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Real Estate Property Management System with AI Chatbot and Google Calendar Integration

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Abstract: ***The real estate sector continues to face challenges such as inefficient communication, lack of transparency, and manual scheduling of property visits. To address these limitations, this paper presents a smart and scalable web-based real estate property management system developed using the MERN stack. The proposed system provides a centralized platform that enables secure interaction among buyers, sellers, and administrators through role-based access control and JSON Web Token (JWT) authentication. An Artificial Intelligence (AI)-powered chatbot is integrated to enhance user experience by providing real-time assistance, answering property-related queries, and guiding users throughout the platform. Furthermore, the integration of the Google Calendar API enables seamless scheduling of property visits, significantly reducing manual coordination and improving operational efficiency. The system also incorporates a structured property lifecycle management model (pending → verified → suspended), ensuring data integrity, authenticity, and controlled visibility of listings. By combining modern web technologies with intelligent automation, the proposed solution improves usability, enhances transparency, and offers a scalable framework suitable for real-world real estate applications.***

Keywords: ***Real Estate Property Management System, Artificial Intelligence (AI), AI Chatbot, MERN Stack Architecture, Google Calendar API Integration, Role-Based Access Control (RBAC), JSON Web Token (JWT) Authentication, Natural Language Processing (NLP), Scalable Web Application, RESTful API Design.***

I. INTRODUCTION

The real estate industry plays a crucial role in economic development, yet many property transactions still rely on traditional methods such as manual communication, physical visits, and third-party agents. These approaches are often time-consuming, inefficient, and lack transparency, leading to poor user experience and reduced trust among buyers and sellers. Additionally, the absence of proper verification mechanisms allows unverified or fraudulent property listings to appear on platforms, further complicating the process. With the rapid advancement of digital technologies, there is a growing need for intelligent and automated real estate platforms that can streamline property management and enhance user interaction. Modern web applications provide opportunities to integrate secure authentication, role-based access control, and scalable architectures to handle large volumes of users and data efficiently. This paper proposes a smart real estate property management system developed using the MERN stack, which offers a robust and scalable full-stack solution. The system incorporates role-based access control to define clear responsibilities for administrators, sellers, and buyers, ensuring secure and controlled access to system functionalities. Admin verification mechanisms are implemented to maintain the authenticity and reliability of property listings.

Furthermore, the integration of an Artificial Intelligence (AI)-powered chatbot enhances user engagement by providing real-time assistance and resolving user queries related to properties. The system also leverages Google Calendar integration to enable seamless scheduling of property visits, thereby reducing manual coordination and improving operational efficiency.

By combining secure authentication, intelligent automation, and modern web technologies, the proposed system aims to provide a transparent, efficient, and user-friendly solution for real estate property management. This approach not only improves the overall user experience but also ensures scalability and adaptability for real-world applications.

II. LITERATURE SURVEY

V. Moosavi (2017) analysed real estate market dynamics using data-driven approaches and highlighted the importance of digital transformation in improving decision-making processes. The study emphasized the need for intelligent systems to handle large-scale real estate data efficiently.

A. Shawar and E. Atwell (2018) presented an overview of Artificial Intelligence and chatbot systems, demonstrating how conversational agents can enhance user interaction by providing real-time responses. Their work laid the foundation for integrating AI-based chat systems into web applications for improved user experience.

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C. Kottmyer and J. Schmid (2022) introduced innovative digital solutions for spatial and property-related applications, focusing on improving visualization and interaction. However, their approach lacked integration with secure backend systems and user role management.

K. Pandya and M. Holia (2023) discussed the automation of customer service systems using AI, highlighting the effectiveness of chatbots in reducing manual effort and improving service efficiency. Despite these advancements, their work did not address domain-specific applications such as real estate property management.

S. Kumar and R. Mehta (2024) proposed an intelligent real estate assistant that utilizes AI techniques to improve property search and user interaction. While their system introduced smart features, it lacked strong security mechanisms and structured role-based access control.

Manoj K. Dobbala and M. S. S. Lingolu (2024) analysed the role of conversational AI in modern applications and emphasized its impact on enhancing user engagement and automation. Similarly, C. Li and Y. Zhang (2024) explored multimodal conversational AI systems, highlighting their potential in handling complex user queries across different platforms.

Recent studies by R. Sharma and A. Verma (2025) and Deepali D. Suryawanshi and M. Patil (2025) focused on AI-based real estate web applications. These systems improved property management and user interaction but lacked complete integration of scheduling systems and secure authentication mechanisms.

