

## YOLO 9

YOLOv9 focuses on making the model more efficient, particularly in segmentation tasks, through optimizations in its architecture. One key improvement is the ability to perform segmentation tasks faster without sacrificing accuracy. YOLOv9 also includes the use of advanced training strategies like GELAN (Generalized Efficient Layer Aggregation Network) to improve performance. YOLOv9 sees fewer limitations in handling complex objects than earlier versions, especially in the context of fine-tuning for specific tasks DEV COMMUNITY .

```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="apikey")
project = rf.workspace("fll").project("fll-59ujz")
version = project.version(7)
dataset = version.download("yolov9")

Requirement already satisfied: roboflow in
/usr/local/lib/python3.10/dist-packages (1.1.49)
Requirement already satisfied: certifi in
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Requirement already satisfied: Pillow>=7.1.2 in
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Requirement already satisfied: six in /usr/local/lib/python3.10/dist-
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loading Roboflow workspace...
loading Roboflow project...
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```
pip install inference-sdk
```

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>matplotlib>=3.6.0->supervision<=0.22.0,>=0.21.0->inference-sdk)  
(1.16.0)

```
import json
from inference_sdk import InferenceHTTPClient
import cv2
import numpy as np
from sklearn.metrics import accuracy_score, precision_score,
recall_score, f1_score
```

```
CLIENT = InferenceHTTPClient(
    api_url="url",
    api_key="apikey"
)
```

```
# Define the model ID
model_id = "model_id"
```

```

# Input and output video paths
input_video_path = "/content/los_angeles.mp4"

# Input and output video paths
input_video_path = "/content/los_angeles.mp4" # Replace with your
actual video path
output_video_path = "output_segmented_tracked.mp4"

# Open the input video
cap = cv2.VideoCapture(input_video_path)

# Video properties
fps = cap.get(cv2.CAP_PROP_FPS)
frame_width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
frame_height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))

# Initialize VideoWriter for the output
out = cv2.VideoWriter(output_video_path,
cv2.VideoWriter_fourcc(*'mp4v'), fps, (frame_width, frame_height))

# Set confidence threshold
confidence_threshold = 0.5

# Mapping for class names to numeric labels (customize this based on
your Roboflow dataset)
class_name_to_label = {"class1": 0, "class2": 1, "class3": 2,
"class4": 3, "class5": 4}

# Load ground truth labels from JSON
with open('ground_truth_labels.json') as f:
    ground_truth_data = json.load(f)

def get_true_labels_for_frame(frame_index):
    # Extract labels for the given frame index
    frame_data = next((item for item in ground_truth_data if
item["frame_index"] == frame_index), None)
    if frame_data:
        return [class_name_to_label.get(label, -1) for label in
frame_data["labels"]]
    else:
        return []

# Initialize evaluation metrics lists
y_true = []
y_pred = []

# Process each frame
frame_index = 0
while cap.isOpened():

```

```

ret, frame = cap.read()
if not ret:
    print("Finished processing video.")
    break

# Save the frame temporarily for inference
temp_frame_path = f"/content/temp_frame_{frame_index}.jpg"
cv2.imwrite(temp_frame_path, frame)

# Perform inference with error handling
try:
    result = CLIENT.infer(temp_frame_path, model_id=model_id)
except Exception as e:
    print(f"Error occurred during inference: {e}")
    continue # Skip this frame and move to the next one

# Parse the results
if "predictions" in result and result["predictions"]:
    predictions = result["predictions"]
    frame_y_pred = []

    # Annotate frame with predictions
    for pred in predictions:
        # Extract bounding box and label
        x0, y0 = pred.get("x0", 0), pred.get("y0", 0)
        x1, y1 = pred.get("x1", 0), pred.get("y1", 0)
        class_name = pred.get("class", "Unknown")
        confidence = pred.get("confidence", 0)

        # Convert class name to numeric label
        frame_y_pred.append(class_name_to_label.get(class_name, -
1)) # -1 if class not found

        # Draw bounding box on the frame
        cv2.rectangle(frame, (x0, y0), (x1, y1), (0, 255, 0), 2)

        # Label the bounding box
        label = f"{class_name}: {confidence:.2f}"
        cv2.putText(frame, label, (x0, y0 - 10),
cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0, 255, 0), 2)

    # Ground truth labels for the frame
    true_labels = get_true_labels_for_frame(frame_index)

    # Extend y_true and y_pred lists
    y_true.extend(true_labels[:len(frame_y_pred)])
    y_pred.extend(frame_y_pred)

# Write annotated frame to the output video
out.write(frame)

```

```

        frame_index += 1

# Release resources
cap.release()
out.release()

# Calculate evaluation metrics after all frames are processed
if y_pred:
    accuracy = accuracy_score(y_true, y_pred)
    precision = precision_score(y_true, y_pred, average='weighted',
                                zero_division=1)
    recall = recall_score(y_true, y_pred, average='weighted',
                           zero_division=1)
    f1 = f1_score(y_true, y_pred, average='weighted', zero_division=1)

    # Print the evaluation metrics
    print(f"Accuracy: {accuracy :.2f}")
    print(f"Precision: {precision :.2f}")
    print(f"Recall: {recall :.2f}")
    print(f"F1 Score: {f1 :.2f}")

else:
    print("No valid predictions were made.")

print(f"Processed video saved at: {output_video_path}")

Finished processing video.
Accuracy: 0.88
Precision: 0.82
Recall: 0.85
F1 Score: 0.81
Processed video saved at: output_segmented_tracked.mp4

```

## YOLOV8

This version, built by the team behind the original YOLO, offers several improvements, especially around segmentation and detection tasks. YOLOv8 enhances the performance of the model by improving speed and accuracy for real-time applications. It also allows better training and fine-tuning capabilities for custom tasks, like segmentation, through tools such as Ultralytics. The architecture continues to use the backbone, neck, and head approach to object detection DEV COMMUNITY

```
#YOLO8

import os
import cv2
import numpy as np
from ultralytics import YOLO
from sklearn.metrics import accuracy_score, precision_score,
recall_score, f1_score, confusion_matrix, roc_curve,
precision_recall_curve
import matplotlib.pyplot as plt

# Load YOLO model
model_path = 'yolov8n-seg.pt'
if not os.path.exists(model_path):
    raise FileNotFoundError(f"Model file {model_path} not found.")
model = YOLO(model_path)

# Video paths
video_path = "people.mp4"
if not os.path.exists(video_path):
    raise FileNotFoundError(f"Video file {video_path} not found.")
cap = cv2.VideoCapture(video_path)

# Output video path
output_file = 'output_video_YOLO8.mp4'

# Video properties
fps = cap.get(cv2.CAP_PROP_FPS)
frame_width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
frame_height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))

# Initialize VideoWriter
out = cv2.VideoWriter(output_file, cv2.VideoWriter_fourcc(*'mp4v'),
fps, (frame_width, frame_height))

# Placeholder function for ground truth labels
def get_true_labels_for_frame(frame_index):
    # Replace this with actual ground truth retrieval logic
    # Example: list of class labels expected for the frame
```



```

    return [0] * 37 if frame_index % 2 == 0 else [1] * 37

# Set confidence threshold
confidence_threshold = 0.5

# Initialize evaluation lists
y_true = []
y_pred = []
y_scores = []

frame_index = 0
while cap.isOpened():
    ret, frame = cap.read()
    if not ret:
        print("Finished processing video.")
        break

    # Get true labels
    true_labels = get_true_labels_for_frame(frame_index)

    # Run YOLOv8 inference on the frame
    results = model(frame)

    # Collect predictions above confidence threshold
    frame_y_pred = []
    frame_y_scores = []
    if results[0].boxes.data.size(0) > 0:
        for pred in results[0].boxes.data.cpu().numpy():
            confidence_score = pred[4]
            if confidence_score >= confidence_threshold:
                predicted_label = int(pred[5]) # Detected class label
                frame_y_pred.append(predicted_label)
                frame_y_scores.append(confidence_score)

    # Extend y_true to match the number of predictions
    y_true.extend(true_labels[:len(frame_y_pred)])
    y_pred.extend(frame_y_pred)
    y_scores.extend(frame_y_scores)

    # Annotate frame
    annotated_frame = results[0].plot()

    # Write annotated frame to output video
    out.write(annotated_frame)

    # Display frame
    cv2.imshow('YOLOv8 Segmentation and Tracking', annotated_frame)

    frame_index += 1

```

```

        if cv2.waitKey(1) & 0xFF == ord('q'):
            break

# Release resources
cap.release()
out.release()
cv2.destroyAllWindows()

# Calculate evaluation metrics
if y_pred:
    accuracy = accuracy_score(y_true, y_pred)
    precision = precision_score(y_true, y_pred, average='weighted',
                                zero_division=1)
    recall = recall_score(y_true, y_pred, average='weighted',
                           zero_division=1)
    f1 = f1_score(y_true, y_pred, average='weighted', zero_division=1)

    print(f"Accuracy: {accuracy:.2f}")
    print(f"Precision: {precision:.2f}")
    print(f"Recall: {recall:.2f}")
    print(f"F1 Score: {f1:.2f}")
    print(f"Accuracy: {accuracy:.2f}")

else:
    print("No valid predictions were made.")

# Confirm video saved
if os.path.exists(output_file):
    print(f"Video saved successfully at: {output_file}")
else:
    print("Error: Video file was not saved.")

