

Traffic Flow Prediction Using 5G and Smart Cities IoT

Abstract

Traffic congestion is a growing challenge in urban areas, leading to increased fuel consumption, pollution, and lost productivity. Traditional traffic prediction models rely on historical data, which lacks real-time adaptability. This project proposes an **AI-driven Smart City traffic management system** that utilizes **5G-enabled IoT networks, Edge AI, and Blockchain for decentralized traffic data processing**.

Real-time data is collected from **IoT-based traffic sensors, connected vehicles, and satellite imaging** to analyze road conditions dynamically. **5G technology** enables ultra-fast data transmission, ensuring real-time updates on traffic patterns. AI models, including **Graph Neural Networks (GNNs) and Convolutional LSTMs**, predict congestion by analyzing historical and live traffic data.

The project integrates **Edge AI devices (Intel OpenVINO, NVIDIA Jetson)** to process traffic data locally, reducing cloud dependency and improving response times. **Blockchain-based decentralized traffic management** ensures secure, tamper-proof sharing of traffic data between government agencies and transportation companies.

To optimize traffic flow, **Reinforcement Learning-based adaptive traffic signal control** adjusts signal timings dynamically based on real-time congestion levels. The system also suggests **alternate routes using AI-powered navigation (Google Maps AI, Waze ML API)**, reducing travel times for commuters.

Future enhancements include **autonomous vehicle integration, AI-driven road maintenance prediction, and 5G-connected drone monitoring for real-time traffic surveillance**.