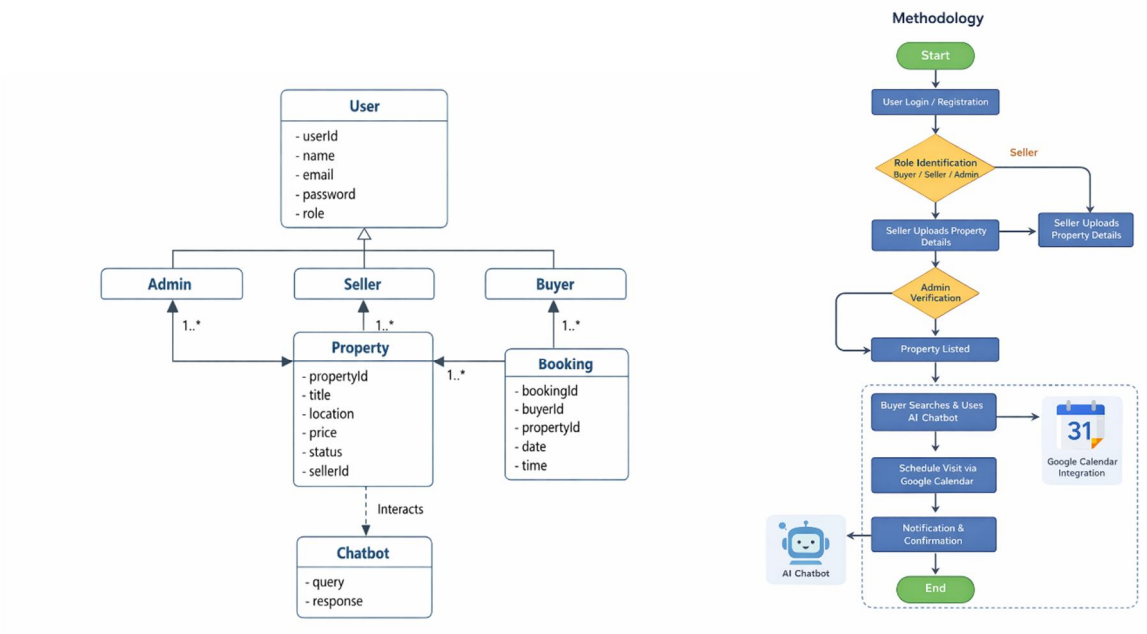
III. PROPOSED SYSTEMS

The proposed system is a smart web-based real estate property management platform developed using the MERN stack, integrated with an AI chatbot and Google Calendar scheduling feature. It addresses the limitations of traditional systems by providing automation, security, and efficient user interaction.

The platform follows a role-based access control model with three user roles: Admin, Seller, and Buyer. Sellers can upload and manage property listings, while Admin verifies and approves them before making them visible to buyers. This ensures authenticity and prevents fraudulent listings. Buyers can search and view only verified properties, improving trust and usability.

An AI-powered chatbot is integrated to assist users by answering queries and guiding them through the platform in real time. Additionally, Google Calendar integration enables users to schedule property visits easily, reducing manual coordination and saving time.

The system also implements a property lifecycle model (pending → verified → suspended) for effective management. Built on a RESTful architecture with JWT-based authentication and MongoDB storage, the system ensures scalability, security, and performance.



