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VIBE ROOMMATE: A Compatibility-Based Roommate Matching System

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Abstract:-

Selecting a compatible roommate is a critical factor in enhancing students' accommodation experience and overall well-being. However, most existing roommate-finding platforms primarily emphasize accommodation availability, rental cost, and location while providing limited support for evaluating lifestyle compatibility. This paper presents VIBE ROOMMATE, a compatibility-based roommate matching platform designed for college students. The proposed system employs a weighted score-based compatibility algorithm that evaluates users across ten lifestyle attributes, including sleep schedule, cleanliness, study habits, social behaviour, food preference, and budget, to generate transparent and explainable roommate recommendations. The platform is developed using the MERN technology stack and integrates JWT-based authentication, bcrypt password encryption, MongoDB Atlas, Cloudinary, and Socket.IO to provide secure profile management, accommodation listing, cloud-based storage, and real-time communication within a unified web application. A functional prototype involving ten test users successfully validated the integration of the proposed modules and demonstrated the technical feasibility of the platform. The proposed solution provides a secure, scalable, and user-centric foundation for compatibility-driven roommate matching and supports future integration of AI-based recommendation techniques.

Keywords: Roommate Matching, Compatibility Recommendation, MERN Stack, Student Accommodation, Lifestyle Compatibility, Rule-Based Recommendation, MongoDB Atlas, Socket.IO, JWT Authentication, Cloudinary.

I. Introduction

The transition to higher education often requires students to relocate and share accommodation with individuals from diverse backgrounds. Although shared living offers financial and social benefits, differences in lifestyle habits—such as sleep schedules, cleanliness, study routines, food preferences, and budgeting—frequently lead to interpersonal conflicts that can negatively affect students' living experience and overall well-being [2], [4].

Existing online accommodation platforms primarily emphasize room availability, rental cost, and location while providing limited support for evaluating lifestyle compatibility between prospective roommates [10], [13]. As a result, roommate selection is often based on incomplete or subjective information, increasing the likelihood of conflicts arising from incompatible living preferences. Furthermore, many existing recommendation systems provide limited transparency in explaining the rationale behind generated matches, highlighting the need for more intelligent and explainable roommate recommendation solutions [1], [2].

This paper presents VIBE ROOMMATE, a compatibility-based roommate matching platform designed specifically for college students. The proposed system employs a weighted score-based compatibility algorithm to evaluate users across ten lifestyle attributes and generate transparent, explainable compatibility recommendations [1], [10]. Developed using the MERN technology stack, the platform integrates secure JWT-based authentication, accommodation listing management, cloud-based data storage, and real-time communication within a unified web application [6], [7], [9]. The proposed solution provides a secure, scalable, and user-centric platform while establishing a foundation for future AI-driven roommate recommendation systems [3], [11], [12].

II. Literature Review

The increasing demand for student accommodation has encouraged the development of numerous digital platforms and recommender systems for roommate and rental searches. Early recommender system research established the importance of personalized recommendations based on user preferences and historical interactions, laying the foundation for modern recommendation techniques [10], [11], [13]. However, most commercial roommate-finding platforms primarily emphasize accommodation availability, rental cost, and user profiles while providing limited support for evaluating lifestyle compatibility.

Recent studies have focused on improving recommendation quality through reciprocal recommendation, explainable recommendation, and knowledge graph-based approaches. Zhang and Chen [1] highlighted the importance of explainable recommendation techniques in improving user trust and decision-making, while Palomares *et al.* [2] demonstrated the effectiveness of reciprocal recommender systems in scenarios where mutual compatibility between users is essential. Guo *et al.* [3] further showed that knowledge graph-based recommendation methods can enhance personalization and recommendation accuracy. In the context of roommate allocation, Hosseini *et al.* [4] investigated strategy-proof roommate and room matching, whereas Yumoto [5] proposed a recommendation approach for student housing based on user preference evaluation.

Alongside these advances, modern web technologies such as the MERN stack, JWT authentication, and scalable software architectures have enabled the development of secure and interactive web applications [6]–[9]. Nevertheless, existing roommate recommendation solutions generally address compatibility assessment, accommodation management, authentication, and communication as separate functionalities, resulting in fragmented user experiences.

Despite significant progress in recommender systems and web application technologies, few existing solutions integrate lifestyle-based compatibility assessment, explainable recommendations, accommodation listing management, secure authentication, and real-time communication within a single platform. The proposed VIBE ROOMMATE platform addresses these limitations by combining these capabilities into a unified MERN-based system for compatibility-driven roommate matching among college students.

Table I. Comparison of Existing Roommate-Finding Platforms

Feature	Roomster	SpareRoom	Roomi	VIBE ROOMMATE
Accommodation Listings	✓	✓	✓	✓
Lifestyle Compatibility	✗	✗	Partial	✓
Compatibility Score	✗	✗	✗	✓
Explainable Recommendation	✗	✗	✗	✓
Real-time Messaging	✓	✓	✓	✓
Secure Authentication	✓	✓	✓	✓
Student-focused Matching	✗	✗	Partial	✓

III. Research Gap and Motivation

Existing roommate-finding platforms primarily emphasize accommodation availability, rental cost, and location, while providing limited support for evaluating lifestyle compatibility [10], [13]. Existing recommender systems often rely on basic user preferences and offer limited transparency in explaining generated recommendations, reducing users' confidence in the matching process [1], [2]. Furthermore, essential functionalities such as compatibility assessment, accommodation management, secure authentication, and real-time communication are typically implemented as separate services, resulting in fragmented user experiences and reduced convenience.

