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import cv2
import os
import json
import torch
import zipfile
from google.colab.patches import cv2_imshow # Import cv2_imshow for Colab
from google.colab import files # Import files for downloading

# Create directories for saving sub-objects
os.makedirs('subobjects', exist_ok=True)

# Initialize YOLOv5 model
model = torch.hub.load('ultralytics/yolov5', 'yolov5s',
pretrained=True)

# Define function to save cropped sub-object images
def save_subobject_image(frame, bbox, object_name, subobject_name):
    try:
        x1, y1, x2, y2 = map(int, bbox)
        cropped_image = frame[y1:y2, x1:x2]
        output_dir = f"subobjects/{object_name}/{subobject_name}"
        os.makedirs(output_dir, exist_ok=True)
        image_path =
f"{output_dir}/{object_name}_{subobject_name}.png"
        success = cv2.imwrite(image_path, cropped_image)
        if success:
            print(f"Saved: {image_path}")
            return image_path
        else:
            print(f"Failed to save image: {image_path}")
            return None
    except Exception as e:
        print(f"Error saving image: {e}")
        return None

# Define function to process a frame and detect objects
def process_frame(frame):
    results = model(frame)
    detections = results.pandas().xyxy[0] # Convert to pandas
DataFrame
    return detections

# Define function to generate JSON and save images
def process_detections(frame, detections):
    detected_objects_info = []
    for _, row in detections.iterrows():
        obj_name = row['name']
        bbox = [row['xmin'], row['ymin'], row['xmax'], row['ymax']]
        obj_id = int(row['class']) # Use class index as ID

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# Save main object image
save_subobject_image(frame, bbox, obj_name, "main_object")

# Generate JSON entry for the detected object
detected_object = {
    "object": obj_name,
    "id": obj_id,
    "bbox": bbox,
    "sub_objects": []
}

# Example sub-object detection (extend logic as needed)
if obj_name == "person":
    # Detect a hypothetical "helmet" sub-object
    sub_bbox = [bbox[0] + 10, bbox[1] - 20, bbox[2] - 10,
bbox[1] + 30]
    sub_obj_name = "helmet"
    save_subobject_image(frame, sub_bbox, obj_name,
sub_obj_name)
    detected_object["sub_objects"].append({
        "name": sub_obj_name,
        "id": obj_id + 1,
        "bbox": sub_bbox
    })

detected_objects_info.append(detected_object)

# Save detections to JSON file
with open('detected_objects.json', 'w') as json_file:
    json.dump(detected_objects_info, json_file, indent=4)

# Process video
def process_video(video_path):
    cap = cv2.VideoCapture(video_path)
    if not cap.isOpened():
        print(f"Error: Unable to open video file {video_path}")
        return

    while cap.isOpened():
        ret, frame = cap.read()
        if not ret:
            print("No more frames to read or video ended.")
            break

    # Detect objects in the frame
    detections = process_frame(frame)

    # Process detections (save images and generate JSON)
    process_detections(frame, detections)

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# Display the frame (with annotations if needed)
for _, row in detections.iterrows():
    x1, y1, x2, y2 = map(int, [row['xmin'], row['ymin'],
row['xmax'], row['ymax']])
    label = f'{row['name']} ({row['confidence']:.2f})'
    cv2.rectangle(frame, (x1, y1), (x2, y2), (255, 0, 0), 2)
    cv2.putText(frame, label, (x1, y1 - 10),
cv2.FONT_HERSHEY_SIMPLEX, 0.5, (255, 0, 0), 2)

cv2_imshow(frame) # Use cv2_imshow for Colab

cap.release()
print("Video processing completed.")

# Zip the saved images and JSON file
def create_zip_file(zip_file_name):
    with zipfile.ZipFile(zip_file_name, 'w') as zipf:
        # Add all files in the subobjects directory
        for root, dirs, files in os.walk('subobjects'):
            for file in files:
                zipf.write(os.path.join(root, file),
os.path.relpath(os.path.join(root, file), 'subobjects'))
        # Add the JSON file
        zipf.write('detected_objects.json')

# Run the script
if __name__ == "__main__":
    video_path = "/content/5927708-hd_1080_1920_30fps.mp4" # Replace
with the actual video path
    process_video(video_path)

    # Create a zip file of the saved images and JSON
    zip_file_name = 'subobjects.zip'
    create_zip_file(zip_file_name)

    # Download the zip file
    files.download(zip_file_name)

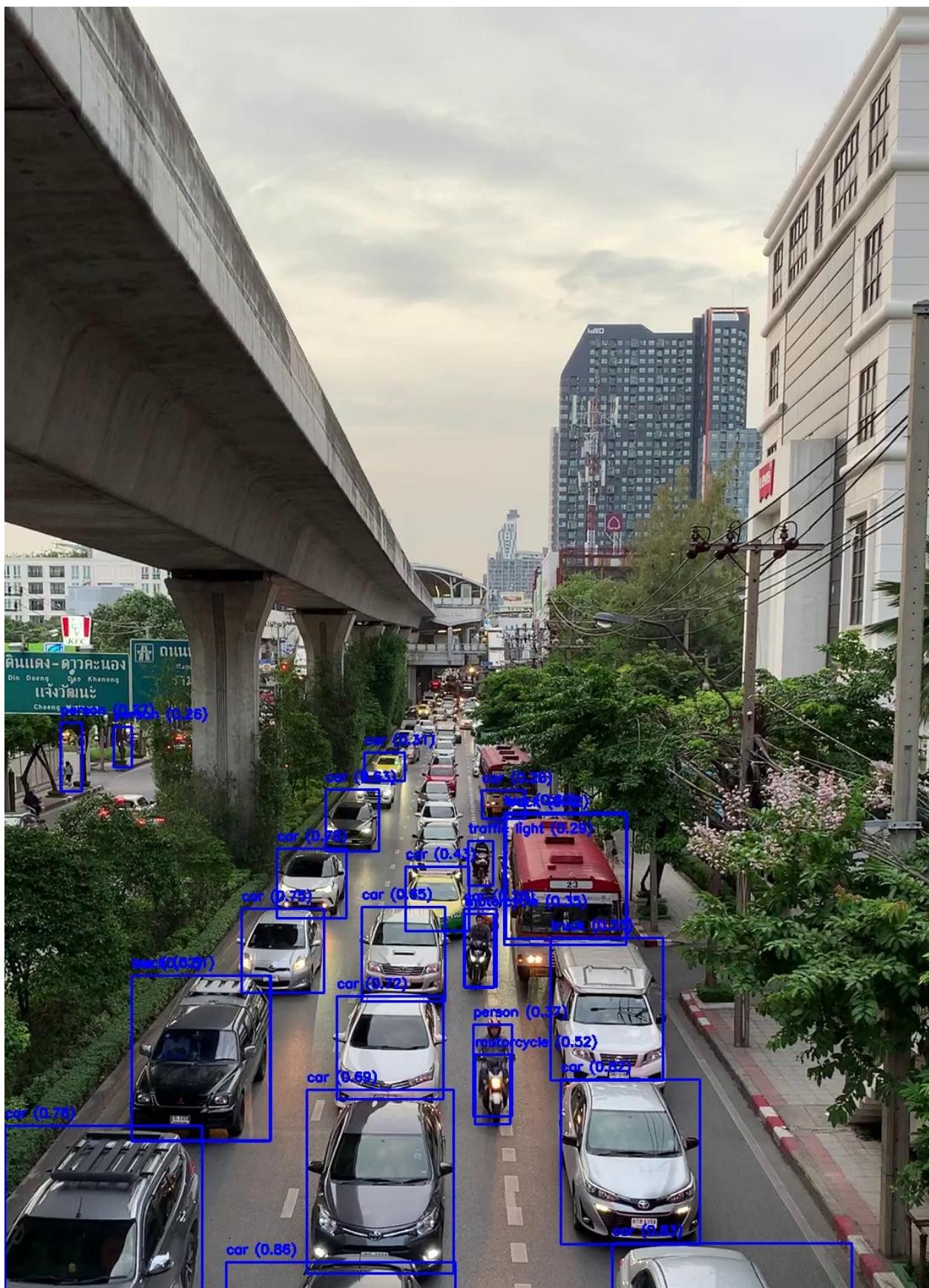
Using cache found in /root/.cache/torch/hub/ultralytics_yolov5_master
YOLOv5 ⚡ 2025-1-10 Python-3.10.12 torch-2.5.1+cu121 CUDA:0 (Tesla T4,
15102MiB)

