# Traffic Vehicle Detection System

Approach, Model Selection & Implementation

# Project Overview

### Vehicle Detection

YOLOv8-based computer vision pipeline.

### Classification & Counting

Identifies cars, trucks, motorcycles, buses.

### Data Output

CSV summary and annotated images.

### Web Interface

Gradio for live demos.

# Model Selection: YOLOv8n

### High Accuracy

On COCO dataset.

### Real-time Performance

Fast inference.

### Built-in Support

For vehicle categories.

### Easy Integration

Via Python and Gradio.

Filtered for relevant classes (car, truck, motorcycle, bus) with 0.5 confidence threshold.

# Implementation Pipeline

### Load Images

From data/test_images.

### Run Inference

YOLOv8 pre-trained weights.

### Filter Detections

For relevant classes.

### Draw Bounding Boxes

And confidence labels.

### Count Vehicles

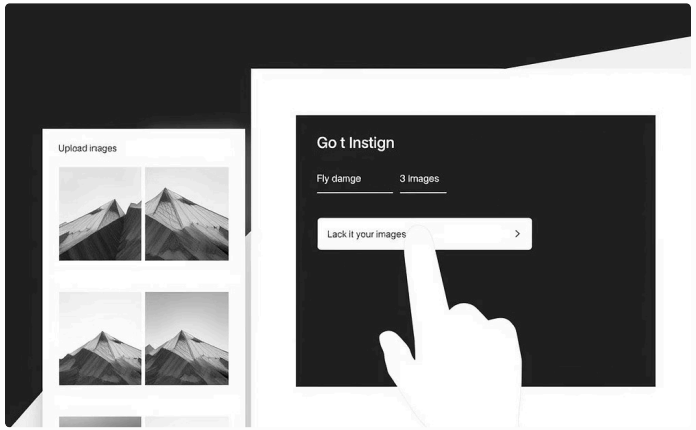
By type.

### Save Results

To output/processed_images and CSV.

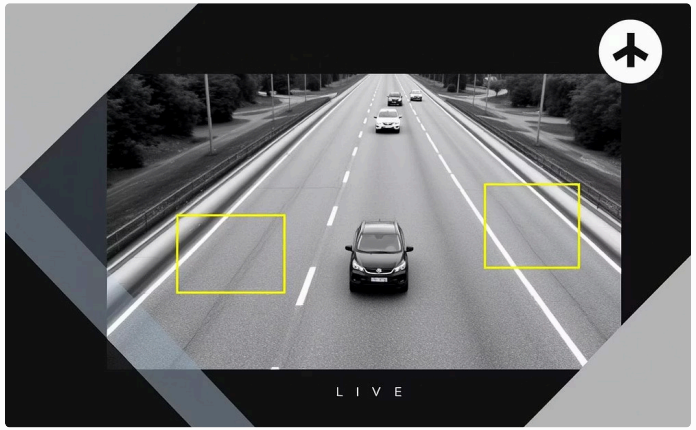
# Web Interface (Gradio)

A user-friendly Gradio web interface was developed that allows:



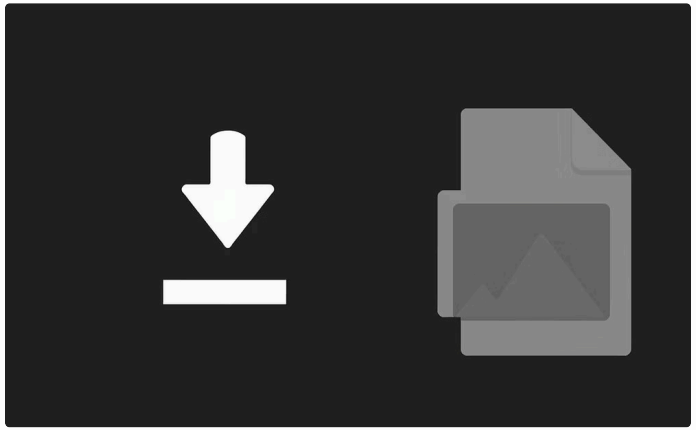

## Image Upload

Seamlessly upload single or multiple images for processing.




## Real-time Results

Instantly view detected vehicles with bounding boxes and labels.



## Data Output

Download annotated images and comprehensive count summaries.

Enables non-technical users to test interactively.

# Results Summary & Challenges

## Results Summary

| | | | | | |
|---|---|---|---|---|---|
| image_001.jpg | 4 | 1 | 1 | 0 | 5 |
| | car | bike | bus | truck | total |

>85% accuracy for clearly visible vehicles.

## Challenges Faced

- Overlapping Vehicles
- Misclassification
- Lighting Conditions
- Edge Detections

# Potential Improvements

### Custom Dataset

Fine-tune model for regional performance.

### Video Processing

Handle live traffic camera feeds.

### Hugging Face Spaces

Deploy Gradio for public testing.

### Dashboards

Visual vehicle analytics.

### Performance Metrics

Evaluate using mAP, precision, recall, F1-score.

# Conclusion

> This traffic vehicle detection system fulfills all internship assignment requirements: it detects, classifies, and counts vehicles accurately, outputs annotated results, and includes a working demo via a Gradio web interface. With further model tuning and real-time capabilities, it can be extended into a robust traffic monitoring solution.