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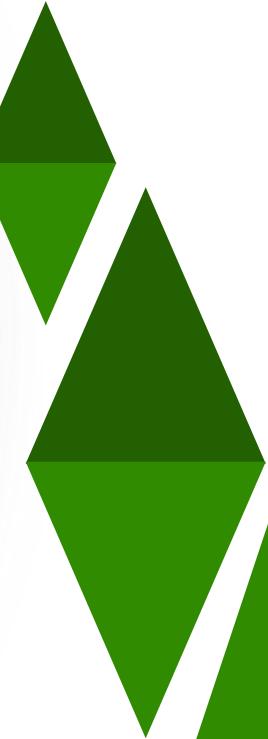
سَاحِل  
(sahel)

Real-time Traffic  
Flow Optimization for Riyadh



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# Our Project

Aims to transform urban mobility by implementing real-time traffic flow management and adaptive speed limits to enhance travel efficiency and sustainability.



# The Traffic Challenge in Riyadh

## Congestion

Riyadh faces significant traffic congestion, particularly during peak hours.



## Environment

Rising vehicle emissions harm air quality.



## Economics

Traffic congestion results in significant economic costs from wasted fuel and decreased productivity.



## Quality of Life

Long commutes and traffic-related stress negatively affect residents' quality of life.

# Our Vision for a Smarter Riyadh

- 01** Transforming Riyadh into a smart city with real-time traffic management.
- 02** Implementing dynamic speed limits to cut down travel times.
- 03** Lowering emissions and improving air quality.
- 04** Enhancing productivity and supporting economic growth.
- 05** Enhancing quality of life for citizens, less time in traffic means more personal time for citizens.



# About the Dataset

01

## Data Collection

We collected data from various online sources and recorded our own videos, resulting in approximately 4000 frames.

02

## Processing the Data

Using YOLO v9, we processed each frame to detect and analyze traffic patterns, identifying vehicles and traffic congestion points.