Fusing layers...
YOLOv5s summary: 213 layers, 7225885 parameters, 0 gradients, 16.4
GFLOPs
Adding AutoShape...
/root/.cache/torch/hub/ultralytics_yolov5_master/models/common.py:892:
FutureWarning: `torch.cuda.amp.autocast(args...)` is deprecated.
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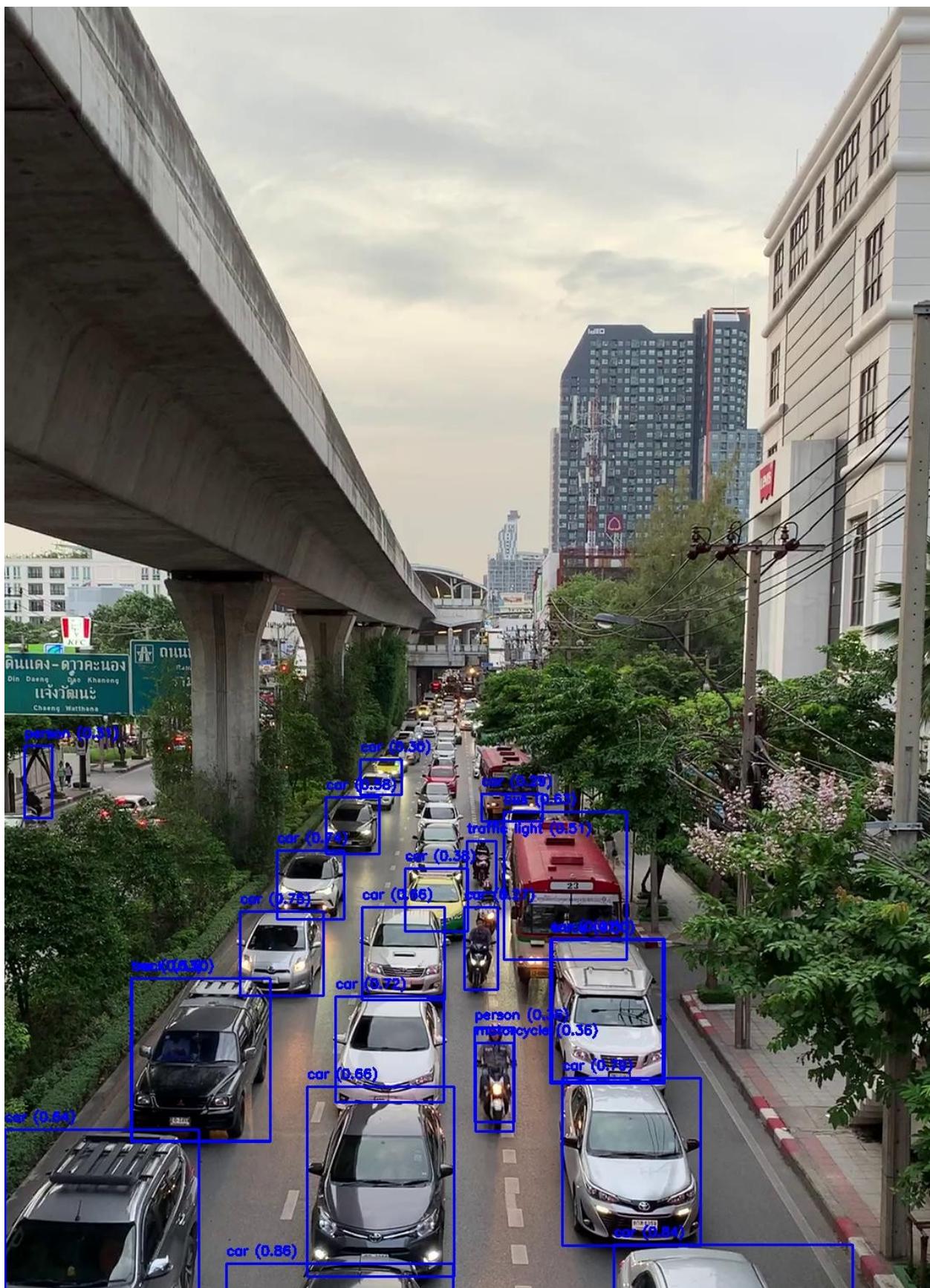
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with amp.autocast(autocast):
WARNING △ NMS time limit 0.550s exceeded

