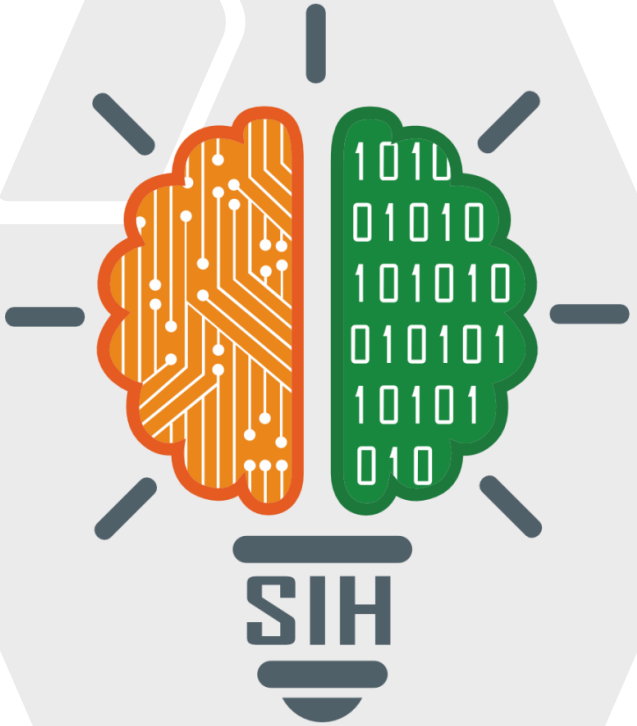
TITLE PAGE



- **Problem Statement ID – SIH1607**
- **Problem Statement Title- AI-Powered Smart Traffic Management System for Real-Time Adaptive Traffic Signal Control**
- **Theme- Smart Automation**
- **PS Category- Software**
- **Team ID-**
- **Team Name- eventHandlers404**

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404

TRAFFIC विकल्प

SMART INDIA HACKATHON 2024

❖ AI-powered traffic light control system

- This AI powered traffic control light utilizes real-time video analysis to manage traffic at intersections. It detects, counts and estimates traffic density.
- This dynamic system adjusts signal timings based on live data to reduce congestion, wait times and factors contributing to accidents.
- Uses AI for intelligent decision-making, unlike traditional fixed-timer systems.
- Continuously adjusts traffic signals based on live traffic conditions for improved adaptability.
- Future-ready with the ability to integrate additional features such as emergency vehicle prioritization and IoT sensors.
- Can be implemented across multiple intersections and integrated into broader city-wide traffic management systems.

