OPTIMIZING TRAFFIC FLOW WITH LIVE STREAM FROM TIMES SQUARE, NEW YORK

T5 REAL-TIME TRAFFIC SIGNAL ADJUSTMENT USING YOLO MODEL

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Introduction

Problem Statement:
Traffic congestion at intersections is a significant issue, leading to delays.
Fixed traffic signal timings do not account for real-time traffic conditions, resulting in inefficient traffic flow.

Solution:
We propose a real-time traffic signal adjustment system that uses vehicle detection from live video streams.
By analyzing the traffic density in real-time, the system dynamically adjusts the green signal timing based on the number of detected vehicles, improving traffic flow efficiency and reducing congestion.

Live Stream Location: Times Square, New York

Technology Used: YOLO object detection model for vehicle detection and counting.

```python
def get_stream_url(page_url):

    command = f"streamlink {page_url} best --stream-url"
    result = subprocess.run(command, shell=True, capture_output=True, text=True)

    if result.returncode != 0:
        print(f"Error getting stream URL: {result.stderr}")
        return None
    return result.stdout.strip()

# Function to capture an image from the stream URL
def capture_image(stream_url, output_path):

    cap = cv2.VideoCapture(stream_url)

    if not cap.isOpened():
        print("Error: Could not open video stream.")
        return False

    ret, frame = cap.read()

    if not ret:
        print("Error: Could not read frame from video stream.")
        cap.release()
        return False

    # Save the captured frame as an image
    cv2.imwrite(output_path, frame)
    cap.release()

    print(f"Image captured and saved as {output_path}")
    return True
```

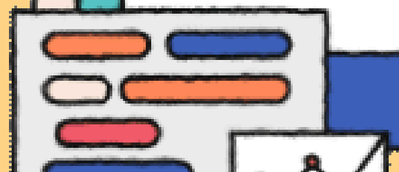
YOLO Model Overview

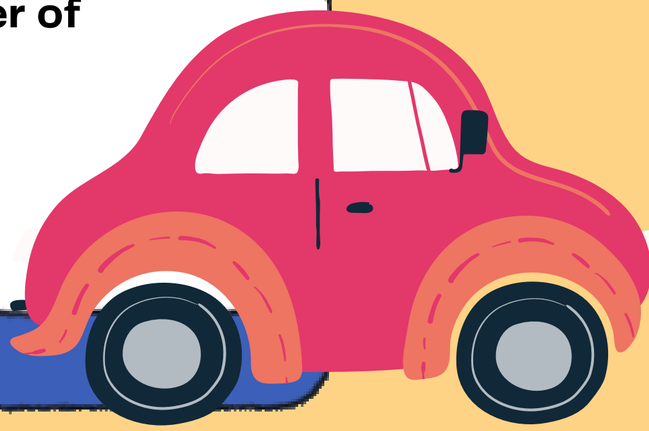
- **Live Video Stream: Capturing a real-time feed from Times Square, New York, to analyze traffic flow.**

- **YOLO Model for Vehicle Detection: It identifies and classifies vehicles (cars, buses, trucks, and motorcycles.) in each frame of the video stream.**

- **Traffic Signal Adjustment Workflow:**

1. **Capture live video frames.**
2. **Detect and count vehicles in each frame using the YOLO model.**
3. **Adjust the green signal time dynamically based on the number of vehicles detected.**
4. **Update the signal timing in real time, optimizing traffic flow.**