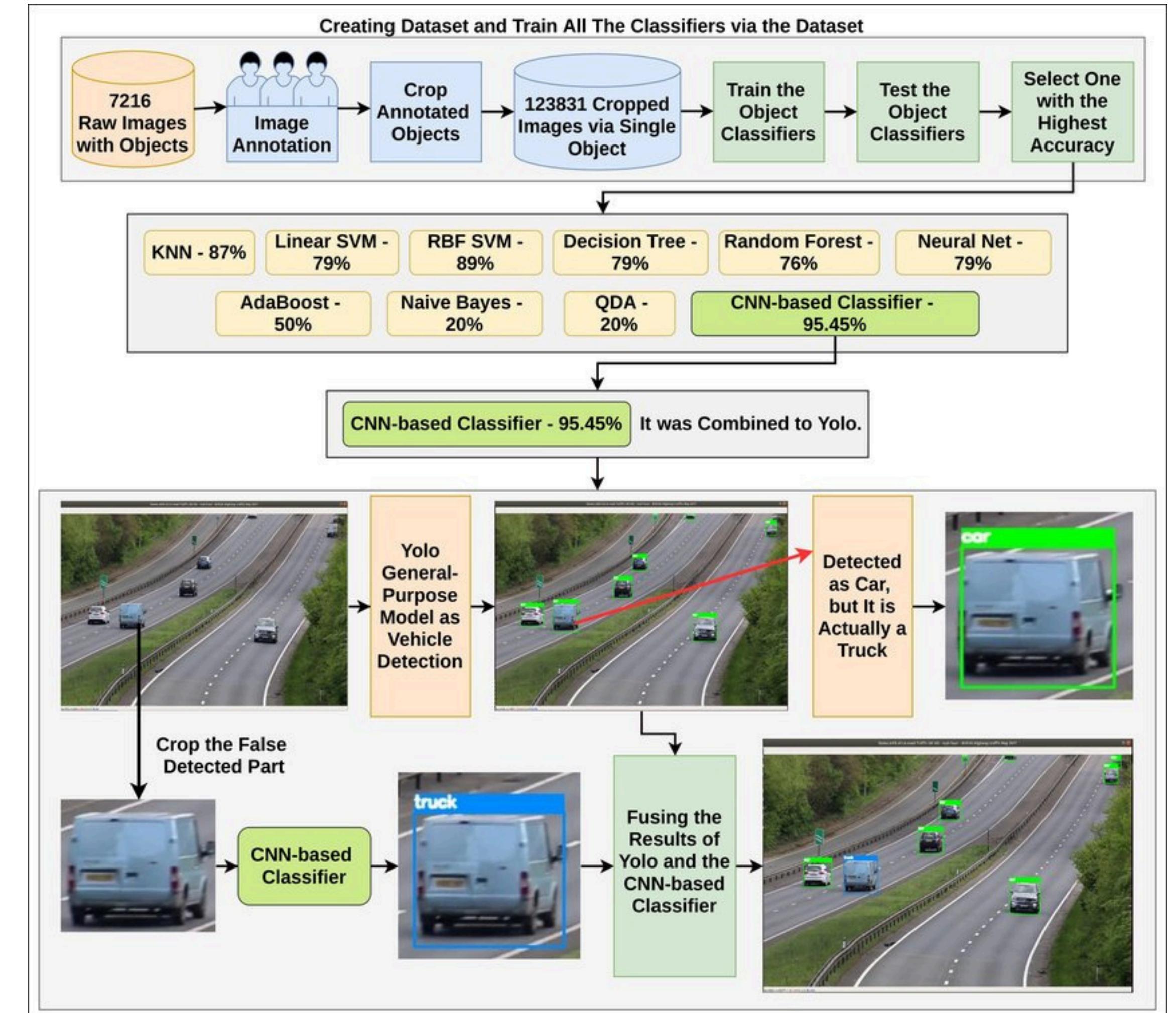
03

## Results and Insights

Our analysis provided insights into traffic congestion points and vehicle flow rates, helping us to understand the traffic dynamics in Riyadh.



# Architecture



# Experiments and Results

## Experiment 1 - Baseline

we trained our custom YOLOv9 model using a batch size of 8, training for **10 epochs**.

### Overall Model Performance:

(P) of 0.792, (R) of 0.695, and (mAP50) of **0.752**.

and a more stringent mean average precision (mAP50-95) of 0.55.

## Experiment 2

we trained our custom YOLOv9 model using a batch size of 16, training for **50 epochs**.

### Overall Model Performance:

(P) of 0.774, (R) of 0.721, and (mAP50) of **0.778**.

and a more stringent mean average precision (mAP50-95) of 0.61.

## Experiment 3

we trained our custom YOLOv9 model using a batch size of 20, training for **100 epochs**.