Class Diagram Use case diagram

Fig 1: Class & Use case Diagram

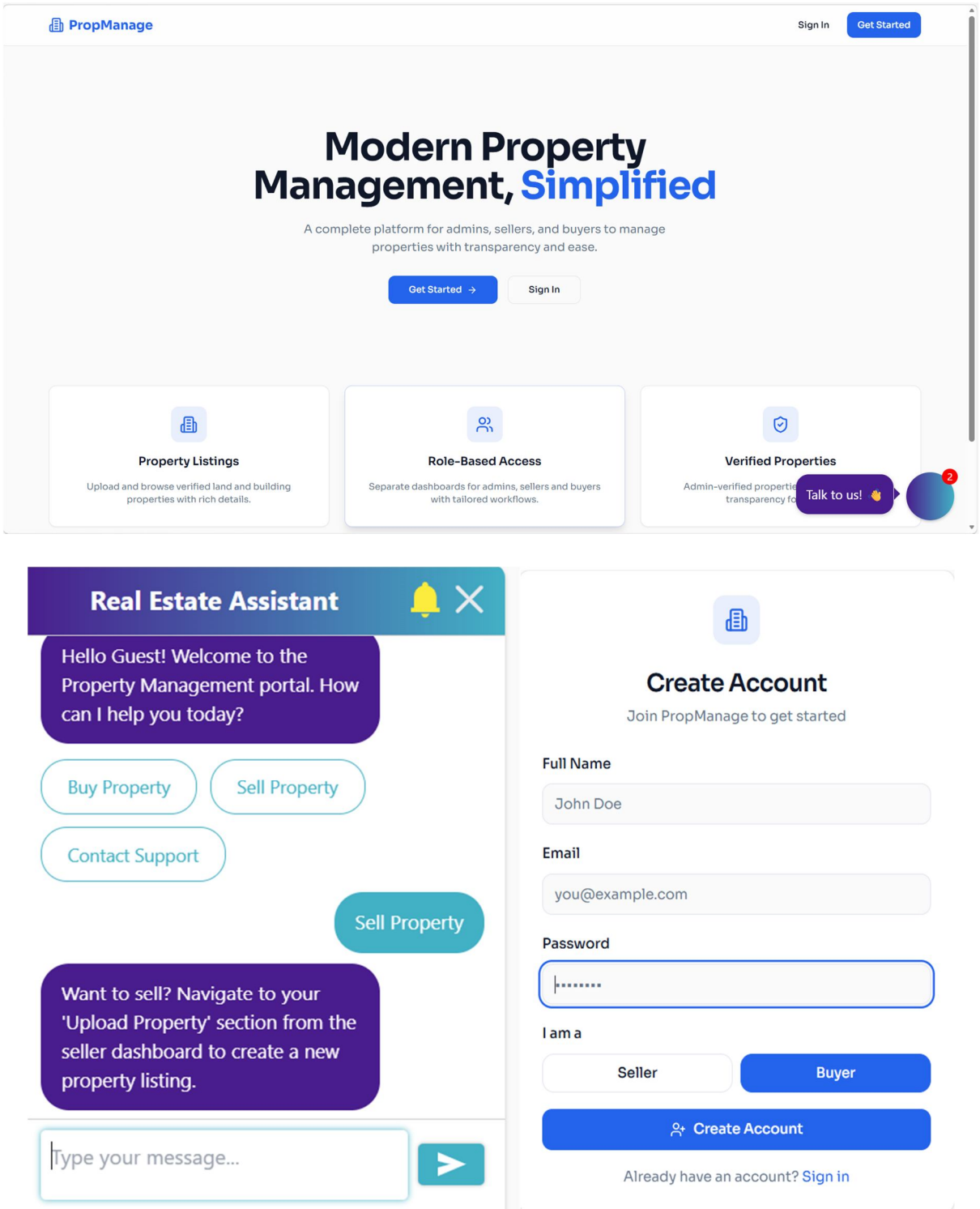


Fig 2: Implementation

IV. WORKFLOW STEPS

1) Users (Admin, Seller, Buyer) register and log in using secure authentication.
2) Sellers add property details through the platform.
3) Uploaded properties are marked as pending status.
4) Admin reviews and verifies the property listings.

5) Verified properties are made visible to buyers.
6) Buyers search and filter properties based on their requirements.
7) Users interact with the AI chatbot for queries and guidance.
8) Buyers schedule property visits using Google Calendar integration.
9) System updates property status (pending → verified → suspended) when required.
10) Admin monitors and manages all activities in the system.

