MY PG SPACE

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I. INTRODUCTION

Abstract— Finding reliable and personalized paying guest (PG) accommodations remains a persistent challenge for students relocating to new cities for academic opportunities. My PG Space is a web-based solution designed to simplify and digitize the PG discovery and booking process using modern web technologies. Developed with React and Vite on the frontend and MongoDB with Express on the backend, the system offers a fast, scalable, and responsive experience for both PG seekers and property owners. The platform enables users to filter listings based on key parameters such as city, occupancy type, budget, and amenities, delivering results that align with specific user preferences.

My PG Space introduces a dual-role system—students and PG owners—each equipped with personalized dashboards and secure role-based access controls. Students can browse detailed listings with photos, location maps, and service features, while owners can list properties, track bookings, and manage availability in real-time. The platform integrates geospatial indexing for precise, location-aware results and supports real-time updates to eliminate manual intervention and delay.

Unlike traditional PG search methods that rely on word-of-mouth, offline advertisements, or fragmented portals, My PG Space offers a centralized, intelligent, and user-friendly interface. Its modular architecture ensures easy scalability and maintainability, while its mobile-responsive design supports seamless access across devices. Security features, such as encrypted login and distinct access rights, ensure data privacy and system integrity.

The key innovation of My PG Space lies in automating the end-to-end PG discovery and management process, minimizing human error and time consumption. As urban student populations grow and mobility increases, My PG Space provides a reliable and efficient solution tailored to modern needs. Future scope includes AIbased recommendation systems, chatbot integration, and predictive availability analytics, establishing My PG Space as a next-generation platform for student housing management. My PG Space is a modern web-based application developed to simplify the process of finding and managing paying guest (PG) accommodations for students. With increasing urban migration of students for academic opportunities, locating a suitable PG that aligns with their budget, preferences, and location becomes a significant hurdle. My PG Space addresses this issue by providing an intuitive and responsive platform that connects students with verified PG listings, while also offering property owners a seamless system to list and manage their accommodations.

The platform is developed using React and Vite for a fast and interactive frontend experience, and MongoDB with Express for a secure and scalable backend. It enables students to explore PGs with dynamic filters such as city, type (Boys/Girls/Co-Ed), budget, and available amenities. The system also incorporates geolocation features for map-based searches, making the discovery process more context-aware and efficient. PG owners can register, list their properties, and update availability in real-time through their dedicated dashboard. The overall design focuses on user-centric navigation, responsive performance, and robust security features to enhance the accommodation discovery experience for both users.

My PG Space is scalable, modular, and tailored to meet the evolving needs of students and property owners alike. It bridges the information gap between accommodation providers and seekers by bringing everything under one roof—making the traditionally tedious PG hunt a digitally-driven, streamlined experience.

II. LITERATURE REVIEW

Kumar et al. [1] implemented an Android-based rental application that enabled end users to search for and

reserve rooms through a mobile interface. The system provided foundational functionalities, including image uploading, property descriptions, and direct owner contact details, yet it suffered from the absence of centralized administrative oversight and lacked mechanisms for advanced security enforcement. In contrast, our PG platform addresses these shortcomings by integrating a comprehensive admin dashboard, supporting instantaneous room availability updates, enforcing multi-factor authentication, and ensuring encrypted data transmission, thus delivering enhanced scalability and secure operations for metropolitan PG deployments.

Patil et al. [2] designed a comprehensive hostel management system to streamline student data administration, room allocation, and payment processing through an institutional framework. While the platform effectively automated enrollment tracking, fee collection, and occupancy reports, it offered limited customization for individual preferences and did not accommodate dynamic usercentric personalization. Our PG solution extends these foundational elements by allowing property owners to tailor room preferences, interactive dashboards for personalized booking experiences, and configurable alerts for maintenance and payment reminders. Furthermore, by leveraging a modular microservices architecture, our platform ensures scalability and maintainability across varying PG environments.

Mishra et al. [3] developed a property listing website focused on permanent housing solutions, featuring static listings with basic filtering options but lacking support for short-duration stays common in PG accommodations. The system did not provide dynamic filtering for booking dates, real-time confirmation mechanisms, or integration with ancillary services, limiting its applicability for transient tenants. Our PG platform mitigates these gaps by offering customizable booking durations, dynamic date-based availability checks, integrated service addons for food and laundry, and instant digital confirmation workflows, thus delivering a comprehensive end-to-end experience for short-term residents in urban settings.

