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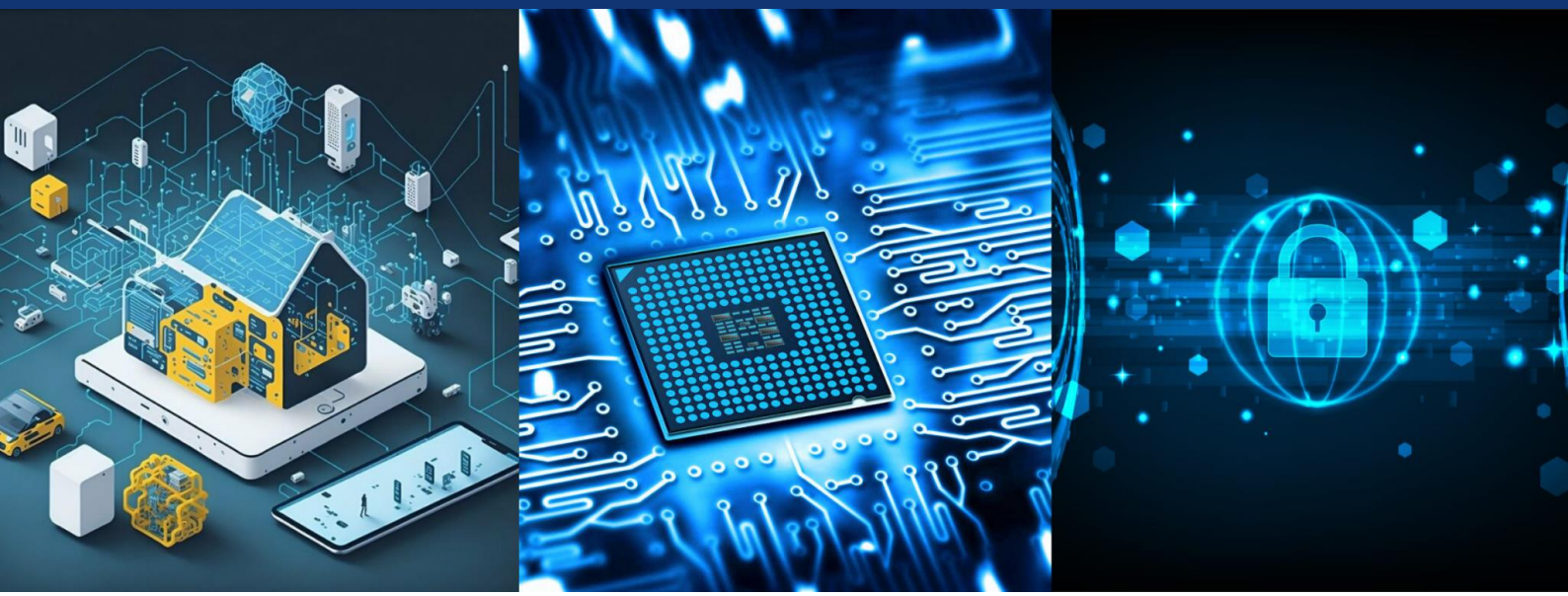