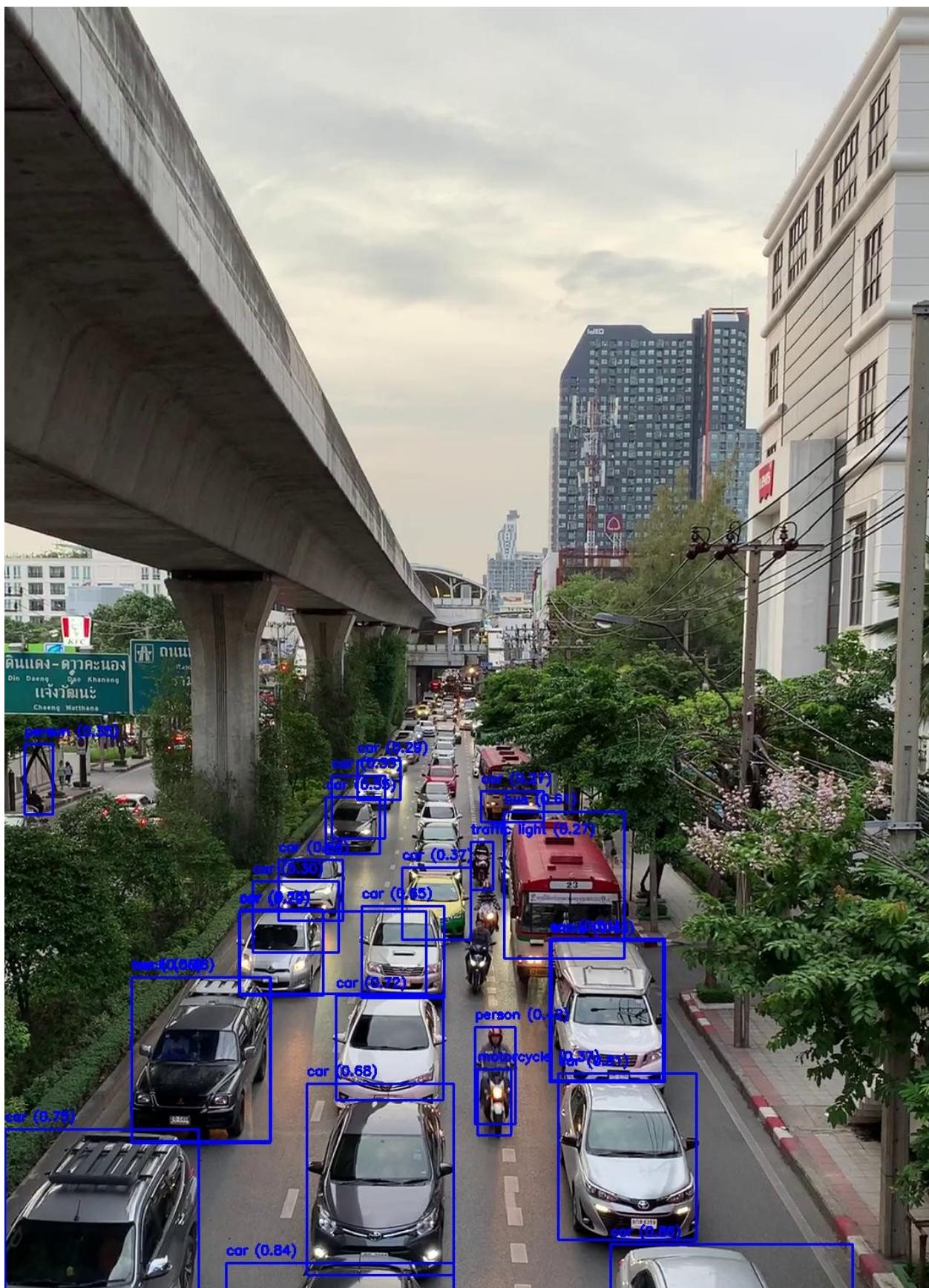
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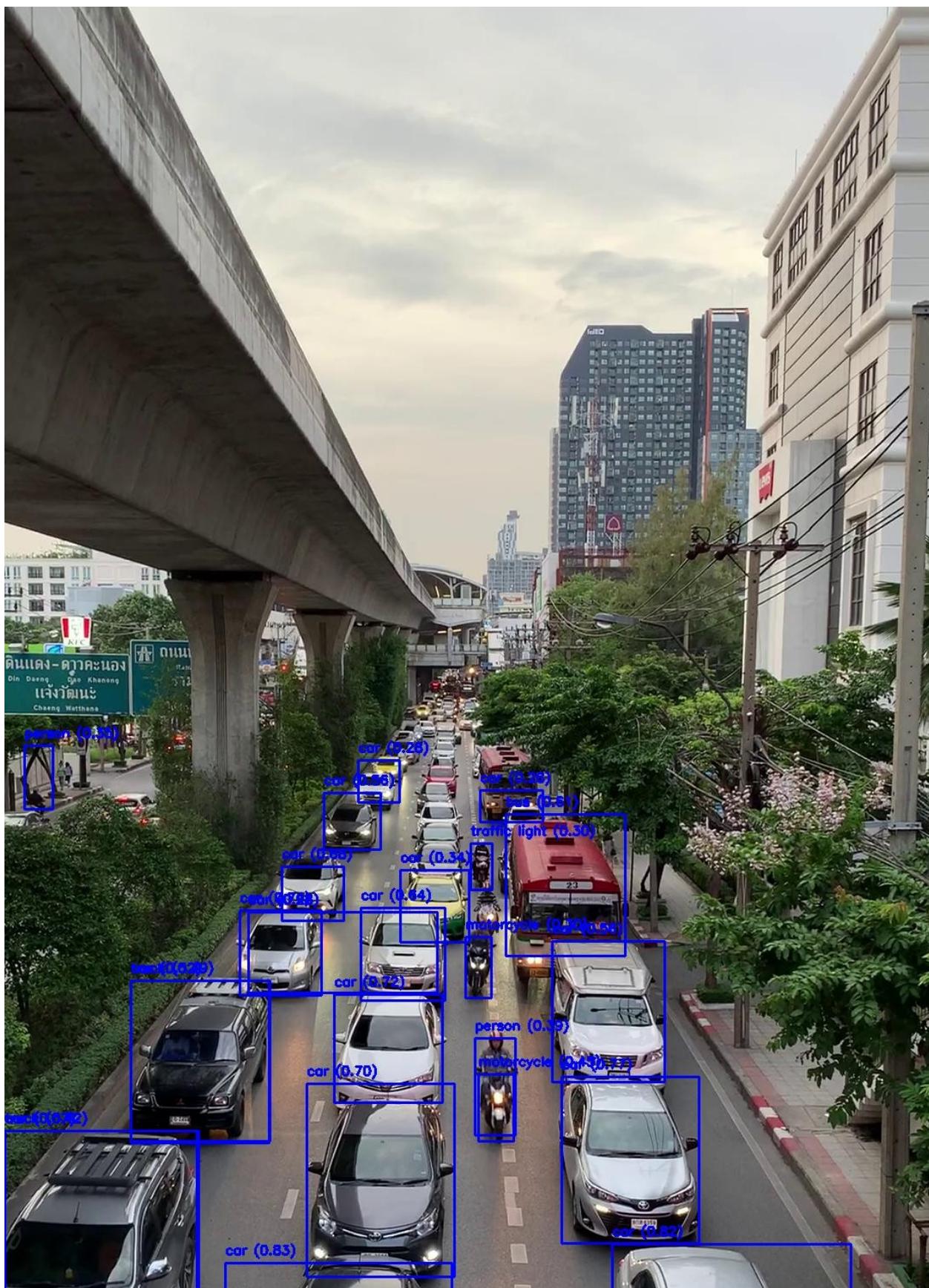
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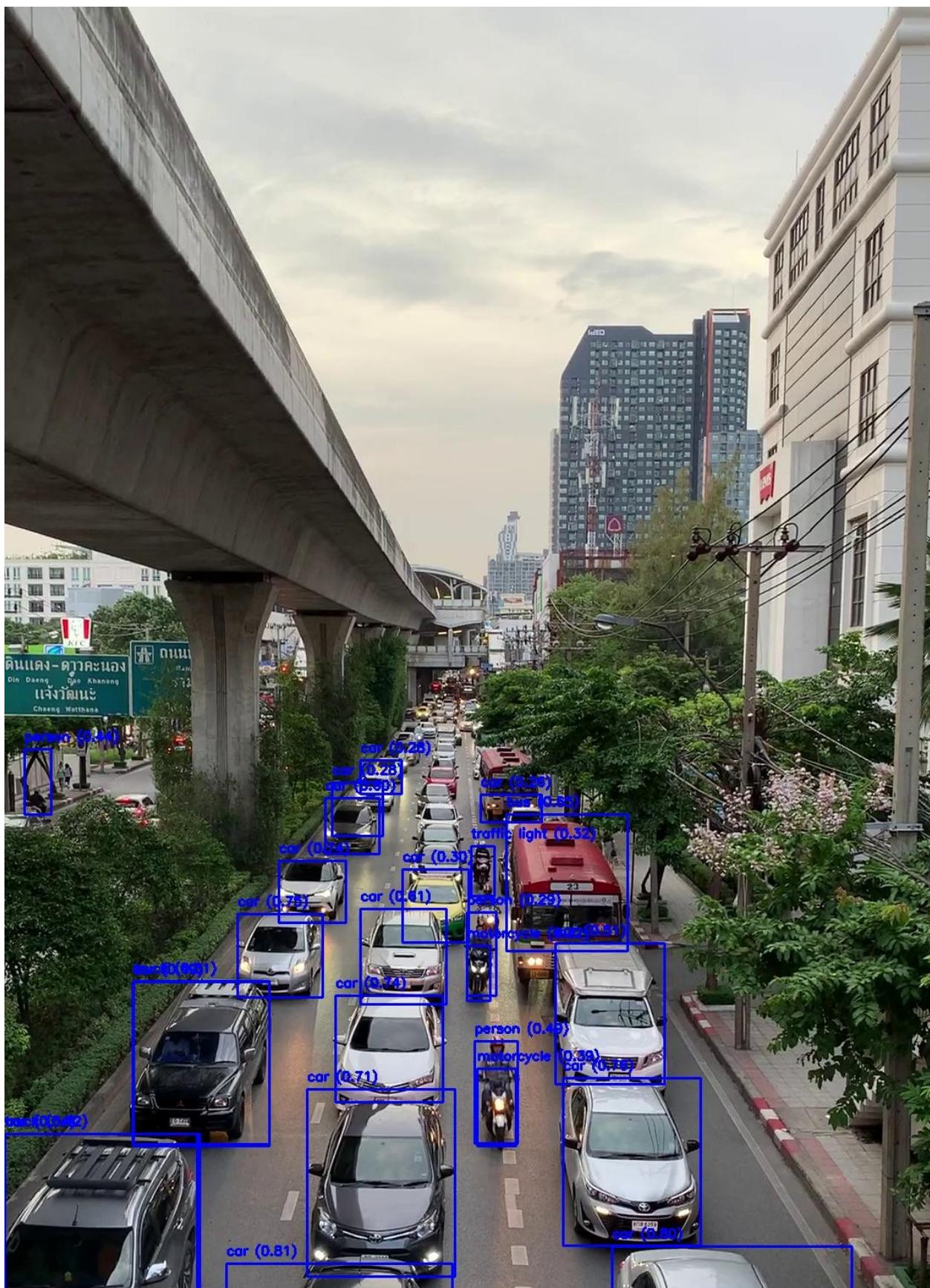