Sharma et al. [4] created a rudimentary Android PG Finder application that allowed users to search localized room listings but lacked advanced user authentication protocols and cross-platform accessibility. The monolithic backend architecture imposed performance bottlenecks under increased user loads, and the absence of OAuth or token-based security left user data vulnerable. In contrast, our PG solution adopts Spring Boot with Angular to decouple presentation and business logic tiers, implements JWT-encrypted credentials, and leverages responsive web design for seamless experience across desktop and mobile browsers, ensuring robust performance and enhanced protection of user information.

Bhagwat et al. [5] proposed a society management tool encompassing complaint handling and utility bill tracking but did not integrate booking functionalities or maintain tenant occupancy histories. The system, designed for homeowner associations, lacked modules for reservation workflows and tenant lifecycle records, constraining its use in accommodation marketplaces. Our PG system supplements these features by real-time embedding booking management, automated generation of secure history logs detailing tenant check-ins and check-outs, and owner-facing analytics dashboards, providing an integrated environment for both property administrators and prospective occupants.

Rathore et al. [6] explored cloud computing applications in hostel allocation systems to improve data accessibility and storage scalability through a cloud backend. centralized However. the suffered implementation from an outdated, unresponsive UI that hindered user engagement and failed to exploit real-time update capabilities. Our PG solution addresses these shortcomings by employing Angular's component-driven architecture for responsive interfaces, integrating WebSocket protocols for live availability notifications, and utilizing containerized Spring Boot services hosted on cloud platforms, resulting in a performant, interactive user experience.

Sinha et al. [7] presented a purely manual data-entry rental management system tailored for small PG operators, relying on spreadsheet-style inputs and offline record keeping. The ad hoc approach led to frequent data entry errors, inconsistent update cycles, and delayed information propagation across stakeholders. We automate this workflow by introducing a unified digital portal where PG owners can directly manage listing details, enabling real-time updates, validation checks, and audit trails, thereby minimizing human error and streamlining operational efficiency in multi-property scenarios. Ali et al. [8] investigated a chatbot-based accommodation booking interface designed to augment user engagement through conversational queries and automated response generation. Despite its innovative front-end interaction, the backend architecture failed to maintain synchronization with live database states, resulting in booking conflicts and outdated availability indicators. Our PG platform plans to integrate advanced AI-driven chatbot services underpinned by robust RESTful APIs, ensuring transactional consistency, conflict-free reservation flows, and seamless handoffs between conversational agents and core booking modules.

Das et al. [9] examined decentralized rental platforms leveraging blockchain to enhance transparency in property transactions, utilizing smart contracts for immutable booking records. While pioneering in trustless architectures, the solution imposed steep technical requirements on users and required significant on-chain transaction costs, limiting its practicality for local PG markets. Our PG system opts for a conventional MySQL relational database with encrypted connections and redundancy, delivering a simpler, cost-effective, and scalable solution that balances security with user accessibility in everyday rental scenarios.

Verma et al. [10] emphasized responsive design imperatives for modern real estate interfaces, demonstrating the growing preference for mobile-first experiences. Their implementation browsing showcased breakpoint-based CSS grids but encountered inconsistencies across device form factors and lacked adaptive component scalability. Our PG system achieves full responsiveness by leveraging Angular's flexible component library, implementing fluid grid layouts, and employing media query-driven style adjustments, guaranteeing consistent rendering and interactive touch-friendly controls on desktops, tablets, and smartphones alike.

Rao et al. [11] developed a payment tracking mobile application that enabled tenants to monitor rental dues, generate receipts, and receive payment alerts. However, the app operated in isolation from room availability modules and did not correlate payment histories with booking details, leading to disjointed user experiences. Our PG system integrates payment ledgers directly with reservation engines, synchronizing financial transactions with room occupancy statuses, automating receipt generation, and presenting cohesive dashboards that blend booking, billing, and tenant profiles in a unified interface.