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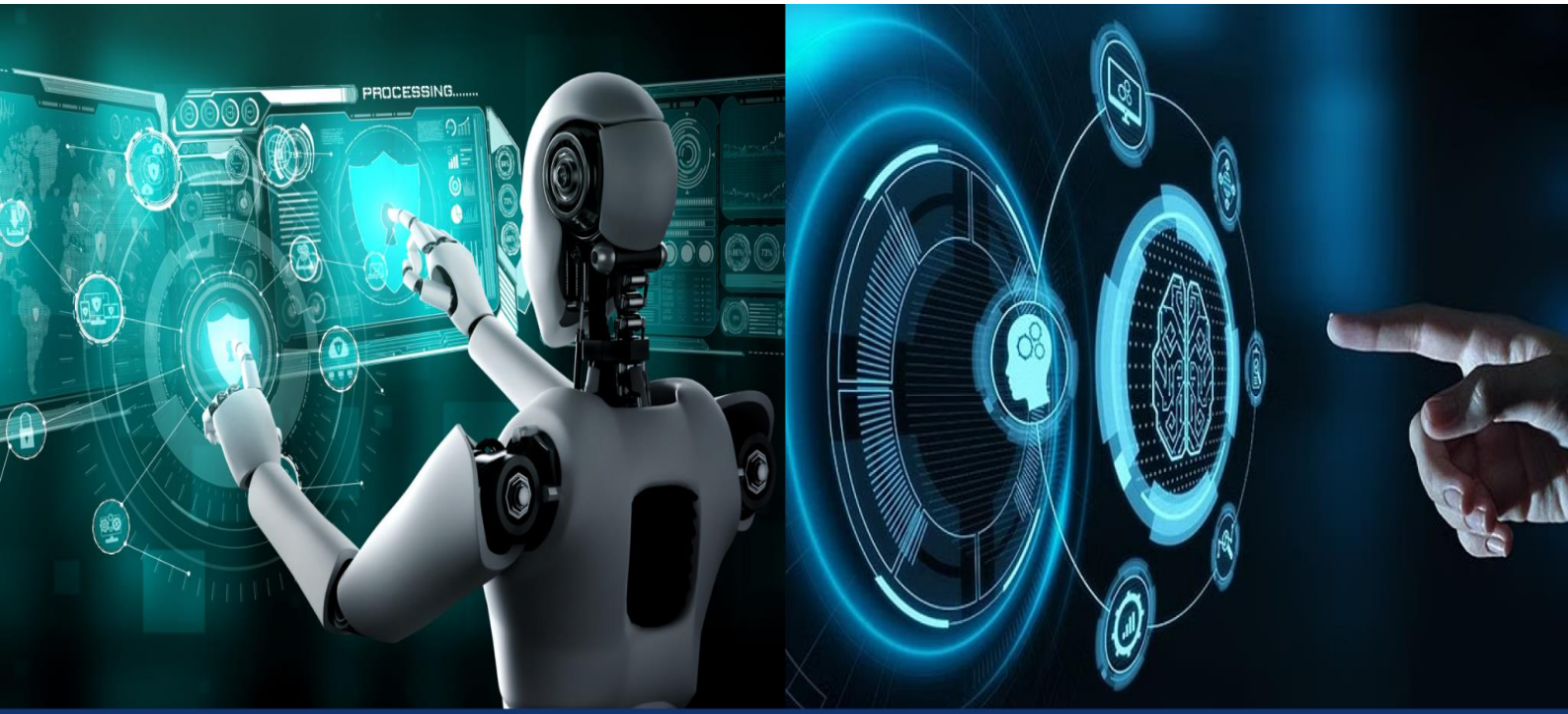

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A Smart AI Based Solution for Traffic Management on Routes with Heavy Traffic from Different Directions, With Real-Time Monitoring and Parking Management

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ABSTRACT: The "Traffic Prediction for Intelligent Transportation System using Machine Learning" project aims to improve traffic management based on real-time predictive data. The project consists of two basic modules: an admin module and a user module. The admin module provides administrators with the facility to log in, manage parking slot information, view booking requests, and approve or reject bookings. On the other hand, the user module supports the registration of users, login, viewing of parking slot details, and booking slots. Users also benefit from sophisticated features such as parking slot predictions, traffic forecast, and live traffic update taking into account emergency vehicles, normal traffic movement, vehicle population, and road clearance time. Through the application of machine learning algorithms, the system offers prompt, accurate traffic forecasts, contributing to congestion mitigation and urban mobility enhancement. This methodology combines image-based parking slot identification and real-time traffic conditions, eventually leading to more efficient and safer transportation networks.

KEYWORDS: Traffic forecasting, machine learning, smart transport, parking space management, car forecast, real-time traffic forecast, traffic congestion management.