```

0: 384x640 38 persons, 66.7ms

Speed: 7.0ms preprocess, 66.7ms inference, 12.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 85.0ms

Speed: 0.0ms preprocess, 85.0ms inference, 17.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 76.1ms

Speed: 0.0ms preprocess, 76.1ms inference, 6.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 bird, 68.1ms

Speed: 0.0ms preprocess, 68.1ms inference, 17.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 83.7ms

Speed: 0.0ms preprocess, 83.7ms inference, 16.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 1 dog, 75.5ms

Speed: 0.0ms preprocess, 75.5ms inference, 8.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 71.5ms

Speed: 0.0ms preprocess, 71.5ms inference, 12.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 dog, 65.7ms

Speed: 1.0ms preprocess, 65.7ms inference, 17.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 dog, 66.8ms

Speed: 0.0ms preprocess, 66.8ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 dog, 79.0ms

Speed: 0.0ms preprocess, 79.0ms inference, 13.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 dog, 67.8ms

Speed: 1.2ms preprocess, 67.8ms inference, 14.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 68.3ms

Speed: 0.0ms preprocess, 68.3ms inference, 14.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 65.6ms

Speed: 0.0ms preprocess, 65.6ms inference, 17.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 1 dog, 71.2ms

Speed: 0.0ms preprocess, 71.2ms inference, 12.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 52.4ms

Speed: 12.1ms preprocess, 52.4ms inference, 15.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 dog, 66.3ms

Speed: 0.0ms preprocess, 66.3ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 66.3ms

Speed: 0.0ms preprocess, 66.3ms inference, 17.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 67.4ms  
Speed: 0.0ms preprocess, 67.4ms inference, 16.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 51.9ms  
Speed: 14.8ms preprocess, 51.9ms inference, 16.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 1 dog, 66.7ms  
Speed: 0.0ms preprocess, 66.7ms inference, 17.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 66.9ms  
Speed: 3.6ms preprocess, 66.9ms inference, 16.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 78.9ms  
Speed: 0.0ms preprocess, 78.9ms inference, 18.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 67.2ms  
Speed: 0.0ms preprocess, 67.2ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 70.8ms  
Speed: 0.0ms preprocess, 70.8ms inference, 13.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 65.3ms  
Speed: 0.0ms preprocess, 65.3ms inference, 27.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 67.1ms  
Speed: 1.1ms preprocess, 67.1ms inference, 17.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 69.8ms  
Speed: 1.0ms preprocess, 69.8ms inference, 17.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 67.5ms  
Speed: 1.4ms preprocess, 67.5ms inference, 17.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 80.8ms  
Speed: 0.0ms preprocess, 80.8ms inference, 16.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 82.4ms

Speed: 0.0ms preprocess, 82.4ms inference, 16.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 83.2ms

Speed: 0.0ms preprocess, 83.2ms inference, 15.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 66.7ms

Speed: 2.0ms preprocess, 66.7ms inference, 17.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 67.1ms

Speed: 0.0ms preprocess, 67.1ms inference, 17.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 80.2ms

Speed: 0.0ms preprocess, 80.2ms inference, 18.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 64.5ms

Speed: 0.0ms preprocess, 64.5ms inference, 17.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 41 persons, 64.7ms

Speed: 0.0ms preprocess, 64.7ms inference, 34.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 66.7ms

Speed: 0.0ms preprocess, 66.7ms inference, 17.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 51.4ms

Speed: 13.5ms preprocess, 51.4ms inference, 16.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 66.6ms

Speed: 0.0ms preprocess, 66.6ms inference, 16.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 52.7ms

Speed: 13.9ms preprocess, 52.7ms inference, 14.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 64.4ms

Speed: 0.0ms preprocess, 64.4ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 67.0ms

Speed: 0.0ms preprocess, 67.0ms inference, 16.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 69.8ms  
Speed: 0.0ms preprocess, 69.8ms inference, 13.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 67.0ms  
Speed: 0.0ms preprocess, 67.0ms inference, 19.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 61.6ms  
Speed: 1.5ms preprocess, 61.6ms inference, 18.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 backpack, 66.6ms  
Speed: 0.0ms preprocess, 66.6ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 1 backpack, 70.6ms  
Speed: 0.0ms preprocess, 70.6ms inference, 15.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 1 backpack, 62.5ms  
Speed: 0.0ms preprocess, 62.5ms inference, 16.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 1 backpack, 66.8ms  
Speed: 0.0ms preprocess, 66.8ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 41 persons, 2 dogs, 66.3ms  
Speed: 16.6ms preprocess, 66.3ms inference, 18.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 41 persons, 2 dogs, 64.4ms  
Speed: 0.0ms preprocess, 64.4ms inference, 16.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 2 dogs, 66.6ms  
Speed: 0.0ms preprocess, 66.6ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 75.8ms  
Speed: 0.0ms preprocess, 75.8ms inference, 17.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 41 persons, 66.3ms  
Speed: 0.0ms preprocess, 66.3ms inference, 18.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 51.1ms

Speed: 15.0ms preprocess, 51.1ms inference, 17.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 66.7ms

Speed: 0.0ms preprocess, 66.7ms inference, 17.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 66.5ms

Speed: 0.0ms preprocess, 66.5ms inference, 16.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 backpack, 68.4ms

Speed: 0.0ms preprocess, 68.4ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 50.3ms

Speed: 15.8ms preprocess, 50.3ms inference, 19.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 66.5ms

Speed: 0.0ms preprocess, 66.5ms inference, 16.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 68.5ms

Speed: 0.0ms preprocess, 68.5ms inference, 14.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 81.7ms

Speed: 0.0ms preprocess, 81.7ms inference, 1.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 66.7ms

Speed: 0.0ms preprocess, 66.7ms inference, 20.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 dog, 67.3ms

Speed: 1.0ms preprocess, 67.3ms inference, 15.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 dog, 62.9ms

Speed: 0.0ms preprocess, 62.9ms inference, 30.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 62.9ms

Speed: 0.0ms preprocess, 62.9ms inference, 15.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 78.6ms

Speed: 0.0ms preprocess, 78.6ms inference, 15.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 62.7ms  
Speed: 0.0ms preprocess, 62.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 63.2ms  
Speed: 0.0ms preprocess, 63.2ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 63.2ms  
Speed: 0.0ms preprocess, 63.2ms inference, 16.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 1 backpack, 62.5ms  
Speed: 0.0ms preprocess, 62.5ms inference, 21.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 2 backpacks, 78.5ms  
Speed: 0.0ms preprocess, 78.5ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 backpack, 63.8ms  
Speed: 0.0ms preprocess, 63.8ms inference, 15.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 63.0ms  
Speed: 0.0ms preprocess, 63.0ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 42 persons, 1 dog, 76.0ms  
Speed: 0.0ms preprocess, 76.0ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 62.9ms  
Speed: 0.0ms preprocess, 62.9ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 40 persons, 1 dog, 74.2ms  
Speed: 0.0ms preprocess, 74.2ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 79.0ms  
Speed: 0.0ms preprocess, 79.0ms inference, 16.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 1 chair, 63.6ms  
Speed: 0.0ms preprocess, 63.6ms inference, 15.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 1 chair, 79.1ms



Speed: 0.0ms preprocess, 79.1ms inference, 14.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 backpack, 1 chair, 79.4ms

Speed: 0.0ms preprocess, 79.4ms inference, 12.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 62.5ms

Speed: 0.0ms preprocess, 62.5ms inference, 25.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 64.2ms

Speed: 0.0ms preprocess, 64.2ms inference, 15.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 dog, 72.5ms

Speed: 4.5ms preprocess, 72.5ms inference, 14.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 2 dogs, 63.7ms

Speed: 0.0ms preprocess, 63.7ms inference, 16.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 dog, 74.1ms

Speed: 0.0ms preprocess, 74.1ms inference, 5.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 78.4ms

Speed: 0.0ms preprocess, 78.4ms inference, 15.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 41 persons, 63.6ms

Speed: 0.0ms preprocess, 63.6ms inference, 15.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 84.2ms

Speed: 0.0ms preprocess, 84.2ms inference, 17.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 83.9ms

Speed: 2.0ms preprocess, 83.9ms inference, 16.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 backpack, 89.6ms

Speed: 1.0ms preprocess, 89.6ms inference, 18.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 78.3ms

Speed: 1.1ms preprocess, 78.3ms inference, 14.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 2 backpacks, 118.6ms  
Speed: 2.0ms preprocess, 118.6ms inference, 18.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 2 backpacks, 79.5ms  
Speed: 2.1ms preprocess, 79.5ms inference, 13.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 backpack, 77.8ms  
Speed: 1.5ms preprocess, 77.8ms inference, 15.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 38 persons, 1 backpack, 78.7ms  
Speed: 1.2ms preprocess, 78.7ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 39 persons, 1 dog, 1 backpack, 64.8ms  
Speed: 1.0ms preprocess, 64.8ms inference, 13.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 2 backpacks, 68.6ms  
Speed: 2.1ms preprocess, 68.6ms inference, 13.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 2 dogs, 2 backpacks, 81.6ms  
Speed: 2.4ms preprocess, 81.6ms inference, 17.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 2 dogs, 1 backpack, 78.0ms  
Speed: 2.0ms preprocess, 78.0ms inference, 14.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 dog, 2 backpacks, 1 skis, 72.8ms  
Speed: 1.0ms preprocess, 72.8ms inference, 14.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 2 backpacks, 1 skis, 75.0ms  
Speed: 1.0ms preprocess, 75.0ms inference, 17.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 1 backpack, 64.0ms  
Speed: 2.1ms preprocess, 64.0ms inference, 12.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 backpack, 1 skis, 65.0ms  
Speed: 1.0ms preprocess, 65.0ms inference, 11.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 backpack, 1 skis, 66.7ms

Speed: 1.0ms preprocess, 66.7ms inference, 15.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 1 backpack, 70.8ms

Speed: 1.0ms preprocess, 70.8ms inference, 13.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 1 backpack, 1 skis, 66.9ms

Speed: 0.8ms preprocess, 66.9ms inference, 13.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 dog, 66.8ms

Speed: 1.0ms preprocess, 66.8ms inference, 11.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 dog, 1 backpack, 75.2ms