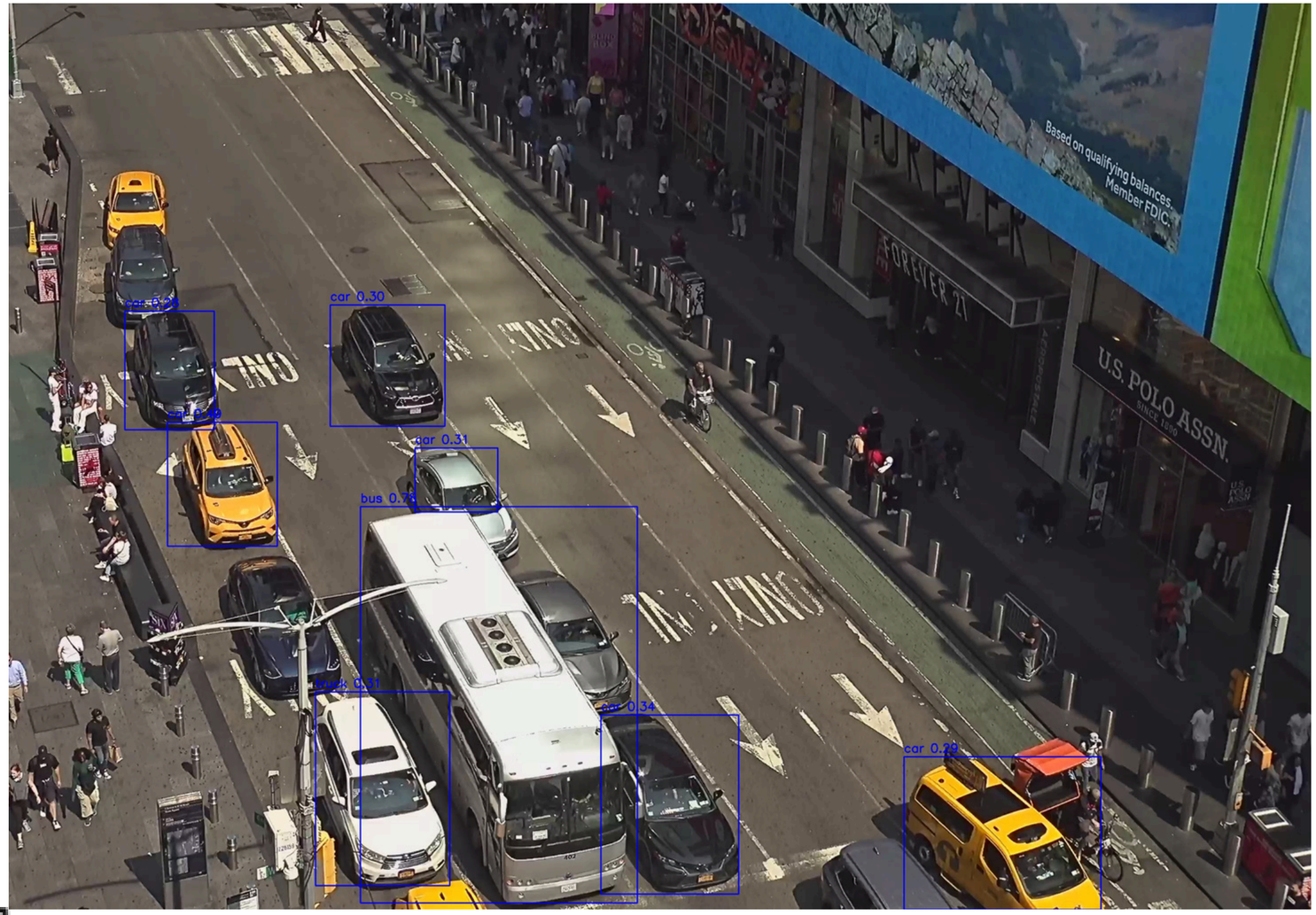


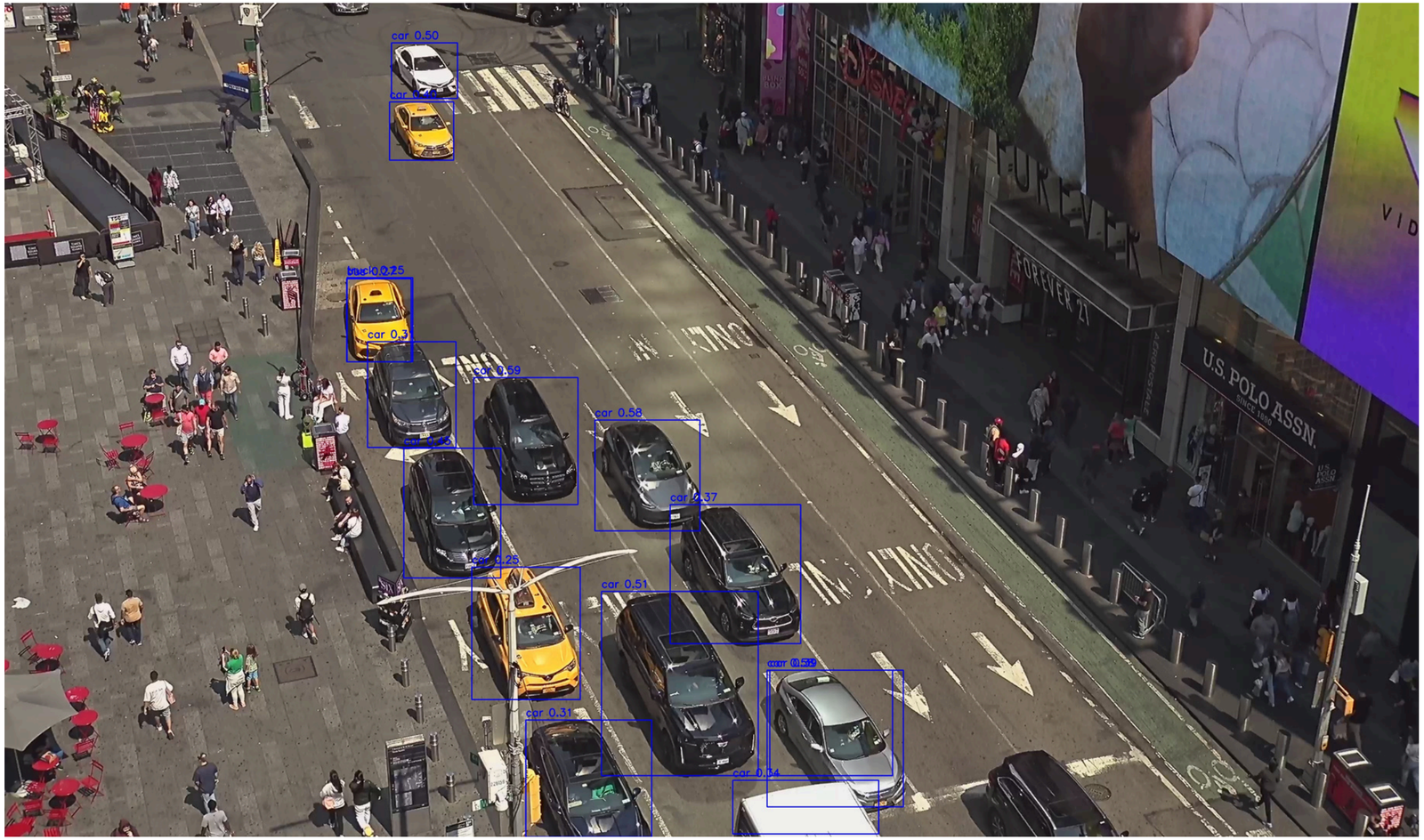
YOLO Model Overview

```
def adjust_green_signal_time(vehicle_count):

    base_green_time = 20
    vehicle_multiplier = 2

    green_time = base_green_time + (vehicle_count * vehicle_multiplier)
    return green_time


def process_traffic_stream():
    while capture_video:
        process_frame(frame)  # Process frame to detect vehicles
        update_vehicle_count()  # Update vehicle count



def adjust_traffic_signal():
    green_time = adjust_green_signal_time(vehicle_count)
    save_green_signal_time(green_time)
```

YOLO Model Overview

```
Image captured and saved as captured_image_20240905161413.jpg

0: 384x640 3 buss, 8.1ms
Speed: 4.8ms preprocess, 8.1ms inference, 1.5ms postprocess per image at shape (1, 3, 384, 640)
Processed image saved as captured_image_20240905161413_processed.jpg
Vehicle count updated in 'vehicle_count.txt'.
Total vehicles detected: 3
Adjusted Green Signal Time: 26 seconds
Adjusted green time saved in 'adjusted_green_time.txt'.
Image captured and saved as captured_image_20240905161420.jpg

0: 384x640 1 bus, 10.6ms
Speed: 2.8ms preprocess, 10.6ms inference, 1.4ms postprocess per image at shape (1, 3, 384, 640)
Processed image saved as captured_image_20240905161420_processed.jpg
Vehicle count updated in 'vehicle_count.txt'.
Total vehicles detected: 1
Adjusted Green Signal Time: 22 seconds
Adjusted green time saved in 'adjusted_green_time.txt'.
Image captured and saved as captured_image_20240905161427.jpg
```


car 0.30
car 0.31
bus 0.78
truck 0.31
car 0.34
car 0.29
U.S. POLO ASSN.
FOREVER 21