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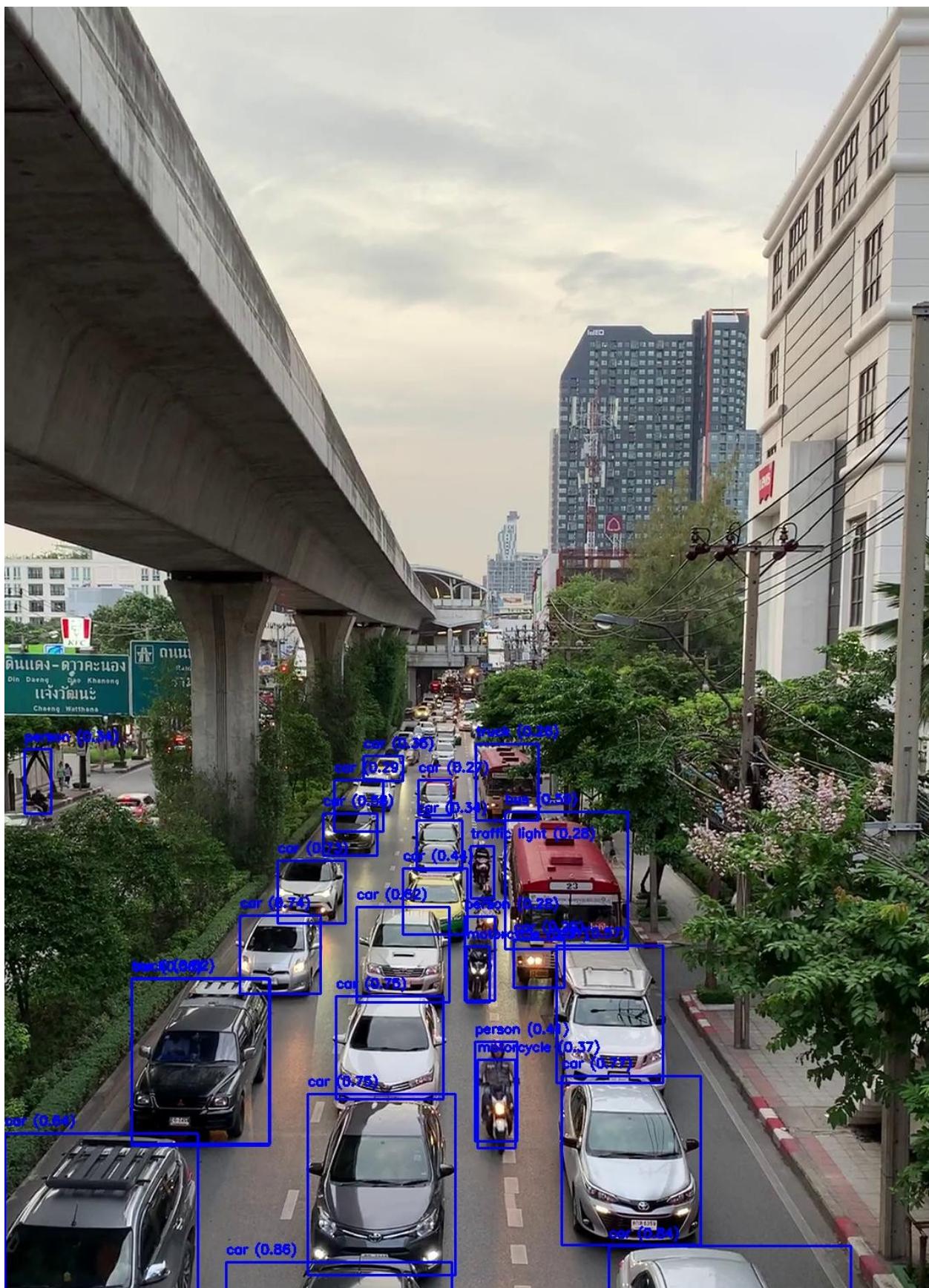
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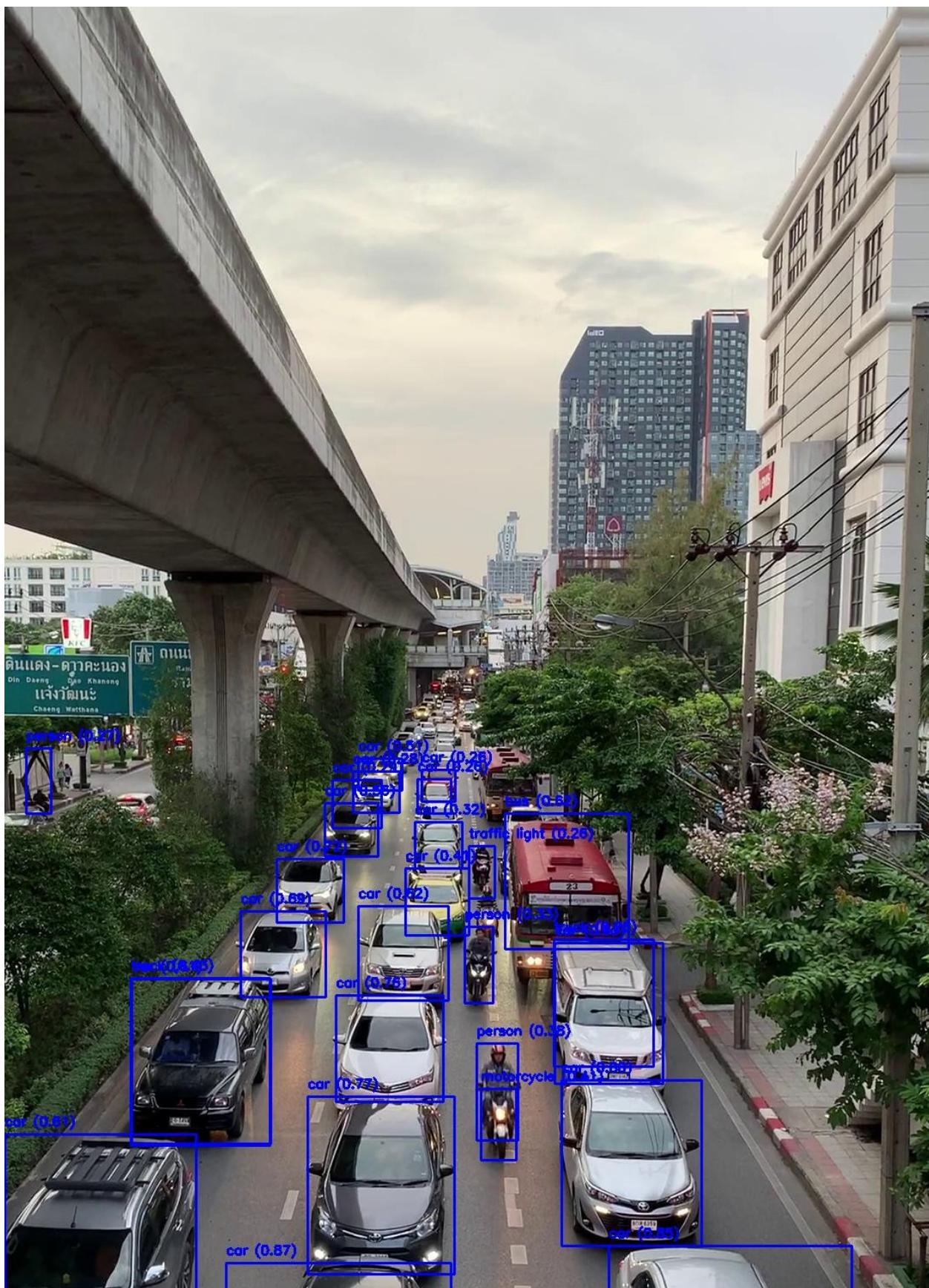
