SMART INDIA HACKATHON 2024

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- **Problem Statement ID – SIH 1594**
- **Problem Statement Title - STUDENT INNOVATION**
- **Theme- Transportations and Logistics**
- **PS Category- Software**
- **Team ID- 58**
- **Team Name - TECH TITANS**

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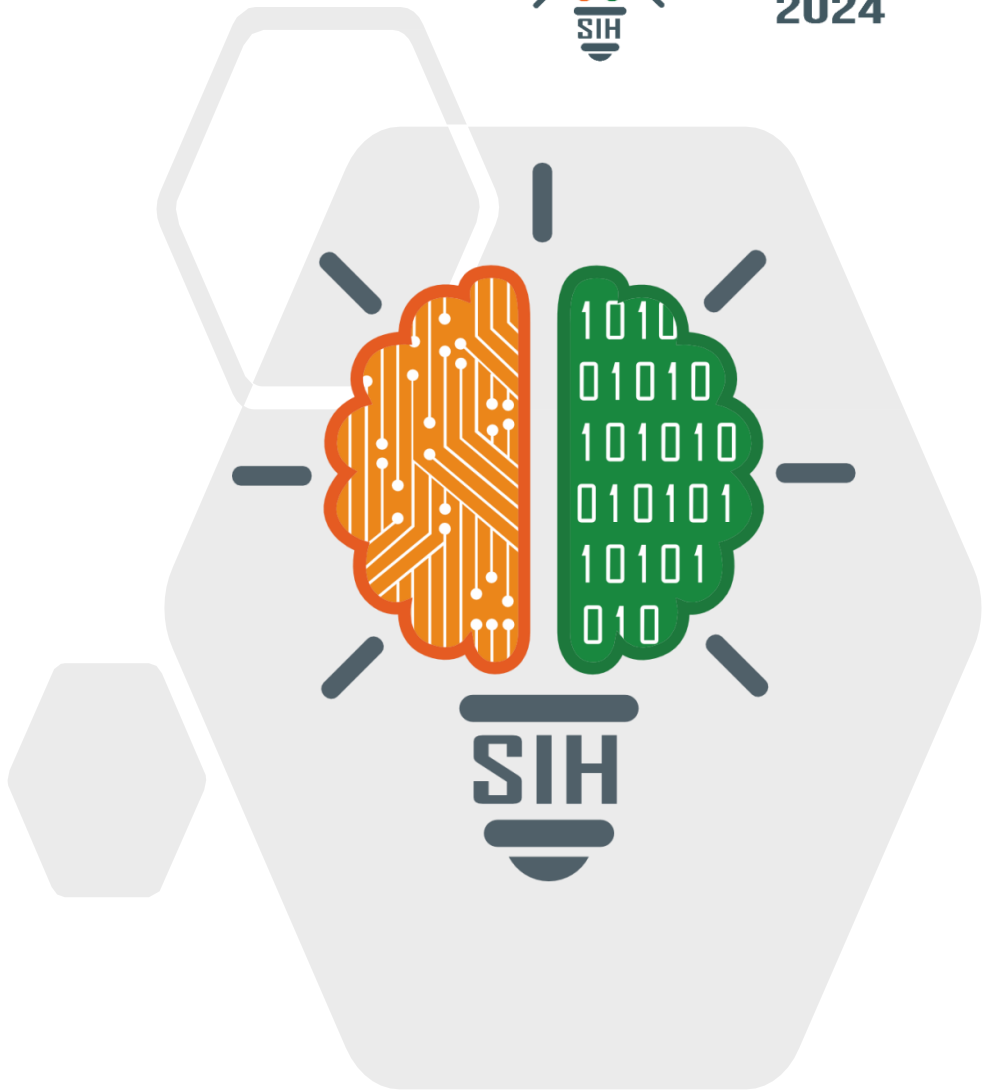