Speed: 0.9ms preprocess, 75.2ms inference, 14.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 dog, 1 backpack, 68.7ms

Speed: 2.0ms preprocess, 68.7ms inference, 13.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 backpack, 76.2ms

Speed: 1.1ms preprocess, 76.2ms inference, 15.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 handbag, 71.2ms

Speed: 1.0ms preprocess, 71.2ms inference, 11.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 dog, 68.7ms

Speed: 1.1ms preprocess, 68.7ms inference, 13.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 65.9ms

Speed: 1.0ms preprocess, 65.9ms inference, 15.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 dog, 1 backpack, 68.0ms

Speed: 1.9ms preprocess, 68.0ms inference, 15.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 1 dog, 1 backpack, 94.3ms

Speed: 1.0ms preprocess, 94.3ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 68.9ms

Speed: 0.9ms preprocess, 68.9ms inference, 13.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 69.3ms  
Speed: 0.9ms preprocess, 69.3ms inference, 11.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 dog, 74.4ms  
Speed: 1.5ms preprocess, 74.4ms inference, 14.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 1 dog, 80.7ms  
Speed: 1.0ms preprocess, 80.7ms inference, 13.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 1 dog, 76.2ms  
Speed: 2.0ms preprocess, 76.2ms inference, 12.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 dog, 71.8ms  
Speed: 1.0ms preprocess, 71.8ms inference, 12.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 dog, 76.1ms  
Speed: 2.1ms preprocess, 76.1ms inference, 13.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 dog, 62.0ms  
Speed: 1.0ms preprocess, 62.0ms inference, 13.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 69.3ms  
Speed: 2.0ms preprocess, 69.3ms inference, 12.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 74.3ms  
Speed: 1.0ms preprocess, 74.3ms inference, 14.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 71.0ms  
Speed: 1.4ms preprocess, 71.0ms inference, 11.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 66.3ms  
Speed: 0.9ms preprocess, 66.3ms inference, 11.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 71.8ms  
Speed: 1.0ms preprocess, 71.8ms inference, 10.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 cat, 76.6ms  
Speed: 2.2ms preprocess, 76.6ms inference, 12.1ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 cat, 71.2ms

Speed: 2.0ms preprocess, 71.2ms inference, 11.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 cat, 1 dog, 75.1ms

Speed: 1.0ms preprocess, 75.1ms inference, 14.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 74.0ms

Speed: 2.0ms preprocess, 74.0ms inference, 13.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 77.3ms

Speed: 2.6ms preprocess, 77.3ms inference, 10.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 79.5ms

Speed: 1.0ms preprocess, 79.5ms inference, 11.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 76.8ms

Speed: 2.0ms preprocess, 76.8ms inference, 12.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 75.4ms

Speed: 1.0ms preprocess, 75.4ms inference, 11.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 74.7ms

Speed: 1.3ms preprocess, 74.7ms inference, 11.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 74.8ms

Speed: 1.0ms preprocess, 74.8ms inference, 12.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 68.7ms

Speed: 1.4ms preprocess, 68.7ms inference, 13.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 handbag, 76.6ms

Speed: 2.0ms preprocess, 76.6ms inference, 12.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 1 handbag, 79.6ms

Speed: 2.0ms preprocess, 79.6ms inference, 13.3ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 1 handbag, 76.1ms  
Speed: 1.0ms preprocess, 76.1ms inference, 12.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 handbag, 74.4ms  
Speed: 0.9ms preprocess, 74.4ms inference, 14.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 handbag, 71.9ms  
Speed: 2.0ms preprocess, 71.9ms inference, 12.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 67.8ms  
Speed: 1.9ms preprocess, 67.8ms inference, 11.3ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 68.7ms  
Speed: 1.0ms preprocess, 68.7ms inference, 12.3ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 77.0ms  
Speed: 1.0ms preprocess, 77.0ms inference, 11.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 76.9ms  
Speed: 1.4ms preprocess, 76.9ms inference, 12.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 70.3ms  
Speed: 2.1ms preprocess, 70.3ms inference, 12.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 75.1ms  
Speed: 2.4ms preprocess, 75.1ms inference, 13.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 73.3ms  
Speed: 2.1ms preprocess, 73.3ms inference, 12.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 86.5ms  
Speed: 0.0ms preprocess, 86.5ms inference, 10.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 73.3ms  
Speed: 1.0ms preprocess, 73.3ms inference, 12.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 70.3ms  
Speed: 1.0ms preprocess, 70.3ms inference, 10.9ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 64.4ms

Speed: 1.0ms preprocess, 64.4ms inference, 13.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 dog, 80.1ms

Speed: 1.0ms preprocess, 80.1ms inference, 10.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 75.6ms

Speed: 1.8ms preprocess, 75.6ms inference, 12.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 95.7ms

Speed: 1.2ms preprocess, 95.7ms inference, 11.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 87.8ms

Speed: 0.9ms preprocess, 87.8ms inference, 12.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 91.7ms

Speed: 1.9ms preprocess, 91.7ms inference, 13.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 89.0ms

Speed: 2.0ms preprocess, 89.0ms inference, 17.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 handbag, 84.1ms

Speed: 1.0ms preprocess, 84.1ms inference, 13.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 79.1ms

Speed: 1.0ms preprocess, 79.1ms inference, 14.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 96.3ms

Speed: 2.2ms preprocess, 96.3ms inference, 12.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 handbag, 86.8ms

Speed: 2.0ms preprocess, 86.8ms inference, 13.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 handbag, 87.2ms

Speed: 0.9ms preprocess, 87.2ms inference, 14.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 handbag, 85.1ms  
Speed: 2.1ms preprocess, 85.1ms inference, 14.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 1 handbag, 86.1ms  
Speed: 1.0ms preprocess, 86.1ms inference, 16.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 1 handbag, 76.6ms  
Speed: 1.0ms preprocess, 76.6ms inference, 12.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 1 handbag, 90.0ms  
Speed: 1.0ms preprocess, 90.0ms inference, 16.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 handbag, 82.5ms  
Speed: 1.0ms preprocess, 82.5ms inference, 14.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 handbag, 98.7ms  
Speed: 1.1ms preprocess, 98.7ms inference, 15.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 1 dog, 1 handbag, 89.6ms  
Speed: 2.0ms preprocess, 89.6ms inference, 14.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 110.7ms  
Speed: 1.0ms preprocess, 110.7ms inference, 16.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 98.1ms  
Speed: 0.9ms preprocess, 98.1ms inference, 16.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 dog, 99.4ms  
Speed: 1.2ms preprocess, 99.4ms inference, 15.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 dog, 98.9ms  
Speed: 1.0ms preprocess, 98.9ms inference, 14.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 90.9ms  
Speed: 2.0ms preprocess, 90.9ms inference, 12.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 83.3ms  
Speed: 2.1ms preprocess, 83.3ms inference, 12.6ms postprocess per



image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 80.7ms

Speed: 1.0ms preprocess, 80.7ms inference, 14.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 dog, 119.7ms

Speed: 1.0ms preprocess, 119.7ms inference, 15.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 dog, 98.6ms

Speed: 2.1ms preprocess, 98.6ms inference, 16.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 dog, 92.8ms

Speed: 1.3ms preprocess, 92.8ms inference, 15.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 86.8ms

Speed: 1.4ms preprocess, 86.8ms inference, 16.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 98.9ms

Speed: 2.4ms preprocess, 98.9ms inference, 17.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 dog, 91.6ms

Speed: 0.9ms preprocess, 91.6ms inference, 10.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 80.7ms

Speed: 2.0ms preprocess, 80.7ms inference, 14.3ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 76.1ms

Speed: 2.1ms preprocess, 76.1ms inference, 10.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 82.3ms

Speed: 2.1ms preprocess, 82.3ms inference, 16.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 89.9ms

Speed: 2.0ms preprocess, 89.9ms inference, 16.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 88.1ms

Speed: 2.0ms preprocess, 88.1ms inference, 14.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 89.0ms  
Speed: 2.0ms preprocess, 89.0ms inference, 18.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 79.4ms  
Speed: 2.3ms preprocess, 79.4ms inference, 12.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 backpack, 85.5ms  
Speed: 1.9ms preprocess, 85.5ms inference, 14.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 2 backpacks, 95.3ms  
Speed: 2.1ms preprocess, 95.3ms inference, 19.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 103.7ms  
Speed: 2.6ms preprocess, 103.7ms inference, 17.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 108.4ms  
Speed: 2.1ms preprocess, 108.4ms inference, 18.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 92.8ms  
Speed: 1.3ms preprocess, 92.8ms inference, 15.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 backpack, 104.7ms  
Speed: 1.9ms preprocess, 104.7ms inference, 19.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 dog, 1 backpack, 110.5ms  
Speed: 1.8ms preprocess, 110.5ms inference, 22.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 1 dog, 1 backpack, 131.2ms  
Speed: 2.5ms preprocess, 131.2ms inference, 25.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 115.1ms  
Speed: 1.0ms preprocess, 115.1ms inference, 20.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 1 dog, 111.6ms  
Speed: 1.9ms preprocess, 111.6ms inference, 17.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 95.2ms  
Speed: 2.1ms preprocess, 95.2ms inference, 17.9ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 37 persons, 105.4ms

Speed: 1.0ms preprocess, 105.4ms inference, 28.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 1 backpack, 1 suitcase, 117.8ms

Speed: 2.0ms preprocess, 117.8ms inference, 22.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 backpack, 106.2ms

Speed: 2.1ms preprocess, 106.2ms inference, 18.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 36 persons, 98.3ms

Speed: 2.0ms preprocess, 98.3ms inference, 16.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 35 persons, 1 backpack, 99.2ms

Speed: 1.0ms preprocess, 99.2ms inference, 17.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 1 dog, 1 backpack, 105.5ms

Speed: 2.0ms preprocess, 105.5ms inference, 25.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 dog, 1 backpack, 103.2ms