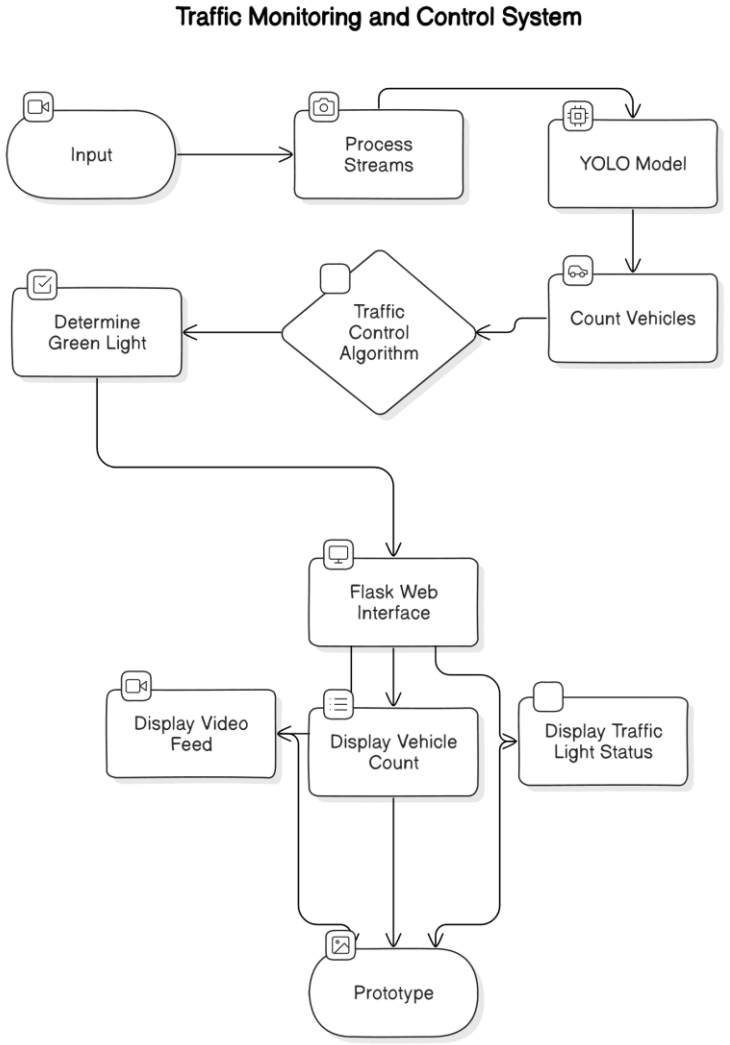
TECHNICAL APPROACH

- **Programming Languages:**

  > Python: For developing the AI model, traffic control algorithms, and backend functionalities.
  > JavaScript: For creating interactive elements and dynamic updates on the web interface.

- **Frameworks and Libraries:**

  > YOLOv8: For real-time object detection and vehicle counting.
  > OpenCV: For video processing, image analysis and integrating with YOLO.
  > Flask: For building the web application to serve live video feeds and display traffic data.
  > Bootstrap: For creating a responsive and visually appealing web interface.
  > NumPy/Pandas: For data manipulation and analysis



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FEASIBILITY AND VIABILITY

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Feasibility

>Technological Readiness: The use of YOLOv8 and OpenCV for real-time vehicle detection and video processing is well-established and proven, ensuring reliable performance.

>Cost-Effectiveness: Standard cameras and servers are affordable and sufficient for the project's needs, making the solution economically viable.

>Scalability: The system can be easily scaled to multiple intersections and integrated into broader city traffic management networks, allowing for future expansion.

Challenges

>Model Accuracy: Ensuring the YOLO model performs well under varying lighting and weather conditions.

>Edge Cases: Handling unexpected situations such as stalled vehicles and violation of traffic rules.

>System Reliability: Maintaining consistent performance and avoiding failures, especially in critical scenarios.

Strategies

>Redundancy: Adds backups to switch to timed signals if the AI or video feed fails.

>Model Tuning: Manually fine-tune the AI model at regular intervals to adapt to different conditions.

>Robust Testing: Conduct thorough testing at Bhaijipura crossroad at peak hours to ensure reliable system performance.

>Image Preprocessing: Adoption of image resizing and feature enhancement techniques to improve the quality of images under bad weather conditions.

IMPACT AND BENEFITS

- **Improved Traffic Flow:** Dynamic signal adjustments reduce congestion and wait times, enhancing overall traffic efficiency.
- **Enhanced Safety:** Real-time monitoring and adaptive signals minimize the risk of accidents by managing traffic more effectively.
- **Environmental Benefits:** Reducing idling time lowers vehicle emissions, contributing to a cleaner environment.
- **Emergency Vehicle Prioritization:** Future integration of emergency vehicle detection ensures quicker response times and improved public safety.
- **Scalability:** The system can be expanded to multiple intersections, optimizing traffic management on a larger scale.

RESEARCH AND REFERENCES

- Real time Traffic monitoring System based on Deep Learning and YOLOv8
- Deep Learning-Based Object Detection and Classification for Autonomous Vehicles in Different Weather Scenarios

FUTURE SCOPE

- **Emergency Vehicle Prioritization:** Integrating systems to prioritize ambulances, fire trucks, and police vehicles, ensuring faster response times during emergencies.
- **Cloud-Based Traffic Monitoring:** Implementing cloud computing for real-time traffic data storage, analysis, and decision-making across cities.
- **AI-Driven Predictions:** Leveraging AI to predict traffic patterns and optimize signal timings for better long-term traffic management.