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AI-DRIVEN TRAFFIC FLOW OPTIMIZATION SYSTEM

Technical Approach

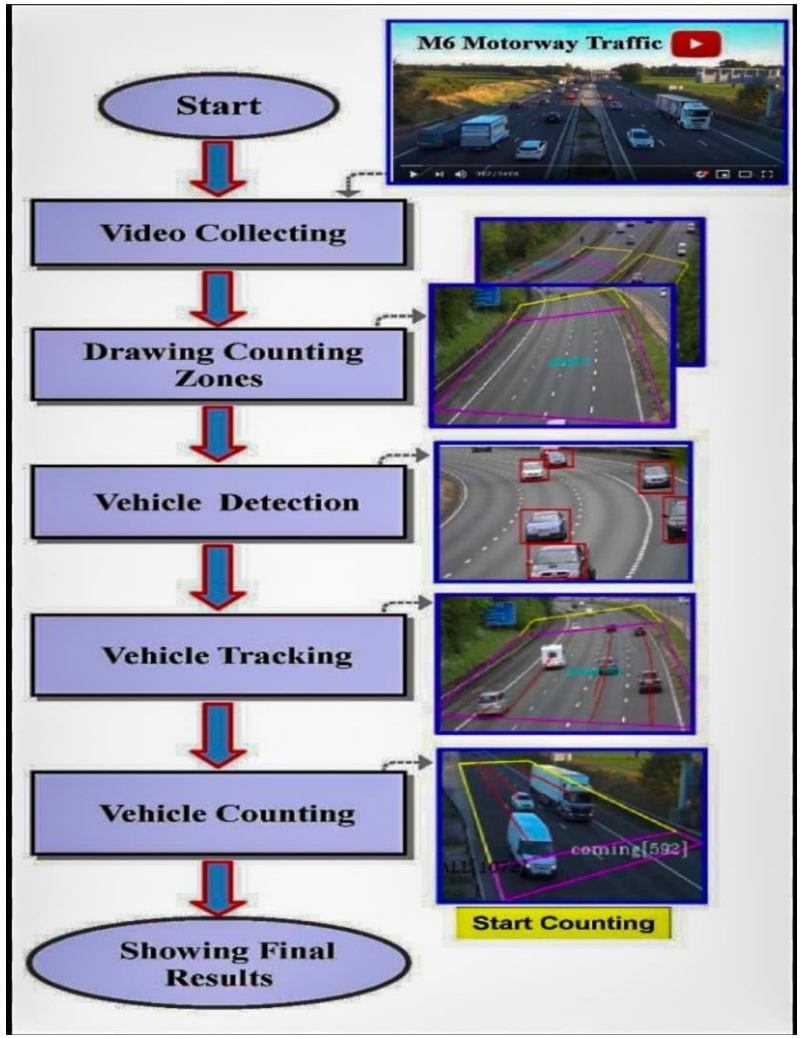
Our AI-based system predicts traffic density using image processing and then the real time traffic data is used to optimize the timings of traffic lights.

Our solution involves two critical components:

1. Vehicle detection and classification using Yolov8.
2. Traffic Signal Optimization algorithm for Dynamic Light Control.

- **Technologies Used:** YOLOv8 and OpenCV
- **Programming Languages:** Python
- **Frameworks:**
  Open-CV (for image recognition), tensorflow
- **Hardware:**
  IoT devices (sensors, camera)

TECH STACK



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PROPOSED SOLUTION

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YOLO V8:

Yolov8 (You Only Look Once version 8) is a real-time object detection model known for its accuracy and speed.

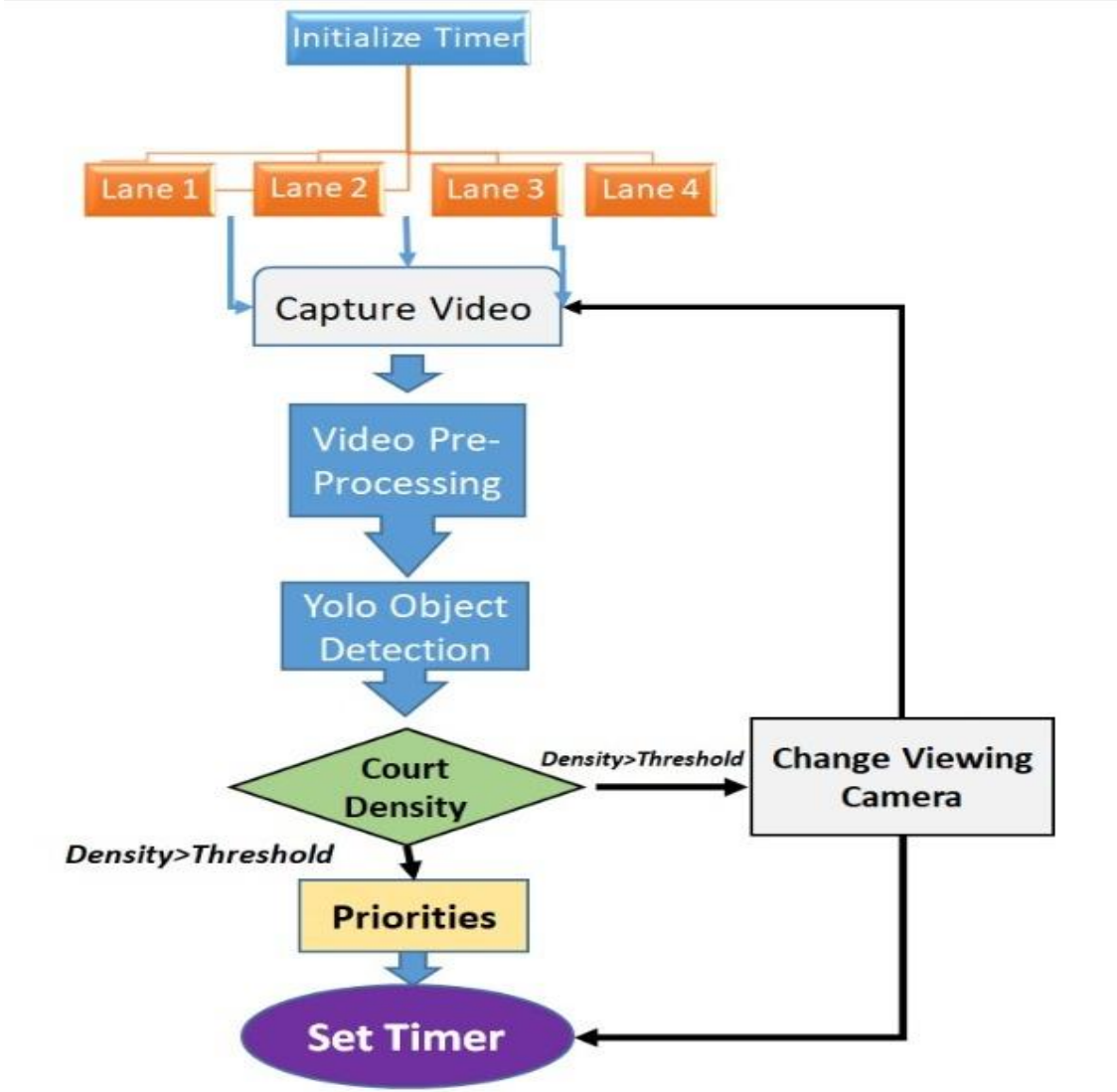
Object Detection: YOLOv8 identifies and classifies different types of vehicles in video feeds from traffic cameras.