I. INTRODUCTION

Good traffic control and reliable parking spaces are prime issues of modern-day cities. As urban dwellers rise and motor vehicle usage becomes popular, the existing infrastructure is overwhelmed by the demand, leading to gridlocks, wasted resources, and heightened frustration among drivers and regulators.

Current methods are based on inflexible, old-fashioned systems that cannot respond to changing conditions in real time or make accurate predictions. This project, "Traffic Prediction for Intelligent Transportation System using Machine Learning," aims to overcome these challenges through sophisticated algorithms and insights based on data.

By integrating live traffic information, machine learning algorithms, and smart parking slot allocation, this project promises to decrease congestion and enhance the overall travel experience.

The system will be able to assist administrators and users alike, with features like live traffic updates, parking availability predictive analysis, and emergency handling functionality. Overall, this methodology not only increases efficiency but also ensures a more sustainable and user-friendly urban transportation environment.

II. RELATED WORK

Lv Y., Duan Y., Kang W., Li Z., and Wang F.-Y., "Traffic Flow Prediction With Big Data: A Deep Learning Approach," IEEE Transactions on Intelligent Transportation Systems, 2015.

In this paper, the traffic flow forecast is achieved based on a deep learning method implemented by stacked autoencoders.The model successfully captures spatiotemporal patterns in massive traffic data and outperforms conventional models like ARIMA and SVR. Real traffic prediction application has been enhanced in accuracy and stability.

Ma X., Tao Z., Wang Y., Yu H., and Wang Y., "Long Short-Term Memory Neural Network for Traffic Speed Prediction Using Remote Microwave Sensor Data," Transportation Research Part C, 2015.

Short-term traffic speed prediction is carried out in this study using LSTM networks. The temporal relationship was handled extremely well by the LSTM model and was improved compared to average response time and forecasting-based neural networks and regression models.

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Zhang J., Zheng Y., and Qi D., "Deep Spatio-Temporal Residual Networks for Citywide Crowd Flows Prediction," AAAI Conference on Artificial Intelligence, 2017.

The authors utilize a deep residual network that takes into account both spatial and temporal interactions for predicting urban traffic flow. Based on crowd flow data, the model performs significantly better than traditional methods, particularly in urban traffic scenes.

Yuan Y., Zhou S., and Yang T., "Parking Slot Detection Based on Deep Learning," IEEE International Conference on Image Processing (ICIP), 2016.

This article presents a CNN-based model for parking slot detection from images taken by surveillance cameras. The model improves detection accuracy under different lighting and weather conditions, providing a scalable solution for automated parking management systems..

III. PROPOSED ALGORITHM

The proposed system offers a machine-learning-intensive framework for real-time traffic prediction and parking slot booking. With the help of advanced algorithms and real-time information, the system provides precise traffic prediction, predictive slot booking, and priority-based emergency vehicle booking. The admin module handles slot bookings while the user module facilitates parking forecasts, real-time traffic data, and easy slot bookings.The intelligent way reduces traffic, saves response time for emergency services, and enhances efficiency within urban transportation systems.

Proposed System Advantages

Real-Time Insights: Offers real-time traffic condition and parking lot forecast to facilitate more informed decision-making.

Improved Efficiency: Minimizes congestion and delays by responding dynamically to existing traffic conditions.

Improved Emergency Handling: Gives precedence to emergency vehicles to facilitate quicker response times and better road safety.

User-Friendly Experience: Facilitates parking slot reservations and traffic navigation through a user-friendly, easy-to-access interface.

Data-Driven: Uses machine learning to continually update predictions and evolve based on changing traffic patterns.

