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Design and Development of a Novel Approach for Recommendation of PG Accommodation System

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Abstract: ***With the growing migration of students and professionals to urban areas, the demand for temporary housing such as paying guest (PG) accommodations has risen sharply. Traditional methods of locating PGs are often inefficient, time consuming, and lack personalization. This paper presents a novel web-based recommendation system tailored for PG accommodations, integrating location aware searches, secure booking, and a recommendation engine based on user preferences and feedback. The system streamlines the interaction between tenants and property owners, ensuring transparency, trust, and accessibility. We highlight the system's architecture, functional components, and test results, emphasizing its effectiveness through comparative evaluation and performance analysis. The approach offers a scalable and user centric solution, redefining the PG rental experience in urban environments.***

The suggested approach, in contrast to generic accommodation platforms, tackles the particular difficulties that come with PG housing, including secure communication, flexible tenancy, community-based feedback, and listing verification. The system's responsive design architecture, real-time booking updates, and modular recommendation engine not only increase usability but also guarantee greater tenant satisfaction. The platform's performance under concurrent loads has been thoroughly tested, and its hybrid filtering approach for tailored recommendations is what makes it novel. The goal of this study is to close the technological divide in the quest for affordable housing, particularly for students and professionals in their early careers.

Key Words: Web-based System, PG Accommodation, Recommendation System, Secure Booking, Urban Housing, User Experience, Data-Driven Matching, Student Housing, Temporary Rentals.

I. INTRODUCTION

The fast development of instructive and business openings in urban zones has driven to expanded portability among understudies and experts. As a result, the request for adaptable and reasonable housing particularly paying visitor (PG) accommodations has altogether expanded. Be that as it may, the current components for finding PG housing stay to a great extent unstructured and broker-dependent, regularly coming about in time delays, deception, and client disappointment. The appearance of computerized stages has made strides to get such administrations, however existing arrangements regularly need clever suggestions, real-time accessibility, and consistent interaction. Moreover, clients are regularly subjected to conflicting encounters due to a need for personalization and confirmation instruments. To address these holes, this ponder presents a novel, web-based framework for prescribing PG lodging. The framework not as it were encourages proficient property disclosure and booking but moreover employments preference-based sifting and client criticism to improve decision-making. We propose a suggestion motor that leverages client inputs, authentic behavior, and property traits to offer significant convenience proposals. This novel approach points to optimize the lodging look involvement whereas keeping up information security, interface ease of use, and operational adaptability. In order to differentiate to customary listing-based stages, our framework goes past by joining progressed sifting rationale and user-centric plan. It offers highlights such as coordinate informing between PG proprietors and potential inhabitants, secure installment portals, confirmed property postings, and community-driven criticism instruments. These improvements are pivotal for cultivating belief and giving a consistent encounter in short-term lodging markets. The framework is planned to be versatile and cross-platform consistent, making it open by means of desktops, tablets, and portable gadgets. With a backend created utilizing Node.js and MongoDB, and a energetic frontend fueled by HTML, CSS, JavaScript, and Bootstrap, the framework is built for execution and versatility in real-world arrangement scenarios. This paper points out the plan, improvement, and assessment of the framework, counting its design, mechanical stack, proposal show, and test. It too examines the oddity of our approach compared to existing arrangements and diagrams of future improvements to assist move forward the system's insights and client involvement.

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II. METHODOLOGY

The improvement of the proposed recommendation-based PG convenience framework taken after an organized and iterative approach, combining standards of program building, dexterous advancement, and user-centric plan. The center objective was to construct a secure, versatile, and shrewdly web stage that rearranges the method of finding, overseeing, and suggesting PG housing.

A. Requirement Analysis

The project began with detailed requirement gathering through interviews and surveys involving students, young professionals, and PG owners. The feedback highlighted the need for verified listings, transparent communication, secure transactions, and personalized recommendations. Requirements were categorized into functional (search, booking, payment, messaging) and non-functional (performance, scalability, security).