Real-time Vehicle Counting: It continuously counts the number of vehicles waiting at the intersection in each direction.

OPTIMIZATION OF TRAFFIC SIGNAL LIGHTS

Dynamic Time Allocation: Instead of having fixed signal durations, our system dynamically adjusts the green light duration for each direction based on the number of vehicles detected.

Real-time Feedback Loop: The vehicle count and classification are continuously fed into the system, which recalculates and adjusts the timings for each signal.



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FEASIBILITY AND VIABILITY

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Feasibility:

Real-Time Data Processing:
AI Systems Use real-time data from cameras, sensors, GPS to monitor traffic accurately.

Scalability:
They can handle varying traffic volumes and adapt to different urban environments.

Viability:

Environmental Impact
By optimizing traffic flow and reducing congestion, AI can significantly reduce vehicle emissions.

Integration with Existing Systems:
AI-based solutions can be integrated with existing systems, reducing the need for a complete overhaul.

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IMPACT AND BENEFITS

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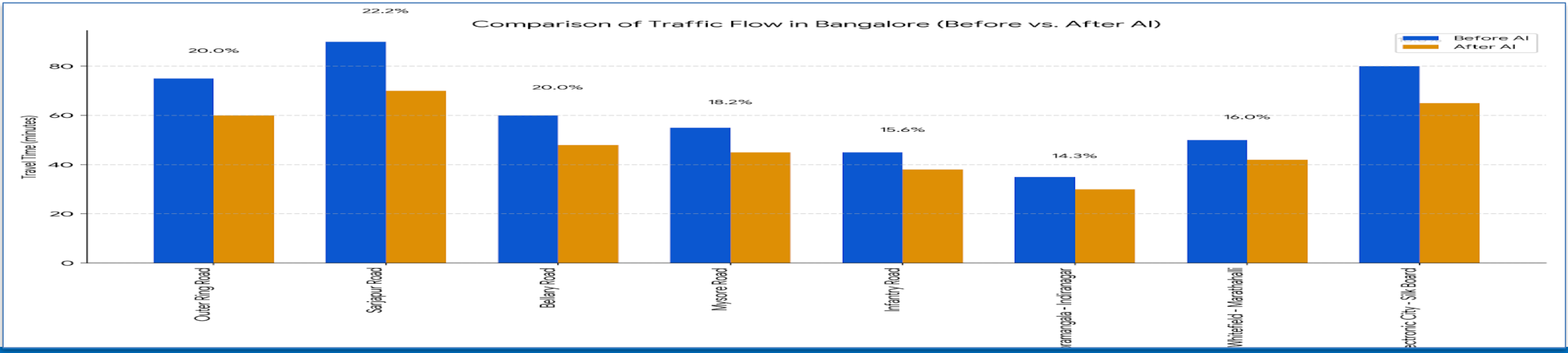
30% Reduction in Wait Times
Real-time adaptive signals prioritize heavier traffic, reducing waiting times and improving flow by up to 30%.

Reduced Pollution
Smoother traffic flow decreases idling, cutting fuel consumption and emissions, leading to a cleaner environment.

Economic Gains
Fewer traffic jams mean less time wasted, boosting productivity and saving costs on fuel, leading to economic benefits.



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RESEARCH AND REFERENCES

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- Details / Links of the reference and research-work-
- https://techvidvan.com/tutorials/opencv-vehicle-detection-classification-counting
- https://fordeurope.blogspot.com/2022/03/smart-tech-turns-traffic-lights-green.html

Future Scope :

- **V2X Communication : Incorporating vehicle-to-everything (V2X) technology will allow AI systems to communicate directly with autonomous vehicles, predicting traffic patterns more accurately and dynamically adjusting traffic signals based on vehicle location, speed, and density.**

- **Traffic Light and Parking Coordination : AI can integrate parking guidance systems with traffic lights, giving drivers optimal routes to available parking spots based on current traffic conditions. This will streamline traffic flow and reduce bottlenecks around parking facilities.**