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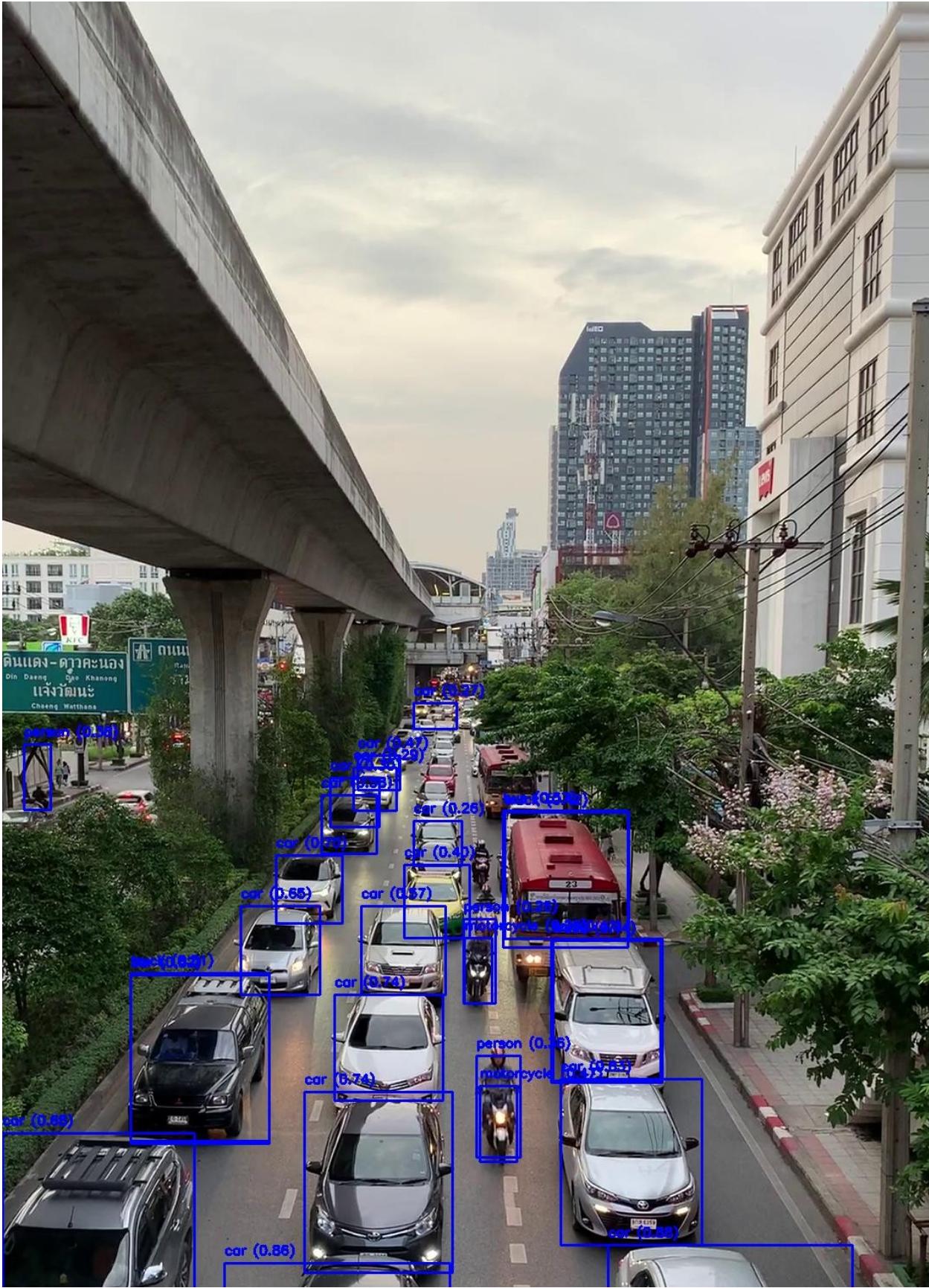
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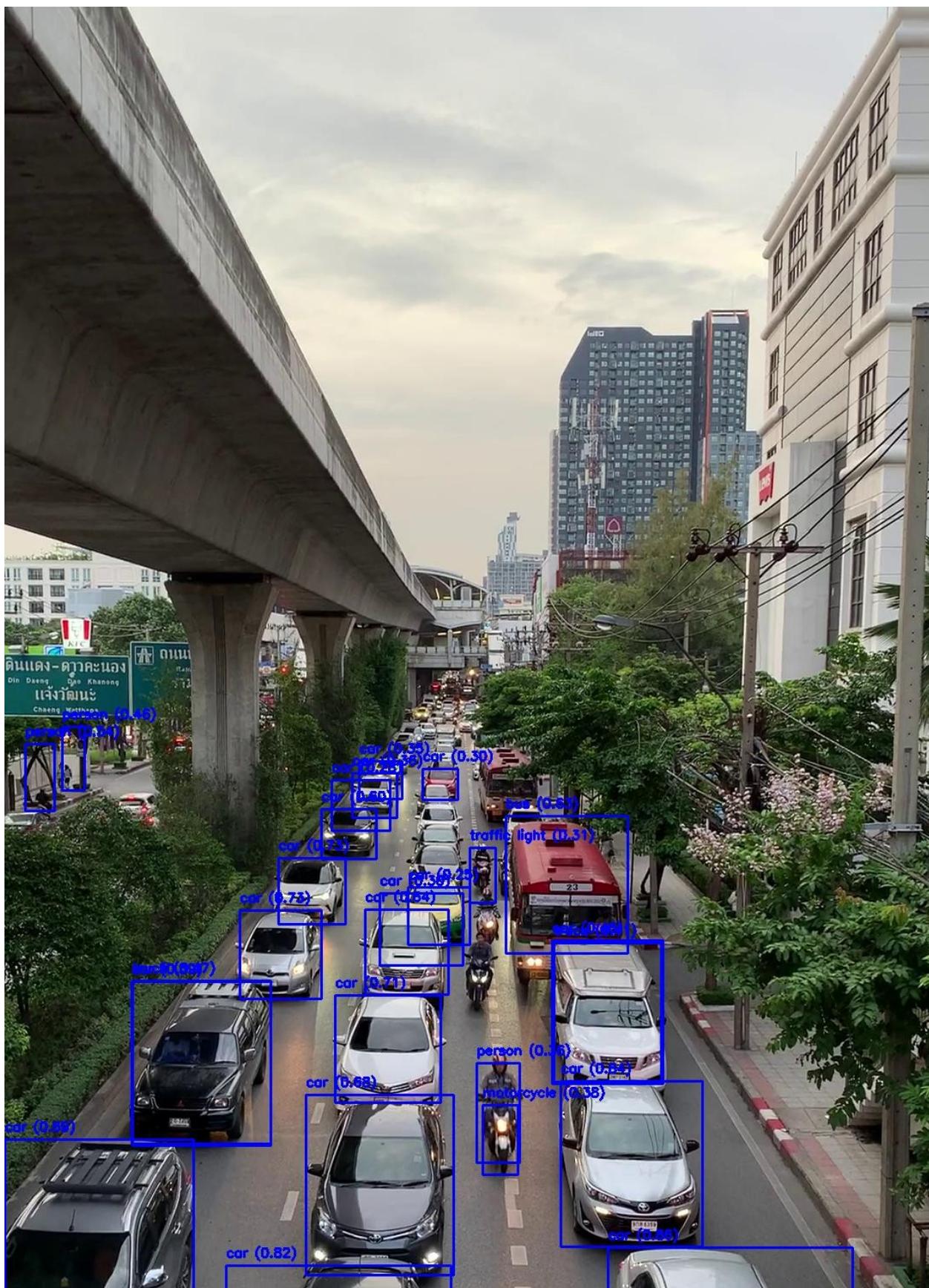