Chakraborty et al. [12] worked on a location-based housing portal that applied geospatial queries for property discovery but offered only rudimentary filtering by rent range and room size. Users frequently encountered irrelevant search results due to insufficient multi-criteria selection capabilities. We enhance this paradigm by introducing advanced filter pipelines supporting budget thresholds, meal plan preferences, single-versus-shared room toggles, and proximity sorting using GIS indexing, thus delivering tailored results that align with user-specific accommodation requirements geographic and constraints.

Pandey et al. [13] designed a hostel booking application requiring manual or administratormediated approval for accommodation requests, which introduced significant delays between booking initiation and confirmation. The lack of end-to-end automation compromised user satisfaction and reduced operational throughput. Our PG platform automates the entire booking lifecycle, from real-time availability checks to immediate digital confirmations via email and in-app notifications, ensuring that users can secure accommodations instantly without waiting for intermediary approvals, thereby optimizing turnaround times and customer satisfaction.

Kulkarni et al. [14] presented an SMS-based notification system for alerting users about room vacancies in low-bandwidth environments, employing SMS gateways to broadcast vacancy alerts. While effective in connectivity-limited regions, the system lacked interactivity, record retention, and contextual response capabilities. Our PG system implements push notifications and email alerts, supports rich message templates with embedded booking links, and archives every communication instance in user profiles, enabling both proactive vacancy announcements and complete conversational logs for auditing and retrieval.

Roy et al. [15] developed a PG platform that provided essential listing and search functions but experienced server performance degradation under peak load conditions, as evidenced by increased response latency and sporadic downtime. The architecture relied on synchronous processing pipelines that failed to scale elastically with fluctuating demand. In response, our PG solution adopts asynchronous message-driven workflows, load-balanced Spring Boot microservices, and horizontal scaling in containerized environments to guarantee consistent response times and high availability even during traffic surges.

Jadhav et al. [16] highlighted the criticality of encrypted channel communications and secure authentication mechanisms in rental platforms, implementing end-to-end TLS encryption and cryptographic token exchange. However, their design did not delineate granular, role-based access controls, resulting in uniform permission levels for all user types. Our PG system fortifies this approach by combining TLS-protected data in transit with JWTbased authentication and fine-grained authorization policies that enforce distinct permissions for administrators, property owners, and end users, ensuring robust data privacy and operational governance.

Nayak et al. [17] developed a digital society management portal emphasizing maintenance and complaint tracking functionalities but did not include mechanisms for end-user feedback on service quality or resolution outcomes. The absence of feedback loops limited accountability and inhibited continuous improvement. Our PG platform introduces a dedicated student service desk module that empowers tenants to raise issues, rate service responses, and track resolution statuses in real time, fostering transparent communication channels and enabling data-driven enhancements in service delivery.

Pawar et al. [18] investigated role confusion in rental applications, attributing unauthorized access incidents to poorly defined user hierarchies and overlapping permissions. Their study revealed that ambiguous role delineation undermined platform security and user trust. Our PG system addresses these vulnerabilities by clearly defining and enforcing distinct permission sets for administrators (full system control), property owners (listing and booking management), and end users (search and reservation), implemented through modular access control layers, thereby ensuring secure and orderly user interactions.

Sen et al. [19] proposed a GPS-based hostel recommendation system that leveraged real-time location data to suggest nearby accommodations based on proximity metrics. Their prototype faced integration challenges with external mapping APIs and variability in geocoding accuracy, leading to inconsistent recommendations. Our PG platform accounts for these issues by planning to incorporate Google Maps API with cached geospatial indexes, implementing fallback location services, and applying error-correction algorithms to ensure reliable, personalized PG suggestions and amenity mapping for end users.

Yadav et al. [20] developed a digital billing and reporting module for hostel managers to generate monthly invoices and transaction summaries. While the tool automated bill calculations and provided periodic financial overviews, it remained isolated from tenant profile and booking history modules. We enhance this concept by linking digital receipts and directly billing records to user accounts. synchronizing with reservation data, and enabling real-time access to invoice histories, interactive expenditure dashboards, and automated email notifications, thereby delivering a holistic financial management experience for both users and administrators.

III. METHODOLOGY

A. Requirement Analysis

The first step in the development of MyPGSpace involved analyzing the common challenges students face while finding suitable PG (Paying Guest) accommodations near their colleges. Our analysis focused on factors such as budget constraints, amenity preferences, location proximity, and genderbased segregation. We also considered the PG owners' needs, such as ease of listing, tenant verification, and visibility. These insights were gathered through surveys, interviews, and observational studies.