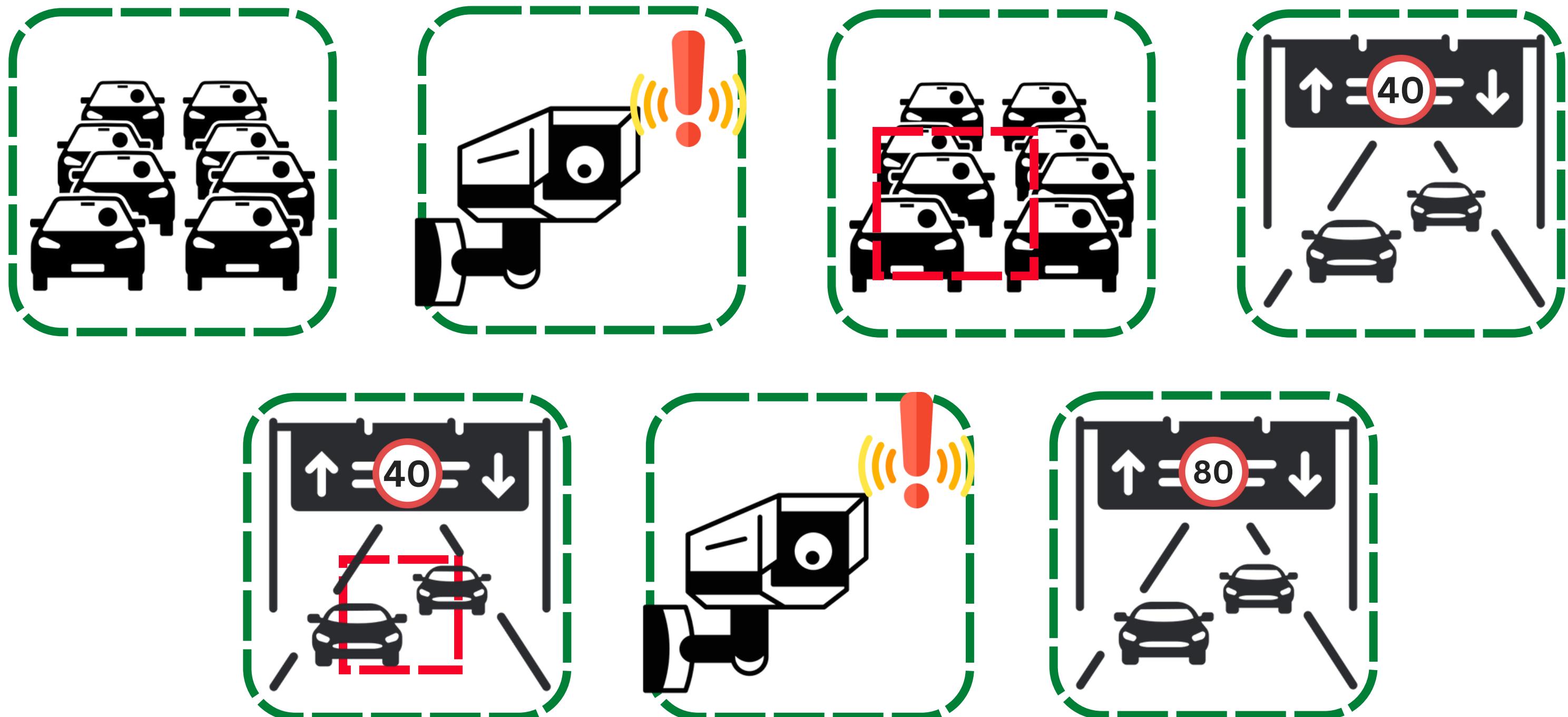
### Overall Model Performance:

(P) of 0.760, (R) of 0.742, and (mAP50) of **0.788**.

and a more stringent mean average precision (mAP50-95) of 0.618.



# Solution Methodology



# Sahel Simulation

1. When the cars



# Impact



## Impact on Drivers

- Reduced Travel Time
- Enhanced Comfort
- Time Savings



## Environmental Impact

- Lower Emissions
- Better Air Quality
- Sustainability



## Safety Impact

- Fewer Accidents
- Safer Roads
- Quicker Emergency Response



## Economic Impact

- Increased Productivity
- Fuel Savings
- Economic Growth



# Alignment with Saudi Vision 2030



## **Smart Cities Initiative:**

Implementing advanced traffic management systems to develop smart cities.

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## **Environmental Sustainability:**

Reducing vehicle emissions and improving air quality.

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## **Quality of Life:**

Enhancing urban mobility to improve the daily lives of citizens.

Enhancing commuter experience by decreasing travel times and stress levels.

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## **Economic Diversification:**

Supporting economic growth through efficient infrastructure.

Reduces fuel wastage and increases productivity.

# Future Improvements

Continuing the Journey Towards Smarter Mobility ...



## Advanced AI and Machine Learning

Optimize Traffic algorithms



## Expansion to Other Cities

Implement the model in other major Saudi cities.



## Enhanced Data Analytics

Utilize big data to monitor and improve system performance.