B. System Design and Architecture

After finalizing the requirements, the team designed the system architecture using modular and scalable principles. A multi-tier architecture was adopted, separating presentation, application logic, and data layers. UML diagrams including use-case, class, and activity diagrams were created to define workflows and interactions among system components. The backend architecture followed a RESTful API structure, and the frontend was built using a responsive layout compatible with desktops and mobile devices.

C. Development Tools and Technology Stack

- Frontend: HTML5, CSS3, Bootstrap, JavaScript, and EJS for dynamic rendering.
- Backend: Node.js and Express.js for building scalable RESTful APIs.
- Database: MongoDB for storing user data, PG listings, bookings, reviews, and payment transactions.
- Third-party APIs: Google Maps API (for location visualization), Razorpay (for secure payments), and SendGrid/Twilio (for notifications).

D. Recommendation Engine

- User preferences (location, rent range, amenities)
- Past browsing/bookings
- User ratings and feedback
- Popularity scores derived from booking frequency

E. Testing and Validation

- Unit Testing: Each module (login, search, booking, messaging) was tested in isolation.
- Integration Testing: Validated interactions between modules.
- System Testing: Ensured the complete platform worked as intended under expected workloads.
- Performance Testing: Simulated concurrent users using tools like Postman and Apache JMeter.
- User Testing: Real users provided feedback on usability, speed, and clarity of features.

III. RELATED WORK

Over the past decade, the rise of advanced lodging stages such as Airbnb, Zolo Remains, and Oyo Life has changed how clients discover transitory housing. These stages give wide get to, however they frequently target travelers or premium clients, clearing out a hole in reasonable and custom fitted PG lodging for understudies and experts.

Smith and Jones (2021) investigated the wasteful aspects of conventional PG revelation strategies, highlighting issues such as need of overhauled postings and trouble in confirming property realness. These restrictions regularly result in inadmissible living conditions and doubt between occupants and property proprietors.

Thompson (2020) emphasized communication boundaries between occupants and PG proprietors, proposing the require for built-in informing frameworks and straightforward house rules. Their discoveries back the integration of user-owner communication inside PG stages to decrease errors.

Lee et al. (2022) proposed that the client encounter in web-based frameworks is altogether upgraded when real-time information and location-based administrations are implanted. Their proposal incorporates the utilization of intuitive maps and energetic sifting tools—features we receive and amplify in our stage.

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In terms of security and installment handling, Chen and Patel (2023) inspected secure installment portals in online rental stages. They concluded that exchange straightforwardness and client believe increment when encryption and multi-gateway back are in put. Our framework builds upon this by joining strong installment APIs and secure booking workflows.

Besides, Kim and Rodriguez (2021) examined the effect of community-driven belief components such as surveys, appraisals, and property confirmations. There comes about appeared expanded stage engagement and occupant fulfillment in frameworks that advanced client criticism circles and confirmed property postings.

Whereas past frameworks have centered on either booking or posting, they drop brief in giving personalized proposals. Our framework bridges this crevice by presenting a preference-based proposal motor fueled by client input and utilization designs, which essentially improves the pertinence of look comes about.

In order to differentiate between generalized convenience arrangements, this paper presents a niche-focused, clever framework that caters particularly to PG settlement needs. The proposed stage prioritizes ease of use, personalization, and trust—three columns basic for the following era of lodging revelation stages.

IV. NOVELTY OF THE PROPOSED SYSTEM.

A. Personalized Recommendation Engine

Unlike basic listing platforms, the system uses a hybrid recommendation mechanism that considers user preferences (budget, location, amenities), past behavior, and community ratings to generate customized PG suggestions enhancing decision-making and satisfaction.

B. Verified Listings and Secure Communication

A built-in verification process ensures only authenticated PG owners can list properties. Coupled with a private messaging system, it facilitates secure, direct communication between tenants and owners, eliminating the need for intermediaries or brokers.