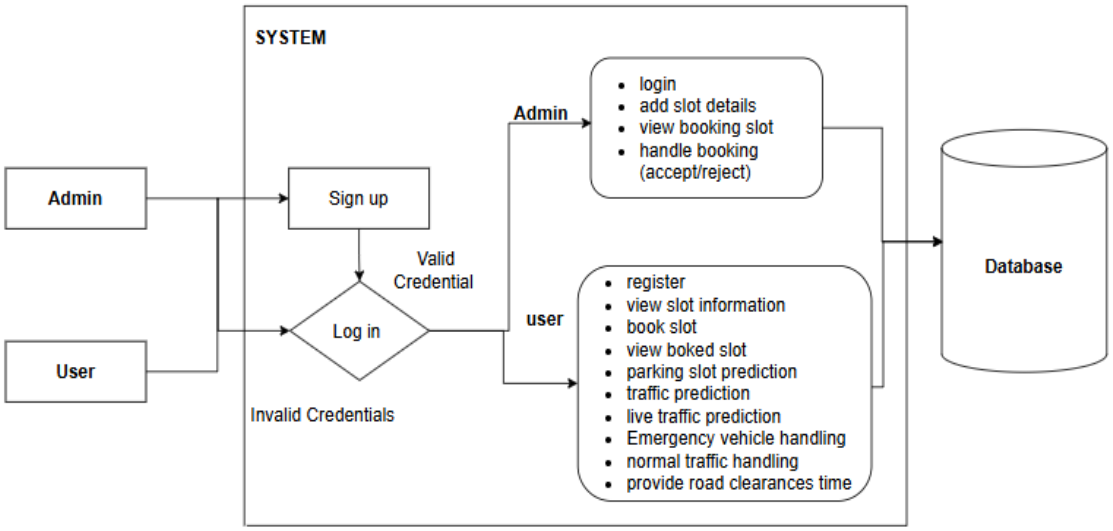

FIG.1 ARCHITECTURE DIAGRAM

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IV. SIMULATION RESULTS

Admin Module :
1. Admin Login:
The system should permit the admin to log in with valid credentials.
2. Add Slot Details:
The admin should be permitted to add new parking slot details such as location, slot ID, and availability status.
3. View Booking Slots:
The system should offer the facility to view all user booking requests.
4. Handle Booking Requests (Accept/Reject):
The system should offer the facility to accept or reject booking requests based on availability.
User Module
User Login and Registration:
1.The system should offer registration of new users and login for existing users.
2. View Slot Details:
a. Users must be able to search for vacant parking slots, i.e., location and availability.
3. Book Parking Slot:
a. Users must be able to book an empty parking slot by specifying the time needed and the location.
4. View Booked Slots:
a. Users must be able to view details of booked slots present now and in the past.
5. Parking Slot Forecasting (using API Image):
a. The system will utilize image-based data in an effort to predict parking space availability in real-time.
6. Traffic Forecasting:
a. The system will predict traffic patterns in the future with machine learning algorithms.
7. Live Traffic Forecast:
a. The system will supply users with real-time traffic trends based on the number of vehicles, movement of emergency vehicles, and road clearance status.
8. Emergency Vehicle & Clearance Management:
a. The system will prioritize the prediction of traffic in case of emergencies and calculate the road clearance time to aid rerouting