Speed: 2.0ms preprocess, 103.2ms inference, 17.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 1 backpack, 94.9ms

Speed: 1.0ms preprocess, 94.9ms inference, 14.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 dog, 1 backpack, 107.5ms

Speed: 2.1ms preprocess, 107.5ms inference, 16.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 dog, 1 backpack, 94.4ms

Speed: 2.0ms preprocess, 94.4ms inference, 14.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 backpack, 92.1ms

Speed: 2.0ms preprocess, 92.1ms inference, 14.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 backpack, 83.3ms

Speed: 1.0ms preprocess, 83.3ms inference, 15.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 86.0ms  
Speed: 1.0ms preprocess, 86.0ms inference, 18.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 88.4ms  
Speed: 1.3ms preprocess, 88.4ms inference, 15.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 34 persons, 1 dog, 81.7ms  
Speed: 1.1ms preprocess, 81.7ms inference, 15.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 dog, 77.3ms  
Speed: 2.0ms preprocess, 77.3ms inference, 14.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 dog, 75.8ms  
Speed: 1.1ms preprocess, 75.8ms inference, 14.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 2 handbags, 78.3ms  
Speed: 1.0ms preprocess, 78.3ms inference, 14.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 handbag, 81.0ms  
Speed: 2.0ms preprocess, 81.0ms inference, 13.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 3 dogs, 69.0ms  
Speed: 1.0ms preprocess, 69.0ms inference, 11.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 3 dogs, 75.7ms  
Speed: 1.0ms preprocess, 75.7ms inference, 12.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 3 dogs, 69.9ms  
Speed: 1.0ms preprocess, 69.9ms inference, 11.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 3 dogs, 76.2ms  
Speed: 1.0ms preprocess, 76.2ms inference, 13.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 3 dogs, 1 handbag, 77.1ms  
Speed: 1.1ms preprocess, 77.1ms inference, 12.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 2 dogs, 2 handbags, 73.7ms  
Speed: 1.2ms preprocess, 73.7ms inference, 17.8ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 2 dogs, 74.8ms

Speed: 2.0ms preprocess, 74.8ms inference, 11.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 2 dogs, 74.4ms

Speed: 2.0ms preprocess, 74.4ms inference, 12.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 2 dogs, 69.3ms

Speed: 1.0ms preprocess, 69.3ms inference, 12.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 dog, 77.1ms

Speed: 2.0ms preprocess, 77.1ms inference, 12.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 dog, 75.5ms

Speed: 0.9ms preprocess, 75.5ms inference, 14.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 backpack, 83.2ms

Speed: 1.0ms preprocess, 83.2ms inference, 13.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 backpack, 86.1ms

Speed: 1.0ms preprocess, 86.1ms inference, 13.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 2 dogs, 1 backpack, 73.2ms

Speed: 2.3ms preprocess, 73.2ms inference, 12.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 dog, 82.0ms

Speed: 1.1ms preprocess, 82.0ms inference, 13.3ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 1 bird, 1 dog, 100.0ms

Speed: 2.0ms preprocess, 100.0ms inference, 13.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 95.1ms

Speed: 1.0ms preprocess, 95.1ms inference, 13.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 1 bird, 1 dog, 1 handbag, 129.2ms

Speed: 1.4ms preprocess, 129.2ms inference, 17.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 bird, 1 dog, 123.8ms  
Speed: 2.1ms preprocess, 123.8ms inference, 23.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 119.2ms  
Speed: 2.1ms preprocess, 119.2ms inference, 23.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 1 handbag, 112.7ms  
Speed: 2.9ms preprocess, 112.7ms inference, 16.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 1 dog, 101.2ms  
Speed: 3.1ms preprocess, 101.2ms inference, 13.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 24 persons, 84.1ms  
Speed: 1.0ms preprocess, 84.1ms inference, 11.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 25 persons, 95.4ms  
Speed: 1.0ms preprocess, 95.4ms inference, 11.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 2 dogs, 93.0ms  
Speed: 2.0ms preprocess, 93.0ms inference, 14.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 90.6ms  
Speed: 1.0ms preprocess, 90.6ms inference, 16.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 handbag, 93.0ms  
Speed: 2.1ms preprocess, 93.0ms inference, 17.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 handbag, 105.7ms  
Speed: 2.1ms preprocess, 105.7ms inference, 14.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 handbag, 96.4ms  
Speed: 3.0ms preprocess, 96.4ms inference, 15.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 2 handbags, 115.9ms  
Speed: 1.6ms preprocess, 115.9ms inference, 19.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 handbag, 108.1ms  
Speed: 2.0ms preprocess, 108.1ms inference, 16.0ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 1 bird, 91.6ms

Speed: 0.9ms preprocess, 91.6ms inference, 12.9ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 bird, 122.8ms

Speed: 1.9ms preprocess, 122.8ms inference, 16.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 128.8ms

Speed: 1.9ms preprocess, 128.8ms inference, 18.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 2 birds, 1 dog, 128.3ms

Speed: 3.0ms preprocess, 128.3ms inference, 22.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 bird, 122.5ms

Speed: 2.0ms preprocess, 122.5ms inference, 27.1ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 bird, 122.4ms

Speed: 1.4ms preprocess, 122.4ms inference, 16.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 25 persons, 1 bird, 104.7ms

Speed: 2.0ms preprocess, 104.7ms inference, 13.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 bird, 1 dog, 163.1ms

Speed: 2.0ms preprocess, 163.1ms inference, 19.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 3 dogs, 150.4ms

Speed: 4.0ms preprocess, 150.4ms inference, 17.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 2 dogs, 137.8ms

Speed: 3.0ms preprocess, 137.8ms inference, 30.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 3 dogs, 187.4ms

Speed: 2.4ms preprocess, 187.4ms inference, 30.3ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 2 dogs, 189.6ms

Speed: 3.3ms preprocess, 189.6ms inference, 20.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 1 dog, 140.9ms

Speed: 2.1ms preprocess, 140.9ms inference, 16.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 129.9ms

Speed: 4.0ms preprocess, 129.9ms inference, 15.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 100.0ms

Speed: 2.1ms preprocess, 100.0ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 117.3ms

Speed: 2.1ms preprocess, 117.3ms inference, 18.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 109.3ms

Speed: 2.2ms preprocess, 109.3ms inference, 17.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 101.9ms

Speed: 1.0ms preprocess, 101.9ms inference, 16.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 1 suitcase, 102.7ms

Speed: 2.6ms preprocess, 102.7ms inference, 17.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 backpack, 1 handbag, 97.5ms

Speed: 2.0ms preprocess, 97.5ms inference, 15.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 backpack, 1 handbag, 97.2ms

Speed: 2.9ms preprocess, 97.2ms inference, 14.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 112.0ms

Speed: 2.9ms preprocess, 112.0ms inference, 18.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 97.1ms

Speed: 0.9ms preprocess, 97.1ms inference, 13.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 98.3ms

Speed: 1.2ms preprocess, 98.3ms inference, 13.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 handbag, 97.2ms

Speed: 0.9ms preprocess, 97.2ms inference, 14.1ms postprocess per image at shape (1, 3, 384, 640)



0: 384x640 27 persons, 103.8ms  
Speed: 3.0ms preprocess, 103.8ms inference, 17.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 24 persons, 103.7ms  
Speed: 1.0ms preprocess, 103.7ms inference, 17.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 117.7ms  
Speed: 2.0ms preprocess, 117.7ms inference, 17.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 112.1ms  
Speed: 2.0ms preprocess, 112.1ms inference, 12.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 104.7ms  
Speed: 2.9ms preprocess, 104.7ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 95.3ms  
Speed: 0.0ms preprocess, 95.3ms inference, 12.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 109.6ms  
Speed: 0.0ms preprocess, 109.6ms inference, 16.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 126.4ms  
Speed: 0.0ms preprocess, 126.4ms inference, 16.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 105.3ms  
Speed: 4.4ms preprocess, 105.3ms inference, 16.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 93.4ms  
Speed: 0.0ms preprocess, 93.4ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 101.3ms  
Speed: 6.0ms preprocess, 101.3ms inference, 3.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 107.2ms  
Speed: 2.0ms preprocess, 107.2ms inference, 16.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 94.8ms

Speed: 0.0ms preprocess, 94.8ms inference, 15.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 bird, 1 dog, 95.3ms

Speed: 0.0ms preprocess, 95.3ms inference, 18.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 120.6ms

Speed: 1.4ms preprocess, 120.6ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 1 skateboard, 110.7ms

Speed: 0.0ms preprocess, 110.7ms inference, 19.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 1 dog, 111.0ms

Speed: 0.0ms preprocess, 111.0ms inference, 15.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 2 dogs, 90.6ms

Speed: 6.1ms preprocess, 90.6ms inference, 15.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 3 dogs, 84.6ms

Speed: 0.0ms preprocess, 84.6ms inference, 25.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 dog, 106.5ms

Speed: 3.0ms preprocess, 106.5ms inference, 15.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 bird, 2 dogs, 91.9ms

Speed: 0.0ms preprocess, 91.9ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 dog, 108.0ms

Speed: 0.0ms preprocess, 108.0ms inference, 17.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 bird, 1 dog, 100.0ms

Speed: 0.0ms preprocess, 100.0ms inference, 15.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 dog, 94.2ms

Speed: 0.0ms preprocess, 94.2ms inference, 17.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 dog, 105.2ms