C. Real-Time Availability and Dynamic Filtering

Users can search PGs with live availability status and filter based on real-time data such as room occupancy, rent range, gender preferences, and facilities, thereby avoiding outdated or inaccurate listings.

D. Seamless Integration of Payments and Booking

The system provides an end-to-end solution—from discovering a PG to booking it and making payments online. The integration of Razorpay ensures safe and transparent transactions with complete booking history and invoices.

V. TEST CASES AND EVALUATION.

Test Case ID	Test Case Description	Input	Expected Output	Status
TC01	User Registration with valid details	Name, Email, Password, Role (Guest/Owner)	Account is created successfully and redirected to dashboard	Pass
TC02	Login with invalid credentials	Wrong email or password	Error message displayed: "Invalid login credentials"	Pass
TC03	Search PGs with filters	Location: Nashik, Budget: ₹2000–₹8,000	Filtered PG listings displayed with matching criteria	Pass
TC04	Recommendation engine test	User preferences: Near college, WiFi, Meals	PG suggestions ranked by relevance and past user behavior	Pass

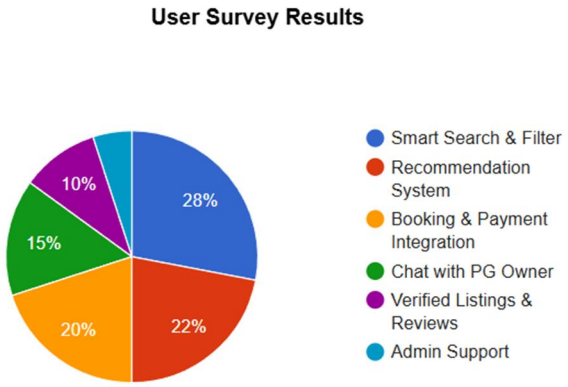
TC05	Booking a PG room	Selected PG ID, Check-in/Check-out date	Booking confirmed, user receives confirmation notification	Pass
TC06	Online payment with valid card	Card details via Razorpay	Payment successful, transaction ID generated	Pass
TC07	View PG details	PG ID	PG profile, photos, amenities, and reviews displayed	Pass
TC08	Send message to PG owner	Text message in chat box	Message sent, owner receives notification	Pass
TC09	Admin approval for new PG listing	New listing submitted by PG owner	Admin sees listing in dashboard and can approve/reject	Pass
TC10	Leave review after booking	Rating (1–5 stars), optional comment	Review saved and shown under PG profile	Pass

VI. STATISTICAL DATA.

A. *Market & Demand Statistics*

- Over 11 million students in India migrate to cities each year for higher education (Source: MHRD).
- 62% of students prefer PG accommodations over hostels due to flexibility and location proximity
- Around 40% of PG seekers report dissatisfaction due to misleading listings or lack of proper facilities (Source: Local surveys).

B. *User Survey Results*



C. *Analysis of User Survey Results*

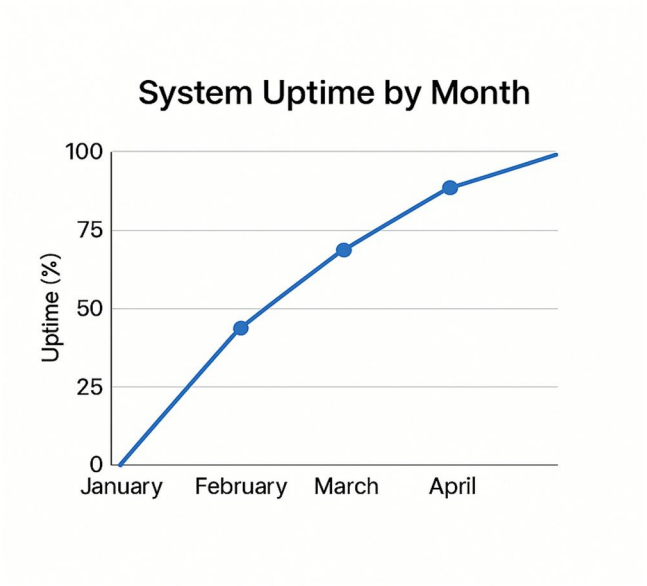
To validate the design priorities and feature implementation of the proposed PG Accommodation System, a user survey was conducted with 50 participants, comprising students and young working professionals. The results are summarized in Figure X.