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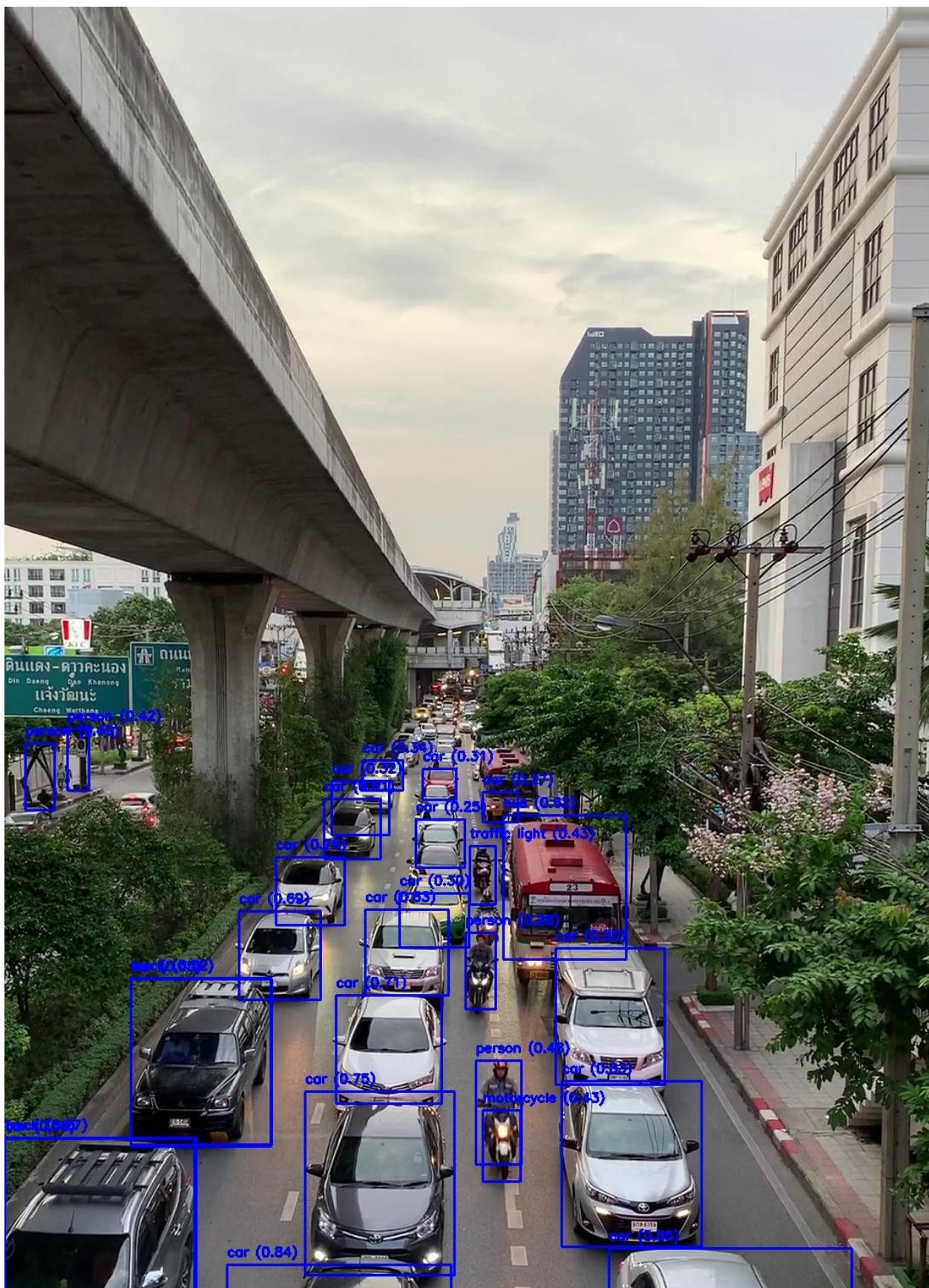
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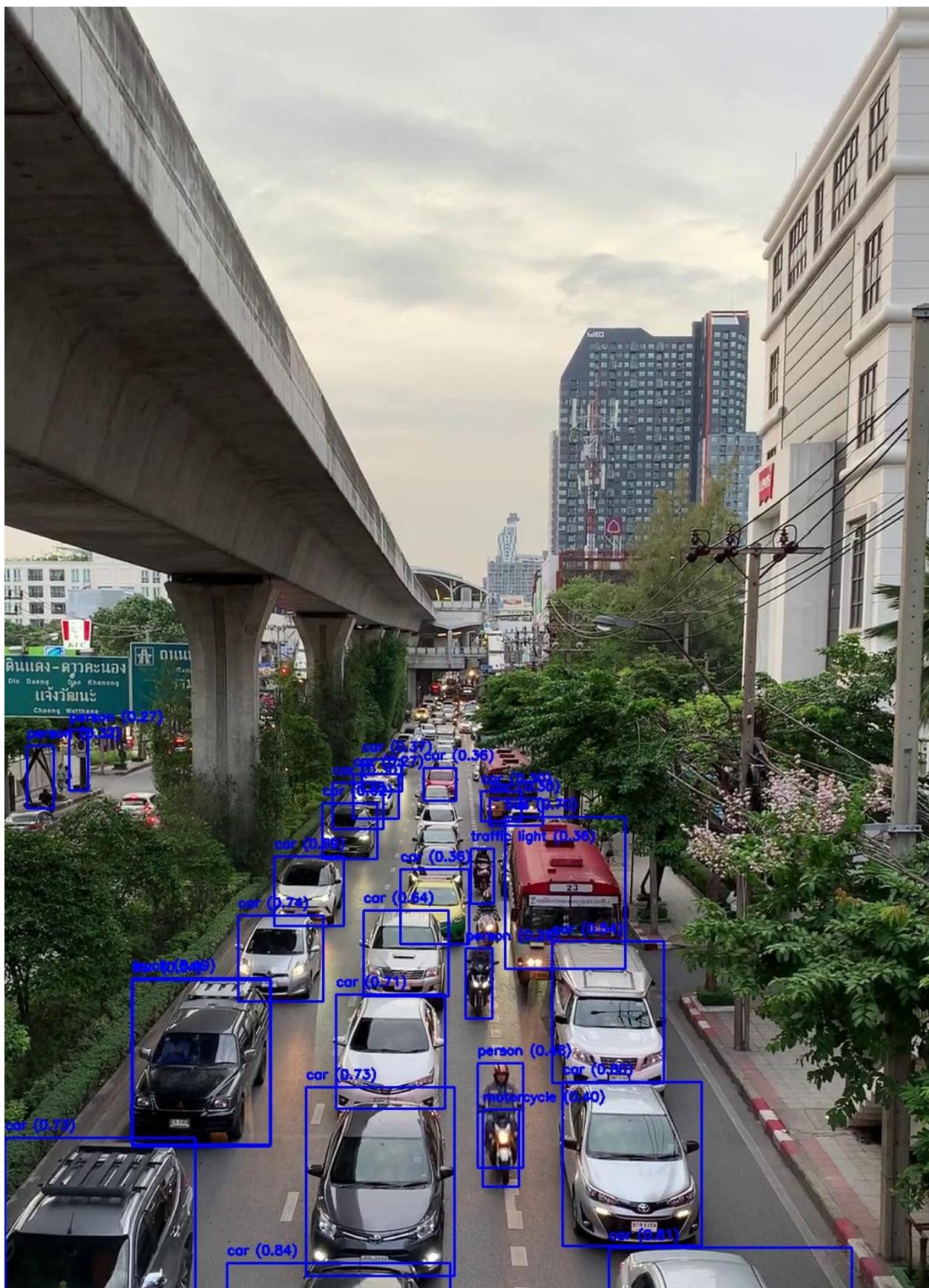
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