## Smart City Infrastructure

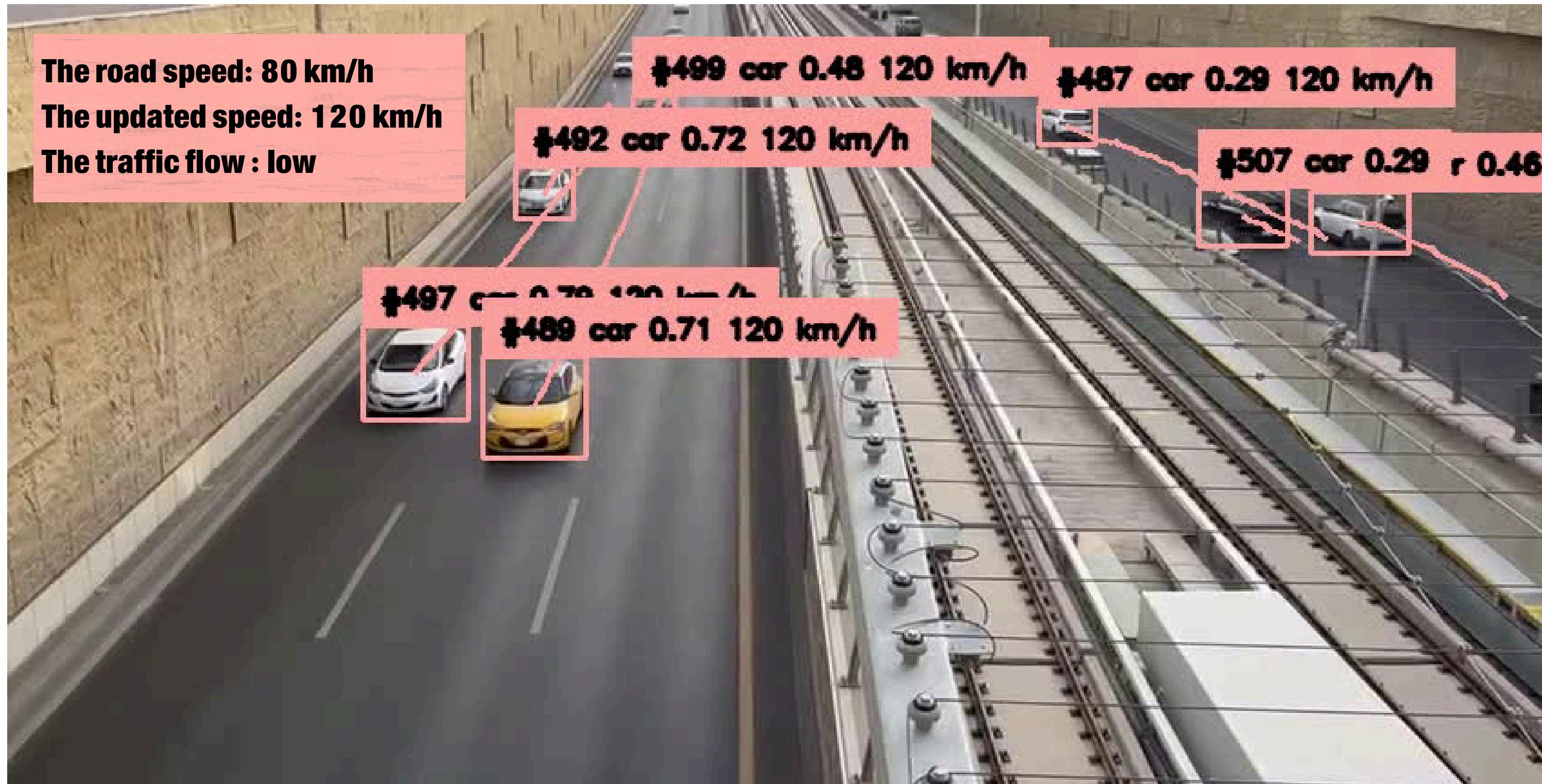
Develop smart roads that communicate with vehicles.



## Real-time Traffic Control

Incorporate public transport data to reduce congestion.

# The Demo





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# THANK YOU

FOR YOUR LISTENING

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