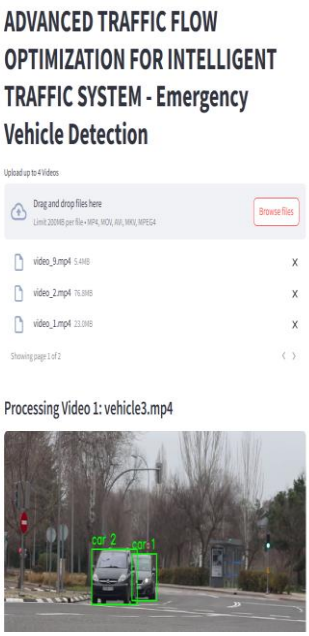

Fig. 2 Traffic prediction through video data

Fig. 3 Prediction results

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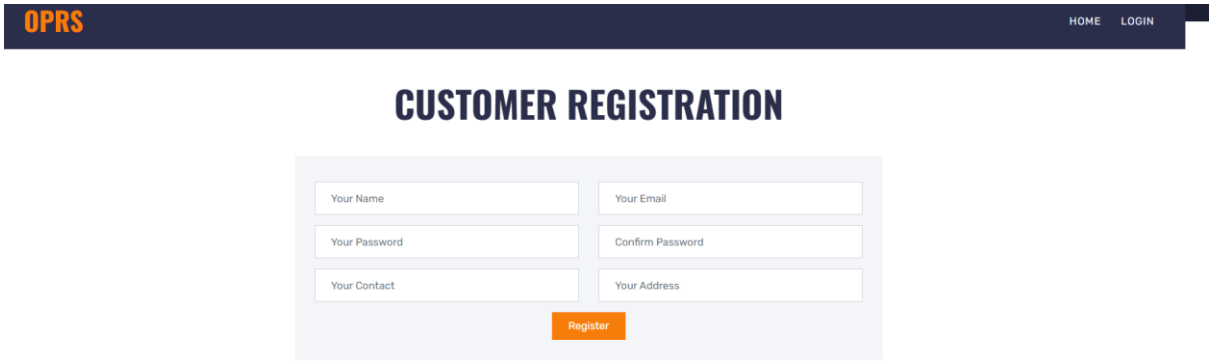

Fig 4. Customer Registration

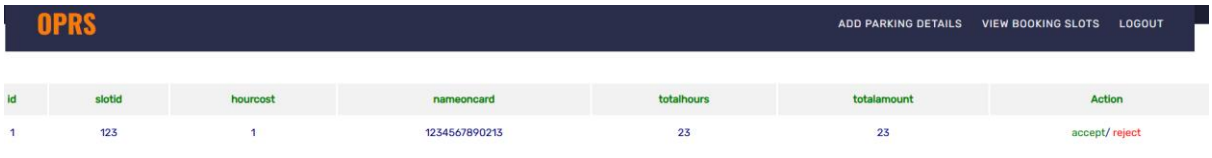

Fig 5. Booking Slot Details

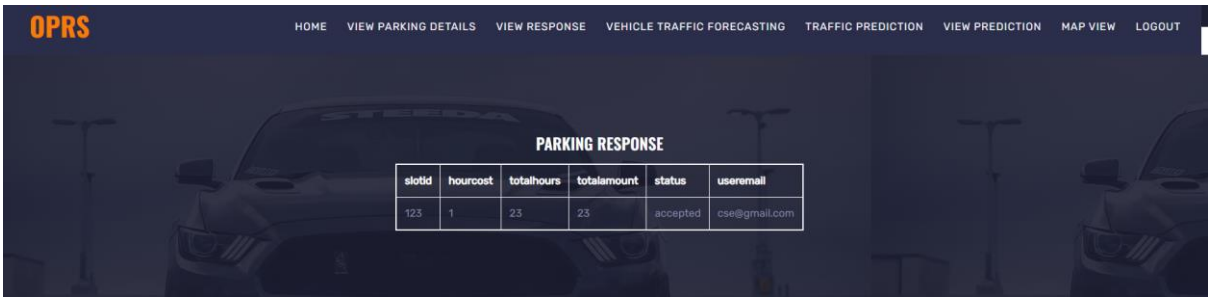

Fig 6. View slot response

V. CONCLUSION AND FUTURE WORK

The system proposed here provides an intelligent AI-driven solution for traffic management and intelligent parking through the use of real-time observation and adaptive traffic light management to handle dense traffic from various directions, along with smart empty slot reservation for vehicle parking. The system can be further developed in the future by integration with IoT-based sensors and CCTV camera feeds to collect more precise and real-time traffic and parking data. AI-based route optimization for emergency vehicles can be used to minimize response times, while other features like voice command capability, multilingual interfaces, and mobile app integration will enhance user convenience and experience. In addition, predictive road maintenance and dynamic traffic signal control can also boost efficiency in urban traffic management. This comprehensive solution, titled "Traffic Prediction for Intelligent Transportation System using Machine Learning", demonstrates the effective utilization of machine learning algorithms and real-time data in resolving urban congestion, prioritizing emergency vehicles, and optimizing parking slot utilization. With independent user and administrator modules, the system promotes urban mobility through automation and predictive analytics, paving the way for smarter, more sustainable, and responsive smart city infrastructure.

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