

Project Overview: AI-Based Traffic Management System

Project Members: Abdurashid Djumabaev 210004, Abzal Ibrohimov 220587, Ismoil Salohiddinov 220626, Komiljon Qosimov 220493

Objective:

The AI-Based Traffic Management System aims to improve urban traffic flow by dynamically adjusting traffic signal timings using artificial intelligence and real-time traffic data. This system minimizes traffic congestion, reduces delays at intersections, and optimizes vehicle movement, ultimately enhancing road safety and reducing emissions.

Key Features:

- **Real-time Traffic Monitoring:** Cameras and sensors at intersections capture live traffic data, including vehicle count, speed, and congestion levels.
- **AI Algorithm for Signal Control:** A machine learning algorithm processes traffic data and optimizes traffic light sequences to reduce waiting times and ensure smoother vehicle flow.
- **Emergency Vehicle Detection:** Using specialized signal recognition, the system prioritizes emergency vehicles, ensuring they can pass through intersections without delays.
- **Data Analytics:** The system provides data analytics and insights on traffic patterns, peak hours, and congestion trends, helping city planners improve infrastructure over time.

System Components:

- **Hardware:**
 - Cameras or LIDAR sensors to detect traffic volume and vehicle movements.
 - Traffic signal controllers integrated with AI algorithms.
 - ESP32/Arduino for processing sensor data and communication with a central server.
- **Software:**

- AI-based traffic prediction model, leveraging historical data and real-time inputs.
- Cloud or edge-based server to manage data from multiple intersections.
- Web dashboard or mobile app for traffic management authorities to monitor the system in real time.

Expected Benefits:

- **Reduced Traffic Congestion:** By dynamically adjusting traffic signals, the system minimizes waiting times and reduces bottlenecks at intersections.
- **Improved Road Safety:** The AI system can detect and manage abnormal traffic conditions (e.g., accidents) and help reroute vehicles accordingly.
- **Environmental Impact:** By reducing idle time and stop-start driving, the system lowers fuel consumption and CO2 emissions.
- **Emergency Response Efficiency:** Prioritizing emergency vehicles ensures quicker response times, potentially saving lives.

Future Scope:

The system could be expanded by incorporating more advanced technologies like vehicle-to-infrastructure (V2I) communication, where connected vehicles can interact directly with the traffic signals, further improving traffic management. Additionally, integrating predictive analytics based on weather data and public events can further optimize traffic flow.