Speed: 0.0ms preprocess, 105.2ms inference, 16.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 2 dogs, 106.5ms  
Speed: 2.0ms preprocess, 106.5ms inference, 14.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 33 persons, 2 dogs, 105.2ms  
Speed: 1.9ms preprocess, 105.2ms inference, 17.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 2 dogs, 78.6ms  
Speed: 0.0ms preprocess, 78.6ms inference, 15.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 dog, 1 backpack, 102.3ms  
Speed: 0.0ms preprocess, 102.3ms inference, 12.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 1 dog, 100.5ms  
Speed: 0.0ms preprocess, 100.5ms inference, 15.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 1 backpack, 87.4ms  
Speed: 0.0ms preprocess, 87.4ms inference, 20.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 1 backpack, 88.0ms  
Speed: 0.0ms preprocess, 88.0ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 1 backpack, 98.8ms  
Speed: 2.7ms preprocess, 98.8ms inference, 16.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 99.3ms  
Speed: 0.0ms preprocess, 99.3ms inference, 15.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 1 dog, 99.0ms  
Speed: 0.5ms preprocess, 99.0ms inference, 13.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 1 dog, 106.7ms  
Speed: 2.0ms preprocess, 106.7ms inference, 13.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 dog, 105.6ms  
Speed: 2.9ms preprocess, 105.6ms inference, 17.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 1 dog, 107.8ms

Speed: 1.0ms preprocess, 107.8ms inference, 17.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 1 dog, 94.0ms

Speed: 2.0ms preprocess, 94.0ms inference, 12.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 25 persons, 1 dog, 107.1ms

Speed: 2.0ms preprocess, 107.1ms inference, 12.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 2 dogs, 104.1ms

Speed: 1.0ms preprocess, 104.1ms inference, 16.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 26 persons, 2 dogs, 88.1ms

Speed: 0.9ms preprocess, 88.1ms inference, 11.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 2 dogs, 1 backpack, 116.3ms

Speed: 1.0ms preprocess, 116.3ms inference, 15.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 2 dogs, 1 backpack, 119.0ms

Speed: 1.1ms preprocess, 119.0ms inference, 16.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 2 dogs, 1 backpack, 98.6ms

Speed: 1.0ms preprocess, 98.6ms inference, 14.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 3 dogs, 103.9ms

Speed: 2.0ms preprocess, 103.9ms inference, 16.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 29 persons, 103.4ms

Speed: 1.0ms preprocess, 103.4ms inference, 16.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 105.7ms

Speed: 1.9ms preprocess, 105.7ms inference, 17.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 backpack, 144.3ms

Speed: 3.5ms preprocess, 144.3ms inference, 20.3ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 1 backpack, 127.9ms

Speed: 1.5ms preprocess, 127.9ms inference, 19.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 97.9ms  
Speed: 2.0ms preprocess, 97.9ms inference, 12.4ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 86.9ms  
Speed: 1.1ms preprocess, 86.9ms inference, 14.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 114.7ms  
Speed: 1.0ms preprocess, 114.7ms inference, 19.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 112.0ms  
Speed: 1.0ms preprocess, 112.0ms inference, 16.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 30 persons, 117.9ms  
Speed: 2.0ms preprocess, 117.9ms inference, 18.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 105.6ms  
Speed: 2.0ms preprocess, 105.6ms inference, 14.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 32 persons, 101.3ms  
Speed: 2.0ms preprocess, 101.3ms inference, 13.3ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 31 persons, 88.2ms  
Speed: 2.3ms preprocess, 88.2ms inference, 13.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 103.5ms  
Speed: 2.0ms preprocess, 103.5ms inference, 14.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 27 persons, 97.1ms  
Speed: 2.0ms preprocess, 97.1ms inference, 14.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 28 persons, 98.9ms  
Speed: 2.0ms preprocess, 98.9ms inference, 15.2ms postprocess per  
image at shape (1, 3, 384, 640)  
Finished processing video.  
Accuracy: 0.90  
Precision: 0.83  
Recall: 0.88  
F1 Score: 0.84

Accuracy: 0.90  
Video saved successfully at: los\_angeles\_output\_video.mp4

## YOLO10

This version introduces substantial changes, such as eliminating the traditional NMS (Non-Maximum Suppression) post-processing step through NMS-Free training. YOLOv10 uses a dual-label assignment method that significantly reduces latency during inference while maintaining accuracy. This version also features a one-to-one head architecture for prediction, streamlining the process during both training and inference VISO.AI .

```
import os
import cv2
import numpy as np
from ultralytics import YOLO
from sklearn.metrics import accuracy_score, precision_score,
recall_score, f1_score, confusion_matrix, roc_curve,
precision_recall_curve
import matplotlib.pyplot as plt

# Load YOLO model
model_path = 'yolov10x.pt'
if not os.path.exists(model_path):
    raise FileNotFoundError(f"Model file {model_path} not found.")
model = YOLO(model_path)

# Video paths
video_path = "people.mp4"
if not os.path.exists(video_path):
    raise FileNotFoundError(f"Video file {video_path} not found.")
cap = cv2.VideoCapture(video_path)

# Output video path
output_file = 'output_video_YOLO10.mp4'

# Video properties
fps = cap.get(cv2.CAP_PROP_FPS)
frame_width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
frame_height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))

# Initialize VideoWriter
out = cv2.VideoWriter(output_file, cv2.VideoWriter_fourcc(*'mp4v'),
fps, (frame_width, frame_height))

# Placeholder function for ground truth labels
def get_true_labels_for_frame(frame_index):
    # Replace this with actual ground truth retrieval logic
```

```

    # Example: list of class labels expected for the frame
    return [0] * 37 if frame_index % 2 == 0 else [1] * 37

# Set confidence threshold
confidence_threshold = 0.5

# Initialize evaluation lists
y_true = []
y_pred = []
y_scores = []

frame_index = 0
while cap.isOpened():
    ret, frame = cap.read()
    if not ret:
        print("Finished processing video.")
        break

    # Get true labels
    true_labels = get_true_labels_for_frame(frame_index)

    # Run YOLOv8 inference on the frame
    results = model(frame)

    # Collect predictions above confidence threshold
    frame_y_pred = []
    frame_y_scores = []
    if results[0].boxes.data.size(0) > 0:
        for pred in results[0].boxes.data.cpu().numpy():
            confidence_score = pred[4]
            if confidence_score >= confidence_threshold:
                predicted_label = int(pred[5]) # Detected class label
                frame_y_pred.append(predicted_label)
                frame_y_scores.append(confidence_score)

    # Extend y_true to match the number of predictions
    y_true.extend(true_labels[:len(frame_y_pred)])
    y_pred.extend(frame_y_pred)
    y_scores.extend(frame_y_scores)

    # Annotate frame
    annotated_frame = results[0].plot()

    # Write annotated frame to output video
    out.write(annotated_frame)

    # Display frame
    cv2.imshow('YOLOv8 Segmentation and Tracking', annotated_frame)

    frame_index += 1

```

```

        if cv2.waitKey(1) & 0xFF == ord('q'):
            break

# Release resources
cap.release()
out.release()
cv2.destroyAllWindows()

# Calculate evaluation metrics
if y_pred:
    accuracy = accuracy_score(y_true, y_pred)
    precision = precision_score(y_true, y_pred, average='weighted',
                                zero_division=1)
    recall = recall_score(y_true, y_pred, average='weighted',
                           zero_division=1)
    f1 = f1_score(y_true, y_pred, average='weighted', zero_division=1)

else:
    print("No valid predictions were made.")

# Confirm video saved
print(f"Accuracy: {accuracy:.2f}")
print(f"Precision: {precision:.2f}")

print(f"F1 Score: {f1:.2f}")
print(f"Recall: {recall:.2f}")
if os.path.exists(output_file):
    print(f"Video saved successfully at: {output_file}")
    print(f"Accuracy: {accuracy:.2f}")
else:
    print("Error: Video file was not saved.")

```

```

0: 384x640 14 0s, 1 26, 517.6ms
Speed: 2.0ms preprocess, 517.6ms inference, 1.0ms postprocess per
image at shape (1, 3, 384, 640)

```

```

0: 384x640 13 0s, 1 26, 540.5ms
Speed: 2.0ms preprocess, 540.5ms inference, 0.0ms postprocess per
image at shape (1, 3, 384, 640)

```

```

0: 384x640 14 0s, 3 26s, 532.5ms
Speed: 0.0ms preprocess, 532.5ms inference, 0.0ms postprocess per
image at shape (1, 3, 384, 640)

```

```

0: 384x640 14 0s, 514.0ms
Speed: 0.0ms preprocess, 514.0ms inference, 0.0ms postprocess per
image at shape (1, 3, 384, 640)

```



0: 384x640 14 0s, 1 26, 556.3ms  
Speed: 0.0ms preprocess, 556.3ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 551.5ms  
Speed: 1.9ms preprocess, 551.5ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 568.3ms  
Speed: 0.0ms preprocess, 568.3ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 547.4ms  
Speed: 0.0ms preprocess, 547.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 550.0ms  
Speed: 0.0ms preprocess, 550.0ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 498.1ms  
Speed: 1.3ms preprocess, 498.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 514.2ms  
Speed: 2.0ms preprocess, 514.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 1 26, 535.7ms  
Speed: 2.4ms preprocess, 535.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 550.4ms  
Speed: 0.0ms preprocess, 550.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 554.6ms  
Speed: 0.0ms preprocess, 554.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 26s, 545.3ms  
Speed: 1.4ms preprocess, 545.3ms inference, 0.8ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 24s, 550.4ms  
Speed: 1.8ms preprocess, 550.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 571.6ms

Speed: 0.0ms preprocess, 571.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 1 26, 553.8ms

Speed: 5.2ms preprocess, 553.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 568.8ms

Speed: 0.0ms preprocess, 568.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 616.4ms

Speed: 0.0ms preprocess, 616.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 601.0ms

Speed: 1.0ms preprocess, 601.0ms inference, 1.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 578.6ms

Speed: 2.7ms preprocess, 578.6ms inference, 1.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 603.4ms

Speed: 0.0ms preprocess, 603.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 596.7ms

Speed: 0.0ms preprocess, 596.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 594.1ms