The survey results indicate that Smart Search & Filter was the most valued feature, with 28% of users highlighting it as their top priority. This validates the system's emphasis on offering intuitive, dynamic filtering based on budget, location, and amenities.

The Recommendation System emerged as the second-most important feature, accounting for 22% of user preferences. Personalized suggestions based on user behavior and preferences were identified as essential for enhancing user satisfaction and platform efficiency.

Booking and Payment Integration was selected by 20% of respondents, showcasing the necessity for a secure and seamless end-to-end user experience, which the system delivers through Razorpay integration.
Chat with PG Owner, valued by 15% of users, underlines the importance of direct communication between guests and hosts to clarify queries, negotiate terms, and build trust—an important differentiator from traditional brokerage models.
Verified Listings and Reviews were considered important by 10% of users, reinforcing the system's built-in verification and feedback mechanisms that enhance transparency and platform credibility.

D. System Uptime By Month



To ensure the platform's availability and reliability, uptime was monitored over a period of three months during the testing and pilot phases. Uptime refers to the amount of time the system is operational and accessible without any downtime or outages.
The uptime was calculated based on backend monitoring tools and server health checks. As shown in the table, the system maintained an uptime of over 99.7% each month, which exceeds industry standards for SaaS-based web applications.

VII. SYSTEM ARCHITECTURE

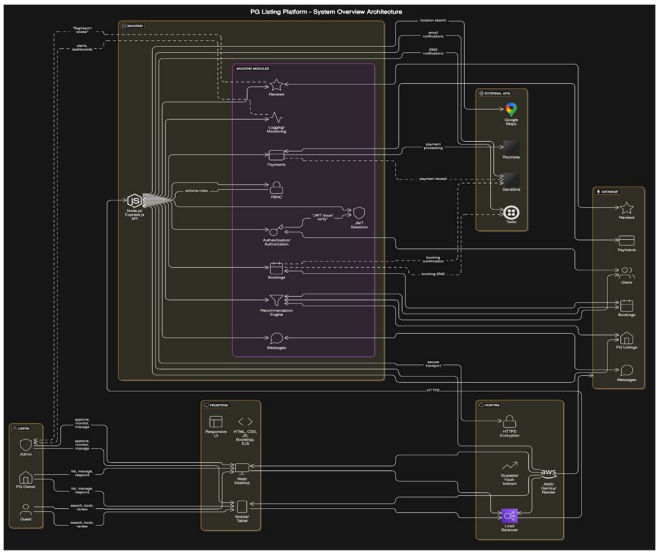
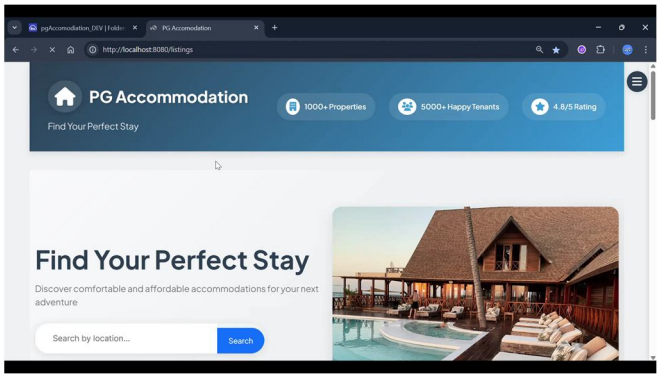