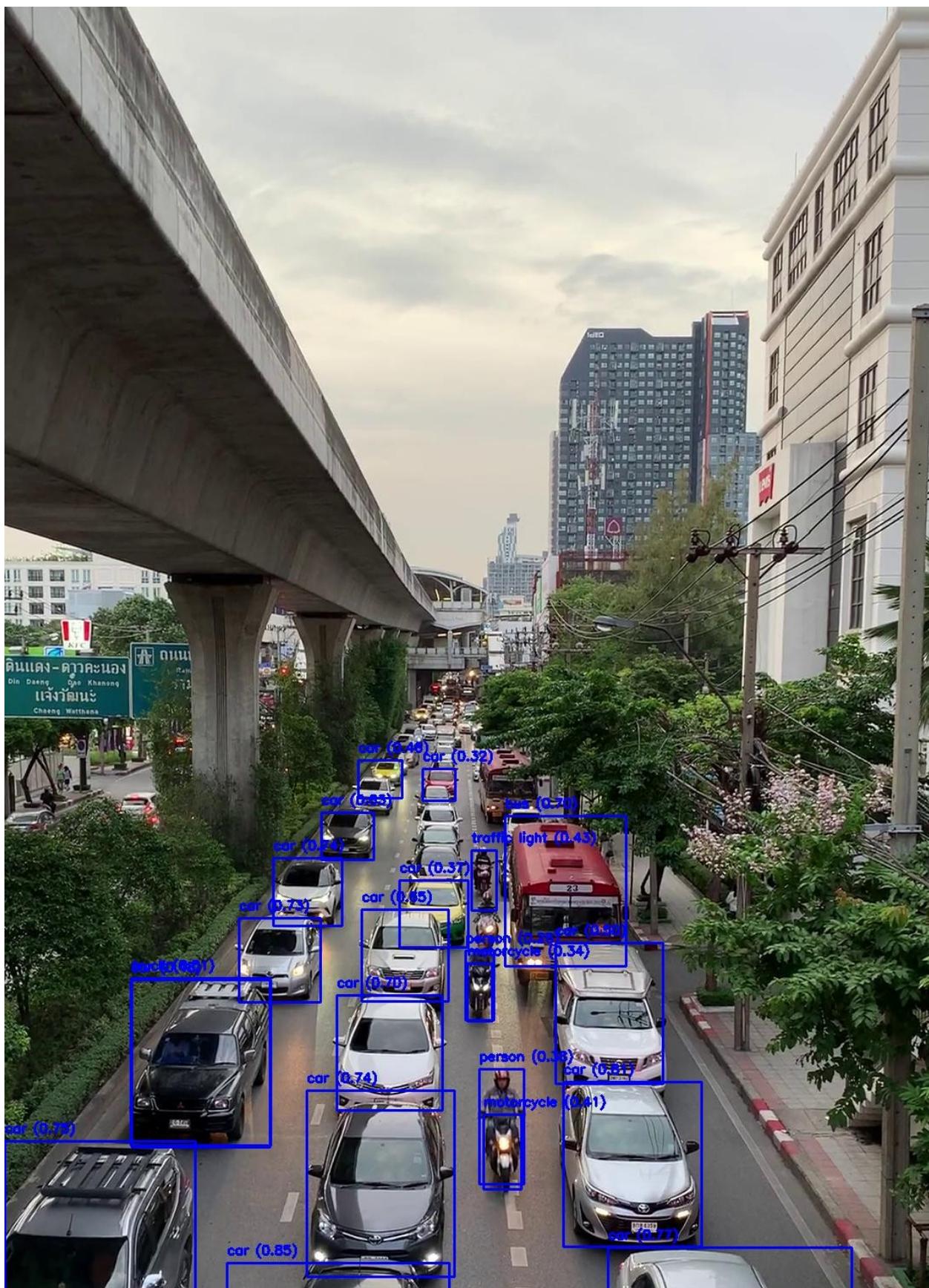
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Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/car/main_object/car_main_object.png
```