Speed: 1.5ms preprocess, 594.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 577.9ms

Speed: 0.6ms preprocess, 577.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 564.3ms

Speed: 0.0ms preprocess, 564.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 559.8ms

Speed: 0.0ms preprocess, 559.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 566.4ms

Speed: 0.0ms preprocess, 566.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 568.7ms  
Speed: 2.4ms preprocess, 568.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 585.2ms  
Speed: 2.0ms preprocess, 585.2ms inference, 1.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 614.9ms  
Speed: 1.8ms preprocess, 614.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 596.7ms  
Speed: 2.0ms preprocess, 596.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 582.7ms  
Speed: 0.0ms preprocess, 582.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 595.9ms  
Speed: 1.3ms preprocess, 595.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 631.1ms  
Speed: 1.0ms preprocess, 631.1ms inference, 0.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 610.9ms  
Speed: 2.0ms preprocess, 610.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 584.9ms  
Speed: 1.7ms preprocess, 584.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 2 26s, 602.0ms  
Speed: 1.2ms preprocess, 602.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 26s, 562.0ms  
Speed: 2.6ms preprocess, 562.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 564.2ms  
Speed: 2.0ms preprocess, 564.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 550.4ms

Speed: 0.0ms preprocess, 550.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 564.5ms

Speed: 0.0ms preprocess, 564.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 587.6ms

Speed: 0.0ms preprocess, 587.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 1 26, 593.9ms

Speed: 0.0ms preprocess, 593.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 3 26s, 577.3ms

Speed: 1.8ms preprocess, 577.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 563.6ms

Speed: 0.0ms preprocess, 563.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 566.4ms

Speed: 15.6ms preprocess, 566.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 2 26s, 565.7ms

Speed: 0.0ms preprocess, 565.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 1 26, 565.3ms

Speed: 0.0ms preprocess, 565.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 581.0ms

Speed: 0.0ms preprocess, 581.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 1 26, 549.6ms

Speed: 0.0ms preprocess, 549.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 555.6ms

Speed: 0.0ms preprocess, 555.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 563.6ms

Speed: 1.9ms preprocess, 563.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 24, 1 26, 768.6ms  
Speed: 0.0ms preprocess, 768.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 913.3ms  
Speed: 0.0ms preprocess, 913.3ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 848.5ms  
Speed: 15.6ms preprocess, 848.5ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 879.1ms  
Speed: 0.0ms preprocess, 879.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 880.1ms  
Speed: 0.0ms preprocess, 880.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 24s, 926.7ms  
Speed: 0.0ms preprocess, 926.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 24s, 848.7ms  
Speed: 15.6ms preprocess, 848.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 833.4ms  
Speed: 0.0ms preprocess, 833.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 911.6ms  
Speed: 0.0ms preprocess, 911.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 24, 2 26s, 863.6ms  
Speed: 0.0ms preprocess, 863.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 929.4ms  
Speed: 14.5ms preprocess, 929.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 1021.2ms  
Speed: 0.0ms preprocess, 1021.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 942.2ms

Speed: 0.0ms preprocess, 942.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 910.9ms

Speed: 0.0ms preprocess, 910.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 881.5ms

Speed: 0.0ms preprocess, 881.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 879.8ms

Speed: 0.0ms preprocess, 879.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 910.4ms

Speed: 0.0ms preprocess, 910.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 880.2ms

Speed: 0.0ms preprocess, 880.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 942.0ms

Speed: 0.0ms preprocess, 942.0ms inference, 15.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 848.8ms

Speed: 0.0ms preprocess, 848.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 24, 958.3ms

Speed: 0.0ms preprocess, 958.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 879.6ms

Speed: 0.0ms preprocess, 879.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 910.6ms

Speed: 0.0ms preprocess, 910.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 850.7ms

Speed: 15.6ms preprocess, 850.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 20 0s, 1 24, 866.0ms

Speed: 0.0ms preprocess, 866.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 24s, 866.2ms  
Speed: 0.0ms preprocess, 866.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 1 26, 930.5ms  
Speed: 0.0ms preprocess, 930.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 1008.4ms  
Speed: 0.0ms preprocess, 1008.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 881.6ms  
Speed: 0.0ms preprocess, 881.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 24s, 912.4ms  
Speed: 0.0ms preprocess, 912.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 3 24s, 2 26s, 834.2ms  
Speed: 15.0ms preprocess, 834.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 24s, 947.7ms  
Speed: 0.0ms preprocess, 947.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 913.0ms  
Speed: 0.0ms preprocess, 913.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 881.2ms  
Speed: 0.0ms preprocess, 881.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 947.9ms  
Speed: 0.0ms preprocess, 947.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 897.3ms  
Speed: 0.0ms preprocess, 897.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 24s, 864.7ms  
Speed: 0.0ms preprocess, 864.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 880.1ms

Speed: 0.0ms preprocess, 880.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 1 24, 879.6ms

Speed: 0.0ms preprocess, 879.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 2 24s, 1 26, 879.9ms

Speed: 0.0ms preprocess, 879.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 24, 2 26s, 894.6ms

Speed: 0.0ms preprocess, 894.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 1 24, 2 26s, 863.9ms

Speed: 0.0ms preprocess, 863.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 3 26s, 879.7ms

Speed: 0.0ms preprocess, 879.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 24s, 2 26s, 871.8ms

Speed: 0.0ms preprocess, 871.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 942.8ms

Speed: 2.0ms preprocess, 942.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 910.5ms

Speed: 0.0ms preprocess, 910.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 862.8ms

Speed: 0.0ms preprocess, 862.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 893.0ms

Speed: 8.5ms preprocess, 893.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 894.8ms

Speed: 0.0ms preprocess, 894.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 2 26s, 863.5ms

Speed: 0.0ms preprocess, 863.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)



0: 384x640 15 0s, 1 24, 1 26, 844.8ms  
Speed: 15.5ms preprocess, 844.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 24s, 895.9ms  
Speed: 0.0ms preprocess, 895.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 912.5ms  
Speed: 15.6ms preprocess, 912.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 912.2ms  
Speed: 0.0ms preprocess, 912.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 882.1ms  
Speed: 0.0ms preprocess, 882.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 980.8ms  
Speed: 0.0ms preprocess, 980.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 4173.0ms  
Speed: 15.6ms preprocess, 4173.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 4660.9ms  
Speed: 2.0ms preprocess, 4660.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 4268.7ms  
Speed: 0.0ms preprocess, 4268.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 4051.1ms  
Speed: 0.0ms preprocess, 4051.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 4137.8ms  
Speed: 0.0ms preprocess, 4137.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 4315.5ms  
Speed: 36.6ms preprocess, 4315.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 5608.1ms

Speed: 0.0ms preprocess, 5608.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 3106.8ms  
Speed: 102.6ms preprocess, 3106.8ms inference, 0.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 3428.0ms  
Speed: 16.9ms preprocess, 3428.0ms inference, 9.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 5780.4ms  
Speed: 3.6ms preprocess, 5780.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3847.4ms  
Speed: 116.0ms preprocess, 3847.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 4641.9ms  
Speed: 110.1ms preprocess, 4641.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 4603.2ms  
Speed: 1.6ms preprocess, 4603.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2708.8ms  
Speed: 8.0ms preprocess, 2708.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 1 26, 2396.4ms  
Speed: 15.6ms preprocess, 2396.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 2740.2ms  
Speed: 0.0ms preprocess, 2740.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 2449.3ms  
Speed: 5.7ms preprocess, 2449.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 2502.2ms  
Speed: 0.0ms preprocess, 2502.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2518.1ms  
Speed: 0.0ms preprocess, 2518.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 24, 2 26s, 2695.7ms  
Speed: 0.0ms preprocess, 2695.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 24, 2 26s, 2519.6ms  
Speed: 0.0ms preprocess, 2519.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 1 26, 2427.6ms  
Speed: 0.0ms preprocess, 2427.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 24, 3 26s, 2551.9ms  
Speed: 0.0ms preprocess, 2551.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 2619.2ms  
Speed: 0.0ms preprocess, 2619.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 2391.0ms  
Speed: 9.5ms preprocess, 2391.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 2375.4ms  
Speed: 15.6ms preprocess, 2375.4ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2779.4ms  
Speed: 0.0ms preprocess, 2779.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 2 26s, 2469.5ms  
Speed: 10.0ms preprocess, 2469.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 2648.4ms  
Speed: 15.0ms preprocess, 2648.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 2534.1ms  
Speed: 0.0ms preprocess, 2534.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 2517.1ms  
Speed: 15.6ms preprocess, 2517.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 2570.1ms  
Speed: 0.0ms preprocess, 2570.1ms inference, 0.0ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 2 26s, 3115.7ms

Speed: 15.5ms preprocess, 3115.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 12 0s, 3 26s, 2629.8ms

Speed: 15.6ms preprocess, 2629.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 2 26s, 2555.4ms

Speed: 5.8ms preprocess, 2555.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 2 26s, 2534.4ms

Speed: 0.0ms preprocess, 2534.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 26, 2632.1ms

Speed: 7.2ms preprocess, 2632.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 2661.8ms

Speed: 0.0ms preprocess, 2661.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2520.2ms

Speed: 15.8ms preprocess, 2520.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 2605.2ms

Speed: 15.7ms preprocess, 2605.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2539.2ms

Speed: 0.0ms preprocess, 2539.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2502.1ms

Speed: 15.6ms preprocess, 2502.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2486.7ms

Speed: 16.3ms preprocess, 2486.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2478.7ms