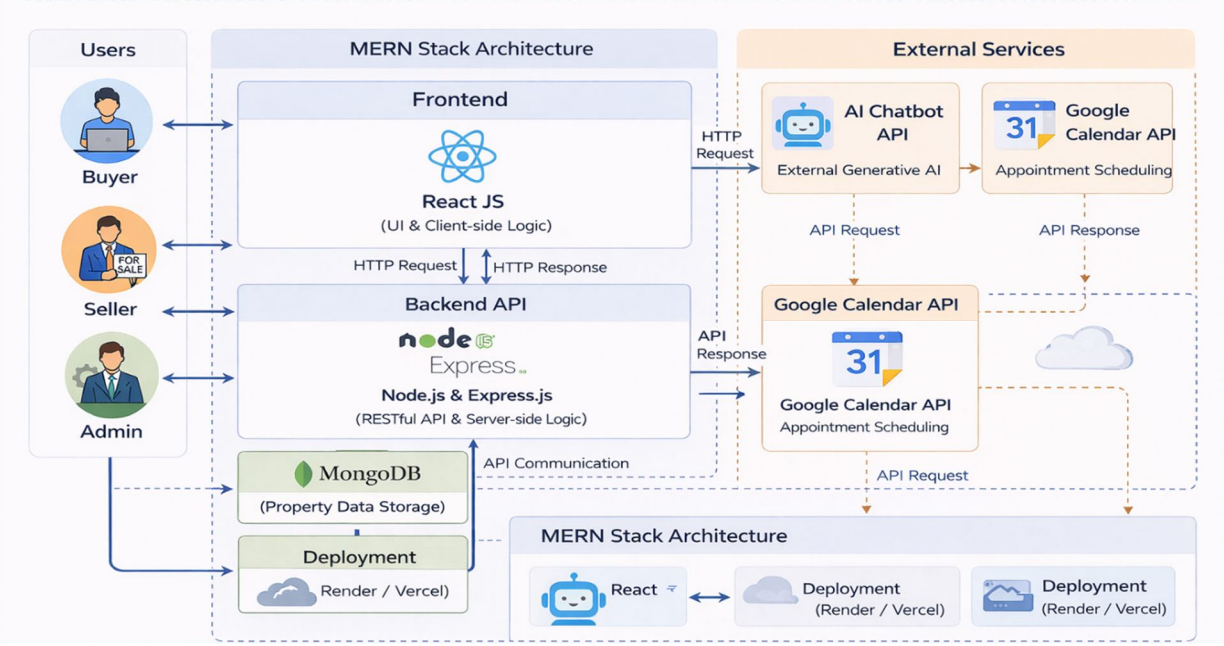


Fig 3: Project implementation & Work flow

V. RESULTS & DISCUSSIONS

1) Role-based access control successfully restricted Admin, Seller, and Buyer functionalities.
2) Admin verification improved authenticity by allowing only verified properties to be visible.
3) JWT authentication ensured secure access and prevented unauthorized usage.
4) AI chatbot provided real-time assistance, improving user interaction and experience.
5) Google Calendar integration enabled easy and efficient scheduling of property visits.

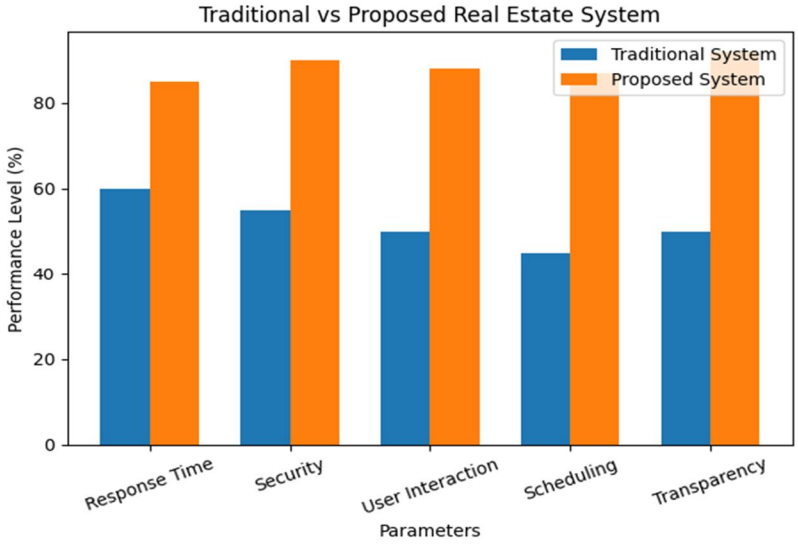


Figure 4: Graphical Representation

VI. GRAPH INTERPRETATION

1) The proposed system shows higher performance compared to the traditional system in all parameters.
2) Security is significantly improved due to JWT authentication and role-based access control.
3) User interaction is enhanced with the help of the AI chatbot, reducing manual effort.
4) Scheduling efficiency is improved through Google Calendar integration.
5) Increased transparency ensures that only verified properties are visible to users, improving trust.

VII. FUTURE INSIGHTS

1) AI-based property recommendation system for personalized suggestions.
2) Voice-enabled chatbot for improved and natural user interaction.
3) Real-time chat feature between buyer and seller.
4) Cloud storage integration (AWS/Cloudinary) for managing images and data.
5) Mobile application development for better accessibility and user experience.
6) Integration of secure online payment system for bookings and premium listings.
7) Advanced data analytics to track user behavior and property trends.
8) Machine learning models for predicting real estate market prices and demand.