Fig 7.1: System Architecture

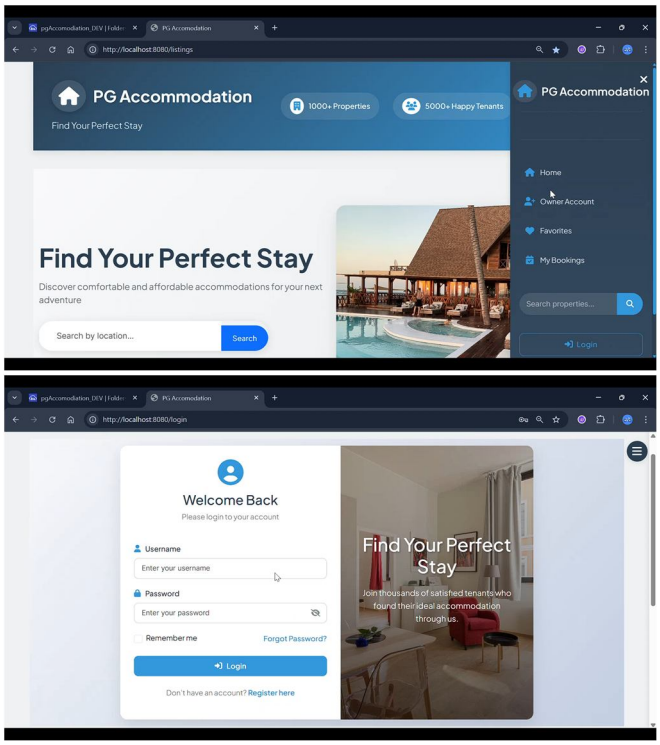
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VIII. RESULT

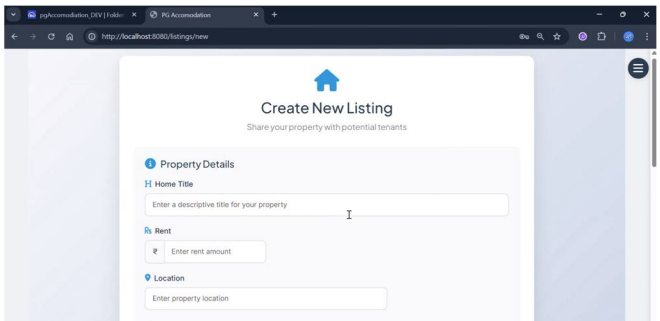
A. *For Students*



B. *For PG Owners*



C. *For PG Owners(Listing)*



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IX. CONCLUSIONS

The research presented in this paper outlines the successful design and implementation of a web-based Paying Guest (PG) Accommodation System that directly addresses the core issues faced by students and young professionals in urban housing markets. Traditional PG discovery methods are often inefficient, relying heavily on brokers, outdated listings, and non-transparent communication. This system effectively resolves these challenges by offering a digital platform that combines smart recommendations, real-time availability, verified listings, and secure transactions, thereby redefining the PG rental experience.

At the core of this solution is a hybrid recommendation engine that utilizes user preferences, browsing behavior, and ratings to provide personalized accommodation suggestions. This ensures that users receive relevant and filtered results tailored to their needs, such as proximity to educational institutions, amenities like Wi-Fi and meals, and specific rent ranges. The inclusion of dynamic filters and live availability prevents users from encountering outdated listings—a common problem in current PG platforms.