Speed: 3.2ms preprocess, 2478.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 1 38, 3750.8ms  
Speed: 0.7ms preprocess, 3750.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 1 38, 1837.7ms  
Speed: 0.0ms preprocess, 1837.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 1124.0ms  
Speed: 1.5ms preprocess, 1124.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 1154.7ms  
Speed: 7.5ms preprocess, 1154.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 3267.3ms  
Speed: 0.0ms preprocess, 3267.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 3196.9ms  
Speed: 0.0ms preprocess, 3196.9ms inference, 0.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 3102.4ms  
Speed: 0.0ms preprocess, 3102.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 1 38, 3174.1ms  
Speed: 6.3ms preprocess, 3174.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 3012.2ms  
Speed: 0.0ms preprocess, 3012.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2965.5ms  
Speed: 17.2ms preprocess, 2965.5ms inference, 0.7ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 3111.0ms  
Speed: 4.8ms preprocess, 3111.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 26s, 3089.1ms  
Speed: 8.1ms preprocess, 3089.1ms inference, 3.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 26s, 2728.0ms  
Speed: 8.1ms preprocess, 2728.0ms inference, 0.0ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 3398.7ms  
Speed: 8.0ms preprocess, 3398.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 3157.5ms  
Speed: 2.0ms preprocess, 3157.5ms inference, 0.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 26s, 2985.9ms  
Speed: 8.0ms preprocess, 2985.9ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2933.1ms  
Speed: 0.0ms preprocess, 2933.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 3067.9ms  
Speed: 6.1ms preprocess, 3067.9ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 2 26s, 2948.8ms  
Speed: 9.2ms preprocess, 2948.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 3030.4ms  
Speed: 6.7ms preprocess, 3030.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 2 26s, 2682.2ms  
Speed: 7.7ms preprocess, 2682.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 2778.3ms  
Speed: 18.2ms preprocess, 2778.3ms inference, 10.6ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 1 26, 2840.2ms  
Speed: 8.0ms preprocess, 2840.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 3913.1ms  
Speed: 13.0ms preprocess, 3913.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 2018.5ms  
Speed: 0.0ms preprocess, 2018.5ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 1096.1ms  
Speed: 2.0ms preprocess, 1096.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1023.4ms  
Speed: 12.5ms preprocess, 1023.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 2670.4ms  
Speed: 0.0ms preprocess, 2670.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 2533.9ms  
Speed: 16.2ms preprocess, 2533.9ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2545.2ms  
Speed: 0.0ms preprocess, 2545.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2597.6ms  
Speed: 18.9ms preprocess, 2597.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2597.2ms  
Speed: 5.7ms preprocess, 2597.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2639.6ms  
Speed: 7.0ms preprocess, 2639.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 1 26, 2803.1ms  
Speed: 0.0ms preprocess, 2803.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2458.2ms  
Speed: 0.0ms preprocess, 2458.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2844.3ms  
Speed: 7.1ms preprocess, 2844.3ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 3039.0ms  
Speed: 16.0ms preprocess, 3039.0ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 2672.0ms  
Speed: 3.0ms preprocess, 2672.0ms inference, 0.0ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 3 26s, 2613.5ms

Speed: 15.8ms preprocess, 2613.5ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 26s, 2617.8ms

Speed: 17.8ms preprocess, 2617.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 26s, 2700.0ms

Speed: 6.6ms preprocess, 2700.0ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2608.8ms

Speed: 0.0ms preprocess, 2608.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2423.8ms

Speed: 2.3ms preprocess, 2423.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2423.8ms

Speed: 0.0ms preprocess, 2423.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2391.4ms

Speed: 15.6ms preprocess, 2391.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2449.9ms

Speed: 6.8ms preprocess, 2449.9ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 26s, 2452.5ms

Speed: 0.0ms preprocess, 2452.5ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2393.4ms

Speed: 0.0ms preprocess, 2393.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 2464.5ms

Speed: 15.8ms preprocess, 2464.5ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2394.1ms

Speed: 0.0ms preprocess, 2394.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)



0: 384x640 17 0s, 2 26s, 2549.9ms  
Speed: 0.0ms preprocess, 2549.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 2541.9ms  
Speed: 0.0ms preprocess, 2541.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2427.5ms  
Speed: 16.7ms preprocess, 2427.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2411.5ms  
Speed: 15.6ms preprocess, 2411.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 26, 2437.3ms  
Speed: 7.0ms preprocess, 2437.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 1 38, 2477.2ms  
Speed: 0.7ms preprocess, 2477.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 1 38, 2652.1ms  
Speed: 15.6ms preprocess, 2652.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2 38s, 2911.5ms  
Speed: 16.1ms preprocess, 2911.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 3 26s, 2 38s, 1556.0ms  
Speed: 8.0ms preprocess, 1556.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2 38s, 991.6ms  
Speed: 1.2ms preprocess, 991.6ms inference, 0.9ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 26s, 1 38, 1130.5ms  
Speed: 0.0ms preprocess, 1130.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 1 38, 3489.0ms  
Speed: 0.0ms preprocess, 3489.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 1 38, 3188.0ms  
Speed: 8.1ms preprocess, 3188.0ms inference, 0.0ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 1 38, 1878.3ms

Speed: 4.1ms preprocess, 1878.3ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 1 38, 1488.6ms

Speed: 8.0ms preprocess, 1488.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 24, 2 26s, 1 38, 1832.7ms

Speed: 5.1ms preprocess, 1832.7ms inference, 15.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 2 38s, 4561.8ms

Speed: 0.0ms preprocess, 4561.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 2 26s, 1 38, 3178.6ms

Speed: 12.9ms preprocess, 3178.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 26, 1 38, 2999.2ms

Speed: 0.0ms preprocess, 2999.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 2 38s, 2865.6ms

Speed: 4.4ms preprocess, 2865.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 26, 1 38, 3030.7ms

Speed: 13.1ms preprocess, 3030.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 26, 1 38, 2908.4ms

Speed: 12.5ms preprocess, 2908.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 26, 1 38, 3312.7ms

Speed: 8.5ms preprocess, 3312.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 3 26s, 1 38, 3178.8ms

Speed: 0.0ms preprocess, 3178.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 1 38, 3280.7ms

Speed: 8.1ms preprocess, 3280.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 26s, 1 38, 3382.3ms  
Speed: 16.2ms preprocess, 3382.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 1 38, 3410.6ms  
Speed: 0.0ms preprocess, 3410.6ms inference, 1.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 1 38, 3400.7ms  
Speed: 9.1ms preprocess, 3400.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 1 26, 1 38, 3421.5ms  
Speed: 8.0ms preprocess, 3421.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 1 38, 3573.2ms  
Speed: 0.0ms preprocess, 3573.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 3 26s, 1 38, 3279.6ms  
Speed: 0.0ms preprocess, 3279.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 26s, 1 38, 3248.6ms  
Speed: 9.0ms preprocess, 3248.6ms inference, 15.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 1 38, 3519.7ms  
Speed: 0.0ms preprocess, 3519.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 3 26s, 1 38, 3648.1ms  
Speed: 10.3ms preprocess, 3648.1ms inference, 0.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 1 38, 3571.6ms  
Speed: 0.0ms preprocess, 3571.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 1 38, 3314.0ms  
Speed: 16.5ms preprocess, 3314.0ms inference, 7.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 3 26s, 1733.3ms  
Speed: 10.0ms preprocess, 1733.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2433.6ms  
Speed: 15.5ms preprocess, 2433.6ms inference, 0.0ms postprocess per

image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1062.2ms

Speed: 8.0ms preprocess, 1062.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 1 38, 987.5ms

Speed: 0.0ms preprocess, 987.5ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 12 0s, 1 26, 987.0ms

Speed: 0.0ms preprocess, 987.0ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 1 38, 1755.0ms

Speed: 3.9ms preprocess, 1755.0ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 3 26s, 1 38, 3317.7ms

Speed: 0.0ms preprocess, 3317.7ms inference, 1.2ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 12 0s, 3 26s, 1 38, 3844.1ms

Speed: 8.0ms preprocess, 3844.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 2515.2ms

Speed: 72.2ms preprocess, 2515.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 5182.4ms

Speed: 2.6ms preprocess, 5182.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 26s, 5357.7ms

Speed: 4.5ms preprocess, 5357.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 4908.8ms

Speed: 0.0ms preprocess, 4908.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 3 26s, 5747.8ms

Speed: 0.0ms preprocess, 5747.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 4 26s, 1180.6ms

Speed: 0.0ms preprocess, 1180.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 3 26s, 1131.0ms  
Speed: 0.0ms preprocess, 1131.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 3 26s, 1443.4ms  
Speed: 0.0ms preprocess, 1443.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 24, 4 26s, 2739.7ms  
Speed: 14.4ms preprocess, 2739.7ms inference, 15.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 4 26s, 1238.9ms  
Speed: 0.0ms preprocess, 1238.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 1078.1ms  
Speed: 0.0ms preprocess, 1078.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 1538.6ms  
Speed: 0.0ms preprocess, 1538.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 4256.1ms  
Speed: 4.8ms preprocess, 4256.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 3 26s, 4840.7ms  
Speed: 0.0ms preprocess, 4840.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 3 26s, 2855.8ms  
Speed: 0.5ms preprocess, 2855.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 1672.7ms  
Speed: 1.5ms preprocess, 1672.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 1 26, 1092.6ms  
Speed: 0.6ms preprocess, 1092.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 1130.9ms  
Speed: 0.0ms preprocess, 1130.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 24, 3 26s, 3746.5ms  
Speed: 0.0ms preprocess, 3746.5ms inference, 0.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 3 26s, 4431.9ms  
Speed: 5.0ms preprocess, 4431.9ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 24s, 3 26s, 4868.1ms  
Speed: 16.2ms preprocess, 4868.1ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 24s, 3 26s, 3134.8ms  
Speed: 0.0ms preprocess, 3134.8ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 3 26s, 1 38, 2896.9ms  
Speed: 11.5ms preprocess, 2896.9ms inference, 2.7ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 24, 4 26s, 1 38, 2806.2ms  
Speed: 7.1ms preprocess, 2806.2ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 24s, 3 26s, 3795.7ms  
Speed: 50.0ms preprocess, 3795.7ms inference, 0.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 24, 2 26s, 1 38, 4230.4ms  
Speed: 87.8ms preprocess, 4230.4ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 3 26s, 1 38, 3383.5ms  
Speed: 6.4ms preprocess, 3383.5ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 1 38, 3427.6ms  
Speed: 0.0ms preprocess, 3427.6ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 26s, 1 38, 3315.1ms  
Speed: 9.6ms preprocess, 3315.1ms inference, 9.5ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 1 38, 3521.5ms  
Speed: 0.0ms preprocess, 3521.5ms inference, 18.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 3 26s, 1 38, 6145.7ms  
Speed: 9.6ms preprocess, 6145.7ms inference, 0.0ms postprocess per  
image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 1 38, 3383.0ms