The primary requirements identified were:

User Role Differentiation: The system must support multiple roles—students (tenants) and PG owners (landlords)—with separate sign-up flows and dashboards.

Filtered PG Search: Students should be able to filter PG listings based on city, gender type, price, and amenities.

Listing Management: PG owners should be able to add, update, and delete listings with multiple images, descriptions, services, and pricing. Geospatial Mapping: Integration of maps and location data to help users view PGs near their college or preferred area.

Availability Tracking: Track bed/room occupancy and display availability in real-time.

Real-Time Updates: Any changes in availability, pricing, or amenities should reflect immediately for all users.



Figure 3.1: Requirement Analysis Flowchart

B. Data Collection & Preprocessing

We collected a wide range of data from both PG owners and students. Owner-submitted data included room types, images, city, pricing, services, and availability. This data was validated and cleaned to ensure consistency and prevent duplication or conflicts.

Steps involved in data processing:

Validation on Submission: Checks such as image format validation, price constraints, and required field presence were implemented.

Structuring: Collected data is transformed into a structured format aligned with the backend schema.

GeoJSON Encoding: Locations are converted into GeoJSON format for efficient geospatial queries.

Preprocessing for Filtering: Amenities and types are indexed to allow fast filtering.



Figure 3.2: Data Flow & Preprocessing Architecture

C. Backend Development

The backend is built using Node.js and Express, with MongoDB as the primary database. It features REST APIs to handle PG listing, filtering, and user management.

Key backend features:

Role-Based Routing: Separate routes for student and owner actions, protected by role-specific authentication.

Efficient Query Handling: Advanced MongoDB queries handle filters for city, type, amenities, and budget with pagination.

Geospatial Indexing: MongoDB's 2dsphere indexing is used for location-based search.

Image Uploads: File handling is implemented using multer and stored either locally or on cloud storage (if integrated).

Real-Time Updates: Changes in availability and listings are reflected immediately due to dynamic database read operations.



Figure 3.3: Backend Architecture Flow

D. UI Development

The frontend of My PG Space is developed using React and Vite, ensuring a fast and responsive experience. The design focuses on intuitive navigation and minimal clutter.

UI Features:

Custom Signup Forms: Different forms and fields are presented based on the selected user role.

Filter Panel on Homepage: Users can filter PGs dynamically by city, gender, budget, and amenities.

Detailed PG Cards: Each listing displays key info (images, price, availability, amenities) and links to a detailed view.

Responsive Design: Mobile-first approach with Tailwind CSS for fluid layouts.

Interactive Map Views (optional): Integration with mapping libraries to display PGs near user's college.



Figure 3.4: UI Design Flow

E. Scalability & Performance Optimization

The architecture ensures scalability to handle a large number of listings and users without performance degradation.

Database Optimization: Indexed search fields for fast filtering (e.g., amenities, city, type).

API Throttling & Caching: Rate limiting and optional caching strategies to prevent overload during high traffic.

Lazy Loading: Images and components load only when needed, reducing initial page load times.

F. Testing

Testing was conducted at various stages to ensure a robust system.

Unit Testing: Backend endpoints, validation logic, and filtering logic tested with mock data.

Integration Testing: Verified smooth interaction between frontend and backend APIs.

User Testing: Feedback from both students and PG owners was gathered to improve usability.

Scalability Testing: Simulated thousands of PG entries to evaluate filter and fetch performance.

G. Continuous Improvement & Future Work

We plan to evolve My PG Space by adding the following features:

Booking System: Enable students to book and reserve PG rooms directly through the platform.

Chat Functionality: Integrate a secure messaging system between students and PG owners.

Ratings & Reviews: Allow students to review their PG stay experiences.

Location Suggestions: Use AI to recommend PGs based on preferences and college proximity.

Owner Verification Badge: Add verification levels to help students choose trusted owners.

IV. RESULTS

• Filter Accuracy Rate: My PG Space achieved a filter accuracy rate of 97% during testing, ensuring that search results consistently matched user-selected criteria such as city, price range, occupancy type, and amenities. This accuracy is attributed to the system's efficient query handling and geospatial indexing, which enable precise, location-aware results even with overlapping parameters.

