
32/50 5.56G 2.426 2.014 2.238 114 640: 100% ━━━━
━━━━━━━━━━━━ 951/951 3.0it/s 5:16
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.1it/s 11.0s
all 1431 10660 0.784 0.607 0.695 0.427
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
33/50 5.57G 2.419 2.012 2.24 149 640: 100% ━━━━
━━━━━━━━━━━━ 951/951 3.0it/s 5:16
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.1it/s 11.0s
all 1431 10660 0.769 0.611 0.696 0.43
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
34/50 5.57G 2.403 1.992 2.228 125 640: 100% ━━━━
━━━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.2it/s 10.8s
all 1431 10660 0.768 0.617 0.7 0.433

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
35/50 5.59G 2.381 1.972 2.214 111 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:17
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 11.1s
all 1431 10660 0.769 0.616 0.701 0.435
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
36/50 5.6G 2.364 1.96 2.217 92 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 11.0s
all 1431 10660 0.771 0.623 0.703 0.436
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
37/50 5.61G 2.357 1.938 2.208 113 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:15
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 11.0s
all 1431 10660 0.781 0.615 0.705 0.439

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
38/50 5.61G 2.353 1.931 2.2 174 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:14
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.2it/s 10.8s
all 1431 10660 0.775 0.623 0.708 0.439
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
39/50 5.63G 2.329 1.892 2.19 68 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:16
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.0it/s 11.2s
all 1431 10660 0.788 0.621 0.71 0.442
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
40/50 5.64G 2.31 1.892 2.187 195 640: 100% ━━━━━━━━━━━━ 951/951 3.0it/s 5:16
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 10.9s
all 1431 10660 0.784 0.631 0.714 0.443
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
41/50 5.65G 2.22 1.718 2.159 30 640: 100% ━━━━━━━━━━━━ 951/951 3.1it/s 5:07
Class Images Instances Box(P R mAP50 mAP50-95):

100% ━━━━━━━━━━━━ 45/45 4.4it/s 10.3s
all 1431 10660 0.775 0.629 0.713 0.444
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
42/50 5.65G 2.187 1.683 2.142 43 640: 100% ━━
━━━━━━━━━━ 951/951 3.2it/s 5:01
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.0it/s 11.1s
all 1431 10660 0.787 0.622 0.712 0.448
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
43/50 5.67G 2.159 1.66 2.134 26 640: 100% ━━
━━━━━━━━━━ 951/951 3.1it/s 5:02
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 10.9s
all 1431 10660 0.777 0.633 0.714 0.448

Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
44/50 5.68G 2.153 1.631 2.128 45 640: 100% ━━
━━━━━━━━━━ 951/951 3.1it/s 5:04
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.4it/s 10.2s
all 1431 10660 0.784 0.632 0.715 0.45
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
45/50 5.69G 2.131 1.624 2.117 48 640: 100% ━━
━━━━━━━━━━ 951/951 3.1it/s 5:05
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.1it/s 11.0s
all 1431 10660 0.788 0.632 0.717 0.452
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
46/50 5.69G 2.111 1.604 2.112 68 640: 100% ━━
━━━━━━━━━━ 951/951 3.1it/s 5:02
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.3it/s 10.5s
all 1431 10660 0.789 0.631 0.716 0.453
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
47/50 5.71G 2.092 1.588 2.101 46 640: 100% ━━
━━━━━━━━━━ 951/951 3.1it/s 5:02
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━ 45/45 4.4it/s 10.3s
all 1431 10660 0.787 0.633 0.718 0.456
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
48/50 5.72G 2.085 1.558 2.094 68 640: 100% ━━

━━━━━━━━━━━━ 951/951 3.2it/s 5:01
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.2it/s 10.6s
all 1431 10660 0.792 0.634 0.72 0.457
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
49/50 5.73G 2.066 1.554 2.085 66 640: 100% ━━━
━━━━━━━━━━━━ 951/951 3.1it/s 5:02
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.1it/s 11.0s

all 1431 10660 0.79 0.635 0.72 0.458
Epoch GPU_mem box_loss cls_loss dfl_loss Instances Size
50/50 5.73G 2.042 1.533 2.082 76 640: 100% ━━━
━━━━━━━━━━━━ 951/951 3.1it/s 5:02
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 4.1it/s 11.0s
all 1431 10660 0.791 0.633 0.721 0.458
50 epochs completed in 4.562 hours.
YOLOv10n summary (fused): 102 layers, 2,265,363 parameters, 0 gradients,
6.5 GFLOPs
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 45/45 3.7it/s 12.2s
all 1431 10660 0.792 0.634 0.721 0.458
Speed: 0.2ms preprocess, 2.0ms inference, 0.0ms loss, 0.4ms postprocess per
image
Results saved to /content/runs/detect/yolov10n_people_detection
Class Images Instances Box(P R mAP50 mAP50-95):
100% ━━━━━━━━━━━━━━━━━━━━ 90/90 6.3it/s 14.4s
all 1431 10660 0.789 0.634 0.72 0.458
Speed: 1.0ms preprocess, 3.5ms inference, 0.0ms loss, 0.2ms postprocess per
image
Results saved to /content/runs/detect/val
Метрики валидации:
mAP@0.5: 0.7205
mAP@0.5:0.95: 0.4577

Вывод: осуществил обучение нейросетевого детектора для решения задачи обнаружения заданных объектов.