Speed: 0.0ms preprocess, 3383.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 3 26s, 1 38, 3655.0ms

Speed: 17.2ms preprocess, 3655.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 5 26s, 1 38, 3349.3ms

Speed: 11.3ms preprocess, 3349.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 24, 2 26s, 1 38, 3351.4ms

Speed: 9.2ms preprocess, 3351.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 24s, 1 26, 3877.6ms

Speed: 5.6ms preprocess, 3877.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 24s, 3346.4ms

Speed: 0.0ms preprocess, 3346.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 24s, 2937.0ms

Speed: 0.5ms preprocess, 2937.0ms inference, 5.5ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 24s, 2825.3ms

Speed: 0.0ms preprocess, 2825.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 1 26, 3025.8ms

Speed: 8.3ms preprocess, 3025.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 1 26, 2747.3ms

Speed: 0.0ms preprocess, 2747.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 3046.0ms

Speed: 0.0ms preprocess, 3046.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2873.8ms

Speed: 0.0ms preprocess, 2873.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 26s, 2761.7ms

Speed: 1.9ms preprocess, 2761.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 26, 2666.5ms  
Speed: 0.0ms preprocess, 2666.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 26, 2667.1ms  
Speed: 0.0ms preprocess, 2667.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 2600.2ms  
Speed: 15.6ms preprocess, 2600.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 2 26s, 2469.3ms  
Speed: 15.6ms preprocess, 2469.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 26s, 2602.3ms  
Speed: 0.0ms preprocess, 2602.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 2409.2ms  
Speed: 15.8ms preprocess, 2409.2ms inference, 0.8ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 2589.3ms  
Speed: 15.6ms preprocess, 2589.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 2477.0ms  
Speed: 15.9ms preprocess, 2477.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 2984.4ms  
Speed: 0.0ms preprocess, 2984.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 1 26, 1695.6ms  
Speed: 0.0ms preprocess, 1695.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 3168.4ms  
Speed: 15.6ms preprocess, 3168.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 24s, 1 26, 1143.1ms  
Speed: 0.0ms preprocess, 1143.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 24s, 1 26, 1125.2ms



Speed: 8.0ms preprocess, 1125.2ms inference, 1.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 24s, 2 26s, 1104.2ms

Speed: 8.0ms preprocess, 1104.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 2 24s, 3 26s, 964.0ms

Speed: 0.0ms preprocess, 964.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 24s, 4 26s, 1083.4ms

Speed: 9.9ms preprocess, 1083.4ms inference, 1.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 24s, 2 26s, 1169.1ms

Speed: 0.0ms preprocess, 1169.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 24s, 2 26s, 1 28, 1123.9ms

Speed: 0.2ms preprocess, 1123.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 24s, 2 26s, 981.7ms

Speed: 8.2ms preprocess, 981.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 3 26s, 1587.4ms

Speed: 0.0ms preprocess, 1587.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 3188.4ms

Speed: 0.0ms preprocess, 3188.4ms inference, 1.4ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 3583.2ms

Speed: 0.0ms preprocess, 3583.2ms inference, 11.1ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 3962.2ms

Speed: 0.0ms preprocess, 3962.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 26s, 1639.8ms

Speed: 15.7ms preprocess, 1639.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 2482.7ms

Speed: 0.0ms preprocess, 2482.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 1 24, 3 26s, 4562.0ms  
Speed: 0.0ms preprocess, 4562.0ms inference, 1.2ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 26s, 3501.1ms  
Speed: 0.0ms preprocess, 3501.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 18 0s, 1 24, 1 26, 3189.4ms  
Speed: 0.0ms preprocess, 3189.4ms inference, 0.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 26, 2728.2ms  
Speed: 10.7ms preprocess, 2728.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 24, 2 26s, 1054.2ms  
Speed: 0.0ms preprocess, 1054.2ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 1102.8ms  
Speed: 0.0ms preprocess, 1102.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 26, 983.3ms  
Speed: 0.0ms preprocess, 983.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 14 0s, 1 26, 931.7ms  
Speed: 0.0ms preprocess, 931.7ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 1 26, 957.0ms  
Speed: 0.0ms preprocess, 957.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 13 0s, 1 26, 986.4ms  
Speed: 9.5ms preprocess, 986.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 1 26, 1079.5ms  
Speed: 2.1ms preprocess, 1079.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 24s, 3 26s, 1104.3ms  
Speed: 3.4ms preprocess, 1104.3ms inference, 4.6ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 2 24s, 2 26s, 941.6ms

Speed: 0.1ms preprocess, 941.6ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 3 24s, 2 26s, 1267.8ms  
Speed: 5.5ms preprocess, 1267.8ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 3 24s, 1 26, 2730.4ms  
Speed: 10.4ms preprocess, 2730.4ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 3 24s, 1 26, 2611.1ms  
Speed: 8.1ms preprocess, 2611.1ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 19 0s, 3 24s, 2 26s, 2789.9ms  
Speed: 0.0ms preprocess, 2789.9ms inference, 1.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 3133.3ms  
Speed: 9.1ms preprocess, 3133.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 2733.3ms  
Speed: 37.9ms preprocess, 2733.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 1 24, 2 26s, 2941.3ms  
Speed: 3.9ms preprocess, 2941.3ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 2 24s, 2 26s, 2836.9ms  
Speed: 8.8ms preprocess, 2836.9ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 16 0s, 2 24s, 2 26s, 2565.0ms  
Speed: 6.0ms preprocess, 2565.0ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 15 0s, 1 24, 2 26s, 2671.5ms  
Speed: 4.2ms preprocess, 2671.5ms inference, 0.0ms postprocess per image at shape (1, 3, 384, 640)

0: 384x640 17 0s, 2 24s, 1 25, 2 26s, 2711.1ms  
Speed: 0.6ms preprocess, 2711.1ms inference, 13.1ms postprocess per image at shape (1, 3, 384, 640)  
Finished processing video.  
Accuracy: 0.79  
Precision: 0.80  
F1 Score: 0.75

```
Recall: 0.86
Video saved successfully at: los_angeles_output_video.mp4
Accuracy: 0.79
```

## YOLO5

YOLOv5 has seen widespread use due to its accessible code and rapid development cycle, even though it isn't an official YOLO release. You can find the source code and pre-trained models from Ultralytics on their official GitHub repository.

```
import cv2
import torch
import time
import numpy as np
import os

# Load the YOLOv5 model (ensure you have YOLOv5 code or model weights)
model = torch.hub.load('ultralytics/yolov5', 'yolov5s') # Download
and load the pretrained YOLOv5 small model

# Open the video file
video_path = "los_angeles.mp4" # Replace with your video file path
cap = cv2.VideoCapture(video_path)

# Check if the video was opened successfully
if not cap.isOpened():
    print(f"Error: Could not open video file {video_path}")
    exit()

# Get frame rate, width, and height of the video
fps = cap.get(cv2.CAP_PROP_FPS)
frame_width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
frame_height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))

# Define output video file and codec
output_file = 'los_angeles_output_video_yolov5.mp4'
out = cv2.VideoWriter(output_file, cv2.VideoWriter_fourcc(*'mp4v'),
fps, (frame_width, frame_height))

frame_count = 0
while cap.isOpened():
    start_time = time.time()
    ret, frame = cap.read()

    if not ret:
        print("Finished processing video.")
        break

    # Run YOLOv5 inference on the frame
    results = model(frame)
```

```

    # Extract and annotate the frame
    annotated_frame = np.squeeze(results.render()) # Rendered frame
with detections

    # Display the frame with YOLOv5 annotations
    cv2.imshow('YOLOv5 Object Detection', annotated_frame)

    # Write the frame to the output video file
    out.write(annotated_frame)

    # Sync FPS (process video in real-time)
    processing_time = time.time() - start_time
    frame_duration = 1.0 / fps
    if processing_time < frame_duration:
        time.sleep(frame_duration - processing_time)

    # Stop the video if 'q' is pressed
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break

    # Increment the frame count
    frame_count += 1

# Release resources
cap.release()
out.release()
cv2.destroyAllWindows()

# Confirm video saved and print FPS details
if os.path.exists(output_file):
    print(f"Video saved successfully at: {output_file}")
else:
    print("Error: Video file was not saved.")

# Optional: Print processing performance statistics
print(f"Processed {frame_count} frames at {fps} FPS.")

Using cache found in C:\Users\CHANDU\.cache\torch\hub\
ultralytics_yolov5_master
YOLOv5 2024-10-10 Python-3.12.4 torch-2.3.1+cpu CPU

Downloading
https://github.com/ultralytics/yolov5/releases/download/v7.0/yolov5s.p
t to yolov5s.pt...
100%|██████████| 14.1M/14.1M [00:03<00:00, 4.44MB/s]

Fusing layers...
YOLOv5s summary: 213 layers, 7225885 parameters, 0 gradients, 16.4
GFLOPs
Adding AutoShape...

```

```
Finished processing video.  
Video saved successfully at: los_angeles_output_video_yolov5.mp4  
Processed 332 frames at 23.976023976023978 FPS.
```