```
/root/.cache/torch/hub.ultralytics_yolov5_master/models/common.py:892:  
FutureWarning: `torch.cuda.amp.autocast(args...)` is deprecated.  
Please use `torch.amp.autocast('cuda', args...)` instead.  
    with amp.autocast(autocast):  
  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/bus/main_object/bus_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/truck/main_object/truck_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/traffic_light/main_object/traffic  
light_main_object.png  
Saved: subobjects/motorcycle/main_object/motorcycle_main_object.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/motorcycle/main_object/motorcycle_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png
```



```
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Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/motorcycle/main_object/motorcycle_main_object.png  
Saved: subobjects/truck/main_object/truck_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/traffic light/main_object/traffic  
light_main_object.png  
Saved: subobjects/motorcycle/main_object/motorcycle_main_object.png  
Saved: subobjects/truck/main_object/truck_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png
```



```
/root/.cache/torch/hub.ultralytics_yolov5_master/models/common.py:892:  
FutureWarning: `torch.cuda.amp.autocast(args...)` is deprecated.  
Please use `torch.amp.autocast('cuda', args...)` instead.  
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Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/bus/main_object/bus_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/truck/main_object/truck_main_object.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/truck/main_object/truck_main_object.png  
Saved: subobjects/traffic light/main_object/traffic  
light_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/car/main_object/car_main_object.png  
Saved: subobjects/motorcycle/main_object/motorcycle_main_object.png  
Saved: subobjects/person/main_object/person_main_object.png  
Saved: subobjects/person/helmet/person_helmet.png  
Saved: subobjects/car/main_object/car_main_object.png  
Buffered data was truncated after reaching the output size limit.
```