ASSIGNMENT 2 - OBJECT DETECTION USING YOLO

Name: MADHU PRIYA N
USN: 23BTRAD011
Branch: B.Tech CSE (AIDE)
Topic: Object detection using YOLO
Dataset Used: Used a sample image

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```python
# Step 1: Install dependencies
!pip install -q ultralytics opencv-python-headless matplotlib

# Step 2: Import libraries
from ultralytics import YOLO
import cv2
import matplotlib.pyplot as plt
from google.colab import files

# Step 3: Upload single image
print("Please upload a single image for object detection:")
uploaded = files.upload()

# Extract uploaded file path (only one image)
image_path = list(uploaded.keys())[0]

# Step 4: Load the largest YOLOv8 model for accuracy
model = YOLO('yolov8x.pt')  # highest accuracy model
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```python
# Step 5: Perform detection with high confidence threshold, larger image size, TTA enabled
results = model.predict(
    source=image_path,
    conf=0.6,          # confidence threshold
    iou=0.5,           # IoU threshold for NMS
    imgsz=1024,        # high resolution for accuracy
    augment=True       # test time augmentation for robustness
)

# Step 6: Save and display results
result_img = results[0].plot()

# Save annotated image
output_path = f"annotated_{image_path}"
cv2.imwrite(output_path, result_img)
print(f"Annotated image saved to: {output_path}")
```

```python
# Show image inline in Colab
plt.figure(figsize=(12, 8))
plt.imshow(cv2.cvtColor(result_img, cv2.COLOR_BGR2RGB))
plt.axis('off')
plt.title("YOLOv8 Object Detection Results")
plt.show()

# Step 7: Print detected objects
print("Detected objects (Class, Confidence, Box coordinates):")
classes = model.names
for box in results[0].boxes:
    class_id = int(box.cls)
    confidence = float(box.conf)
    bbox = [round(coordinate, 2) for coordinate in box.xyxy[0].tolist()]  # [x1,y1,x2,y2]
    print(f"- {classes[class_id]} | Confidence: {confidence:.2f} | Box: {bbox}")
```

```
Please upload a single image for object detection:
Choose Files No file chosen  Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
Saving sample_image.jpg to sample_image (1).jpg

image 1/1 /content/sample_image (1).jpg: 1024x608 7 persons, 1 tie, 13959.7ms
Speed: 6.5ms preprocess, 13959.7ms inference, 3.9ms postprocess per image at shape (1, 3, 1024, 608)
Annotated image saved to: annotated_sample_image (1).jpg
```

YOLOv8 Object Detection Results


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Detected objects (Class, Confidence, Box coordinates):
- person | Confidence: 0.94 | Box: [1.09, 508.25, 258.57, 1128.8]
- person | Confidence: 0.93 | Box: [187.52, 468.15, 596.88, 1127.28]
- person | Confidence: 0.91 | Box: [1.98, 247.19, 232.64, 692.95]
- person | Confidence: 0.90 | Box: [435.77, 475.16, 638.83, 1126.99]
- tie | Confidence: 0.89 | Box: [308.86, 721.96, 405.83, 770.45]
- person | Confidence: 0.84 | Box: [406.89, 246.08, 639.56, 641.92]
- person | Confidence: 0.76 | Box: [152.06, 250.44, 466.57, 620.47]
- person | Confidence: 0.64 | Box: [171.07, 49.5, 489.54, 419.95]
```