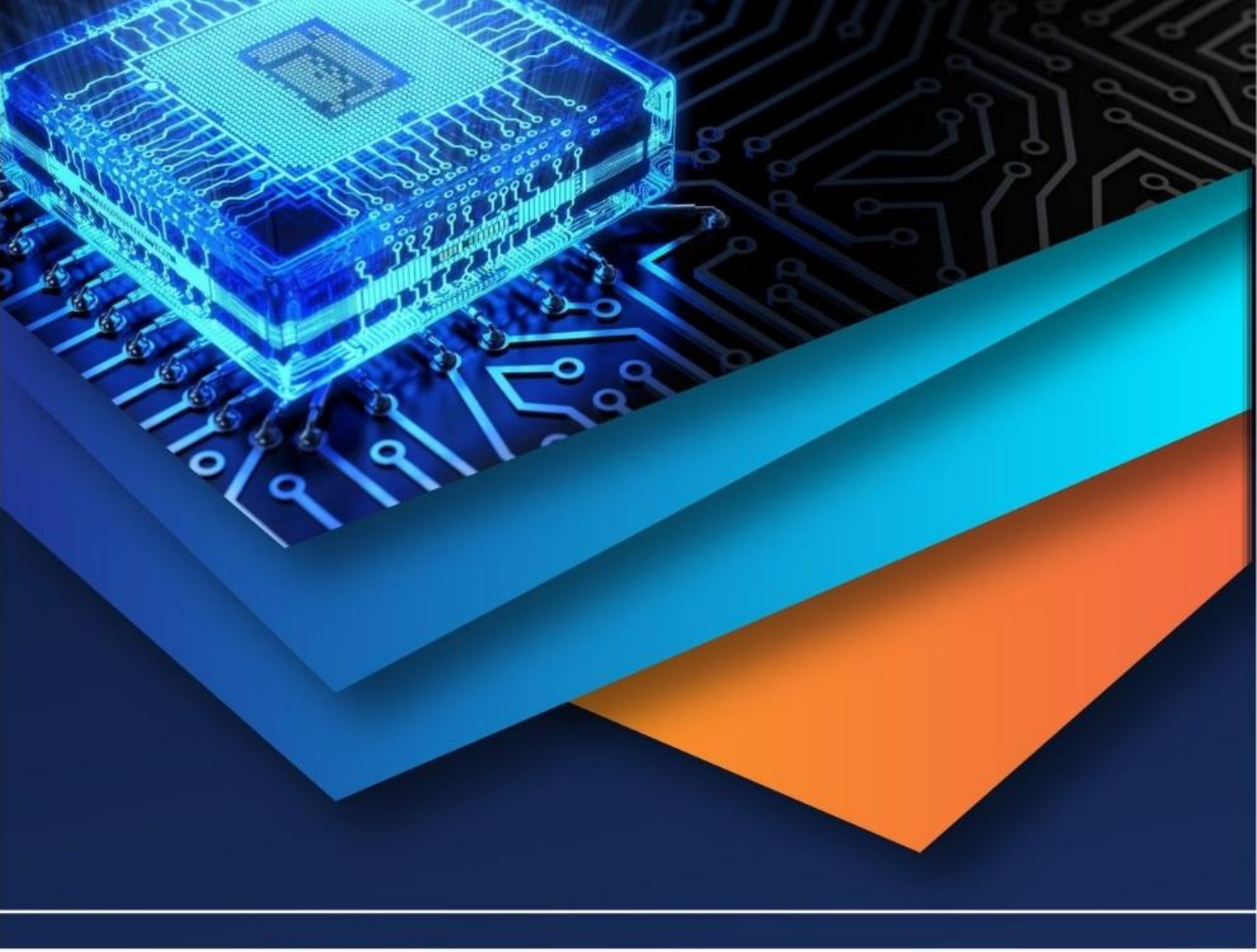
VIII. CONCLUSION

The proposed real estate property management system provides a secure, efficient, and scalable solution using the MERN stack. By implementing role-based access control and JWT authentication, the system ensures safe and controlled access for all users. The integration of an AI chatbot enhances user interaction through real-time assistance, while Google Calendar simplifies property visit scheduling. Additionally, admin verification and lifecycle management improve transparency and ensure the authenticity of property listings. Overall, the system reduces manual effort, improves communication, and delivers a reliable and user-friendly platform suitable for real-world real estate applications.

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