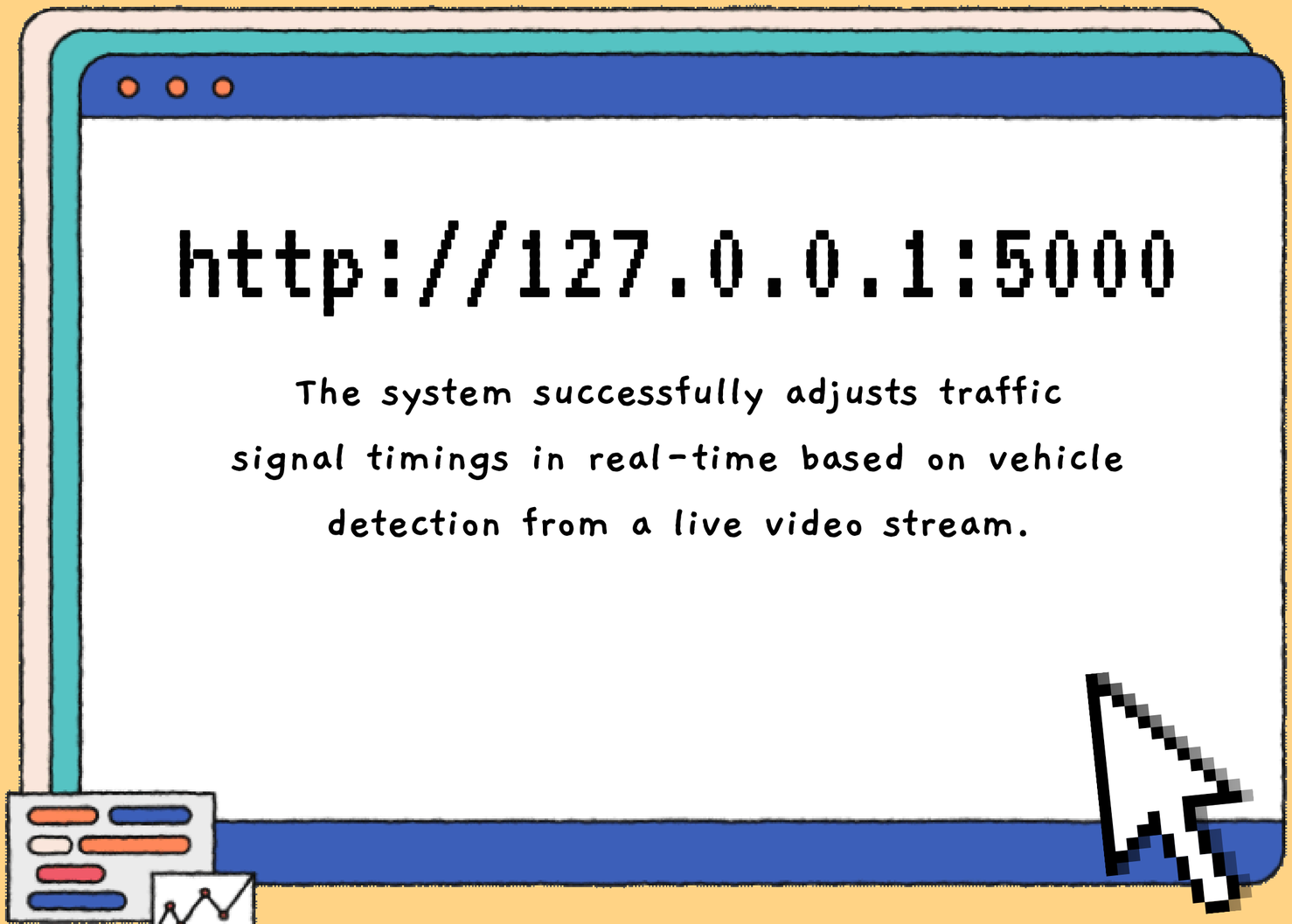

car 0.50
car 0.3
car 0.59
car 0.58
car 0.37
car 0.51
car 0.31
car 0.34
U.S. POLO ASSN.
FOREVER 21


OLD NAVY
Get loose.
car 0.51
car 0.31
car 0.47
car 0.27
car 0.38
car 0.37
car 0.40

Model Evaluation and Results

Class	Precision	Recall	mAP50
Overall (All Classes)	81.2	83.7	90.4
Car	81.5	78.5	88.6
Bus	81.0	89.0	92.2

Deployment


http://127.0.0.1:5000
The system successfully adjusts traffic signal timings in real-time based on vehicle detection from a live video stream.


Thank you
Do you have any questions ?