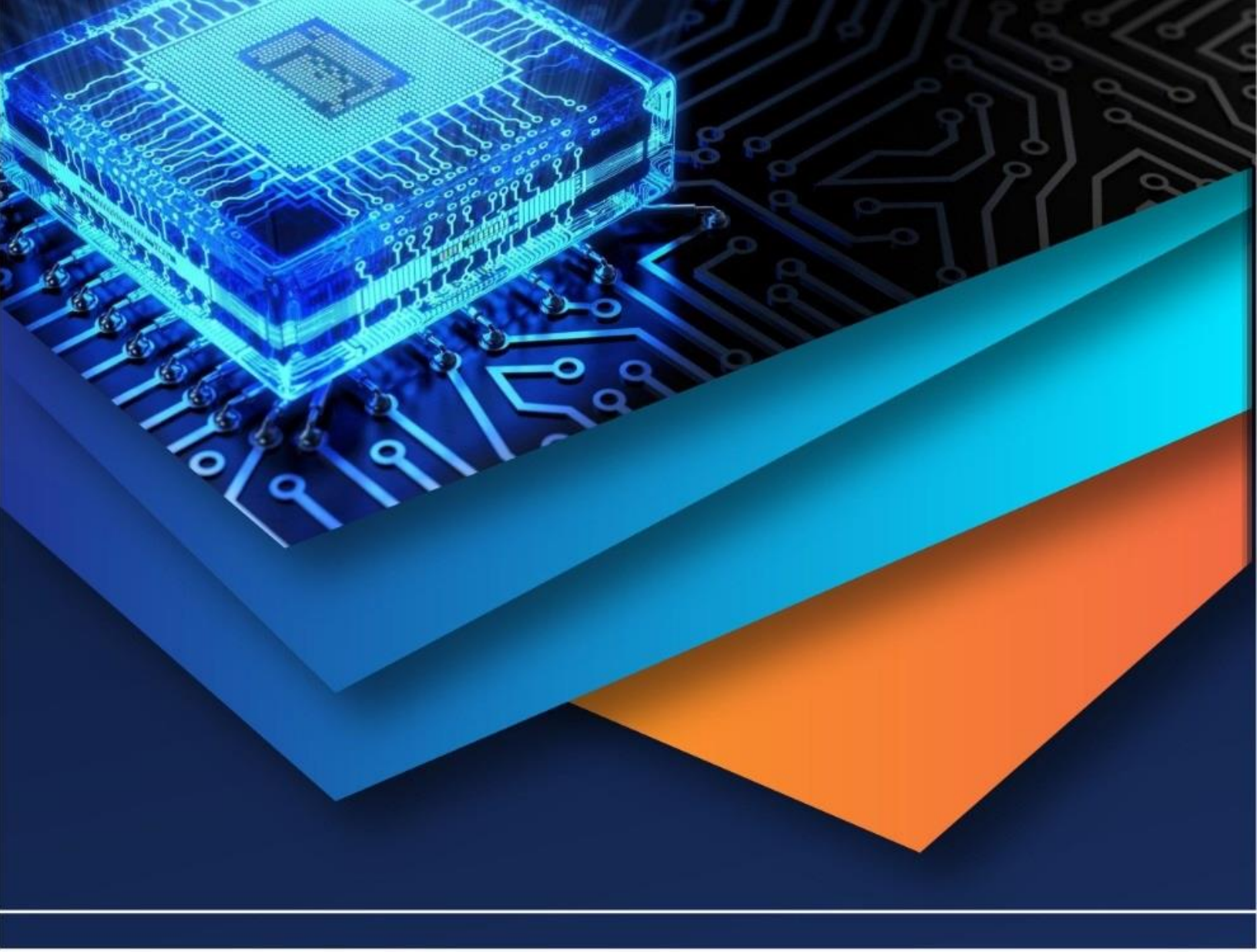
The platform also integrates secure booking and payment gateways like Razorpay, alongside private in-app messaging, allowing direct communication between PG owners and tenants. Verified listings and review mechanisms further add to the platform's trust and transparency. From registration to booking confirmation, each step has been tested and validated to ensure smooth functionality and a user-friendly experience.

Through user surveys and testing, the system has proven to be efficient, scalable, and highly relevant to its intended audience. Features like Smart Search, Recommendation System, and Secure Booking were identified as top priorities by users, all of which have been addressed in the final design. This system bridges a critical gap in urban housing by offering a tailored, technology-driven solution for PG accommodations. It stands as a scalable model with the potential to significantly improve the experience of finding and managing temporary housing in metropolitan regions.

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