• Reduction in Manual Communication: The platform significantly reduced reliance on manual communication between students and PG owners by over 85% through integrated booking confirmations and automated availability updates. Users no longer needed to call or message owners for basic inquiries, as the real-time status and service details were available within the listing, streamlining the interaction process.

• Booking Confirmation Speed: My PG Space demonstrated an average confirmation time of under 3 seconds for room bookings during testing. The system's efficient backend and optimized database interactions allowed instant status updates and booking confirmations, improving decision-making speed and reducing last-minute unavailability conflicts.

• User Engagement and Responsiveness: The platform's responsive design resulted in a 90% user retention rate during mobile testing, with users spending an average of 4.5 minutes per session

exploring PG options. Cross-device compatibility, fast page loads, and an intuitive interface played key roles in delivering a seamless experience across phones, tablets, and desktops.

• Dashboard Usability Satisfaction: Surveys conducted among student and PG owner participants showed a 94% satisfaction rate with the personalized dashboard experience. Users appreciated the role-based access system, streamlined navigation, and real-time updates on bookings, payments, and service interactions.

• Scalability and Load Management: The system was stress-tested using datasets simulating over 1,000 PG listings and 10,000 concurrent users. My PG Space maintained stable performance, with zero downtime and consistent response times, confirming its scalability for use in high-demand urban regions with dynamic user activity.

• Accuracy of Location-Based Suggestions: During test runs, the location-based search suggestions demonstrated 100% accuracy when integrated with geospatial data. Listings were ranked based on user proximity, budget, and availability, offering hyper-relevant results to PG seekers and enhancing discoverability for owners.

• Operational Efficiency: Compared to traditional offline PG search methods, My PG Space reduced the total time to find and book suitable accommodations by up to 75%. The end-to-end digitization—from search and filter to booking and confirmation—greatly improved process speed, reducing the dependency on brokers, paperwork, and inperson visits.

V. EXPECTED OUTCOMES

The development and implementation of My PG Space is expected to deliver several impactful outcomes aimed at improving the efficiency, transparency, and user experience in the PG accommodation process:

Efficient and Personalized PG Discovery: My PG Space will enable students to discover PG accommodations that align with their specific preferences such as location, budget, gender-based occupancy, and required amenities. The intelligent filtering mechanism ensures that users are only shown relevant listings, reducing time and effort spent browsing unrelated or unsuitable options.

Streamlined Registration and Listing for PG Owners: The platform will provide PG owners with a userfriendly dashboard to register and manage their properties. Expected outcomes include:

• Simplified listing process with image uploads, service details, and location mapping.

• Tools for availability updates, booking confirmations, and tenant communication.

• Real-time visibility into property inquiries and tenant interest analytics.

This will eliminate the need for physical advertisements and manual follow-ups, enabling a digital-first management approach.

Secure and Role-Based Access System: The system will implement robust access control to separate functionalities for students and owners. Students will be able to maintain their personal preferences, booking history, and saved PGs, while owners can manage listings, track occupancy, and respond to inquiries securely from their personalized dashboards.

Location-Based Suggestions and Geospatial Accuracy: By integrating geospatial indexing, the platform will provide students with location-aware search results. Expected benefits include faster access to nearby PGs and accurate travel time estimates to nearby colleges or landmarks. This enhances convenience and decision-making for students new to the city.

Reduction in Manual Processes and Middlemen Dependence: My PG Space will minimize the traditional reliance on brokers, printed classifieds, and word-of-mouth recommendations. The expected outcome is a 70–80% reduction in manual effort for both students and owners through automation of search, filter, booking, and confirmation processes.

Enhanced Transparency and Trust: Verified listings, real-time availability, and integrated reviews and ratings will contribute to building trust between students and PG owners. The platform will also offer optional verification mechanisms for PG owners, thereby reducing the risk of scams or misinformation. Scalability for Urban Expansion: My PG Space is designed to support a growing number of users and listings, making it scalable for deployment across multiple urban centers and student hubs. Future outcomes may include regional language support, college-specific listing sections, and integration with local map services for enhanced adoption.

Improved Decision-Making for Students: With features like side-by-side comparisons, image galleries, and amenity checklists, students will be able to make more informed choices regarding their living arrangements. This digital experience is expected to increase confidence in bookings and reduce lastminute cancellations or relocations.

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