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- **Problem Statement ID – 1607**
- **Problem Statement Title – A smart AI based solution for traffic management on routes with heavy traffic from different directions, with real-time monitoring and adaptation of traffic light timings**
- **Theme - Smart Automation**
- **PS Category - Software**
- **Team ID -**
- **Team Name – TEAM NIKOLA**

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AI-Powered Adaptive Traffic Management System [AITraS]

Proposed Solution :

- AI-Powered Adaptive Traffic Management System [AITraS] is a Real Time Traffic Management Software which controls the Traffic congestion by AID [Automatic Incident Detection].
- Using Computer Vision , Detects and analyzes the real time traffic using well trained YOLOv9 model
- Neural Network and fuzzy logic algorithm's to Predicts traffic patterns and optimizes signals with accurate solution
- Dynamic traffic signal based on the density of the traffic for smooth and safe traffic flow.
- Ambulance App : Helps ambulance to find the shortest path to the nearest hospital with using AITraS to clear traffic
- Private Vehicle Feature : Allows private vehicles in emergencies to clear traffic, with police notification to prevent misuse.

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TECHNICAL APPROACH

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- **Programming Languages** : Python for data processing and machine learning; JavaScript for frontend development, SQL For database management and querying traffic data.
- **Frameworks** : TensorFlow-PyTorch-Keras for machine learning, OpenCV for computer vision, React for the user interface.
- **Cameras and Sensors** : Install at key intersections to monitor traffic flow and collect real-time data with and without wired lines.
- **Object Detection** : techniques like Faster R-CNN (Regions with Convolutional Neural Networks), YOLO (You Only Look Once), SSD (Single Shot MultiBox Detector), OpenCV and YOLOv9 are used for better object detection and traffic analysis.
- **Machine Learning** : Train models to predict traffic patterns and optimize signal timings.
- **Integration** : Combine models with traffic signal control systems and develop APIs for communication.
- **App for public** : Ambulance drivers find the nearest hospital and clear traffic. Private Vehicle Feature : provides information about the current location and Allows private vehicles in emergencies to clear traffic by notifying with app, with a safety mechanism to notify the police.

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FEASIBILITY AND VIABILITY

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- **Proven Technologies**: Uses established technologies like computer vision (OpenCV) and machine learning (TensorFlow/PyTorch).
- **Economic Benefits**: Reduces fuel consumption and emissions, leading to cost savings, reduces death rate(road accidents).
- **Data Privacy** : Ensuring secure and anonymized data.
- **Integration Complexity** : Integrating with existing traffic systems.
- **System Reliability** : Maintaining performance under various conditions.
- **Data Security** : Implement encryption and anonymization.
- **Modular Design** : Simplify integration with a modular approach.
- **Redundancy** : Use redundant systems for reliability.

IMPACT AND BENEFITS

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Potential Impact on the Target Audience:

- Urban Commuters: Reduced travel time and less frustration.
- Emergency Services: Faster response times for ambulances.
- Traffic Authorities: Better real-time traffic management.

Benefits of the Solution:

Social:

- Improved Quality of Life: Less time in traffic.
- Enhanced Safety: Quicker emergency response.

Economic:

- Cost Savings: Reduced fuel consumption and vehicle wear.
- Increased Productivity: More productive hours.

Environmental:

- Lower Emissions: Reduced vehicle idling.
- Sustainable Development: Supports smart city initiatives.

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RESEARCH AND REFERENCES

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Delhi-to-implement-integrated-traffic-management-system-by-the-end-of-2024/100649833

Bengaluru/city-sees-spike-in-accident-victims-dying-en-route-to-hospital-2998128#:~:text=n

Bengaluru-traffic-police-launch-astram-initiative-for-enhanced-traffic-management

Intelligent-transportation-system-in-india

For More Information:
https://github.com/Teslas-deciple/IMP-Links/blob/main/README%20(1).md