To address these limitations, the proposed VIBE ROOMMATE platform provides a unified, compatibility-driven solution for college students. The system employs a weighted score-based compatibility algorithm to evaluate users across ten lifestyle attributes and generate transparent, explainable roommate recommendations [1], [10]. Developed using the MERN technology stack with JWT-based authentication, bcrypt password encryption, MongoDB Atlas, Cloudinary, and Socket.IO, the platform integrates compatibility assessment, accommodation management, secure communication, and profile management within a single web application [6], [7], [9]. The modular architecture also provides a scalable foundation for future integration of AI-driven recommendation techniques and intelligent personalization [3], [11], [12].

IV. Proposed System

A. System Overview

The proposed VIBE ROOMMATE platform is a compatibility-based web application designed to assist college students in identifying suitable roommates based on lifestyle preferences. Unlike conventional accommodation platforms that primarily emphasize room availability and rental information, the proposed system focuses on behavioural compatibility to support informed roommate selection [2], [10], [13]. Users complete a questionnaire comprising ten lifestyle attributes, including sleep schedule, cleanliness, study habits, social behaviour, food preference, and budget. A weighted score-based compatibility algorithm evaluates these responses to generate compatibility scores, descriptive badges, and matching insights, thereby providing transparent and explainable recommendations [1], [10], [11].

The platform is implemented using the MERN (MongoDB, Express.js, React.js, and Node.js) technology stack. It integrates secure authentication using JWT and bcrypt [6],

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cloud-based data management through MongoDB Atlas, media storage using Cloudinary, accommodation listing management, and real-time messaging through Socket.IO. Together, these components provide a unified, secure and scalable roommate matching solution.

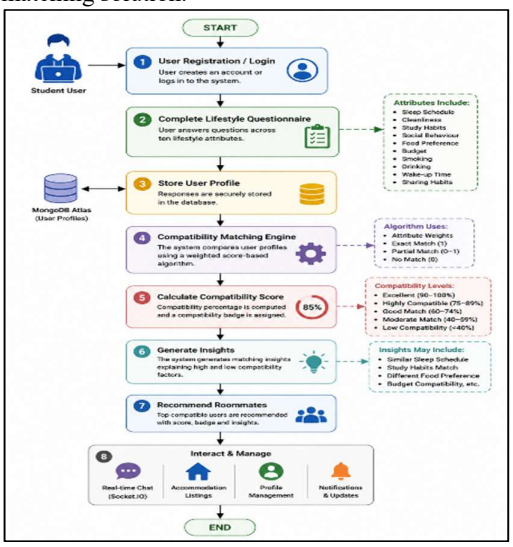

Fig. 1 Workflow of the compatibility-based roommate recommendation process.

B. System Architecture

The proposed platform follows a modular client-server architecture comprising five logical layers: Presentation, Application, Business Logic, Data, and External Services. The React.js frontend provides an interactive interface for user registration, profile management, compatibility assessment, and accommodation browsing. The Node.js and Express.js backend exposes RESTful APIs responsible for authentication, compatibility computation, listing management, and messaging. MongoDB Atlas stores user profiles, compatibility information, accommodation listings, and chat records, while Cloudinary and Socket.IO support cloud-based image storage and real-time communication, respectively. This layered architecture promotes modularity, maintainability, scalability, and efficient separation of system responsibilities [7], [8], [9].

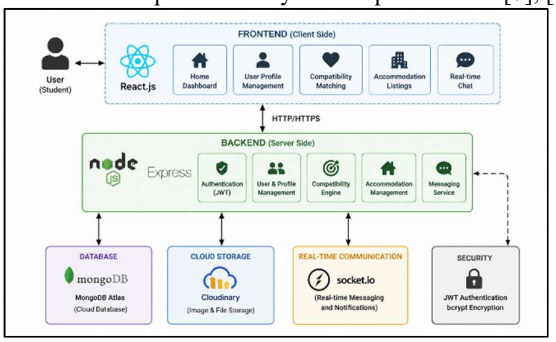

Fig. 2 Overall system architecture of the proposed VIBE ROOMMATE platform.

C. Compatibility Matching Algorithm

The recommendation engine employs a weighted score-based compatibility algorithm that evaluates users across ten predefined lifestyle attributes. Each attribute is assigned a predefined weight according to its relative importance, with the total weight normalized to 100. Matching responses contribute their respective weights toward the final compatibility score, while conditional rules are applied for attributes such as budget and food preference. The overall compatibility score is calculated using Equation (1).

$$Compatibility\ Score\ (\%) = \frac{\sum_{i=1}^{n} W_i S_i}{\sum_{i=1}^{n} W_i} \times 100$$

where CS denotes the compatibility score expressed as a percentage, $W_i$represents the weight assigned to the ith lifestyle attribute, S_i denotes the normalized matching score for the corresponding attribute $(0 \leq S_i \leq 1)$, and $n$is the total number of lifestyle attributes considered. An exact match contributes a score of **1**, a complete mismatch contributes **0**, while predefined conditional rules assign intermediate scores for attributes such as budget and food preference.

Based on the computed compatibility percentage, users are classified into five categories: Excellent Match (90–100%), Highly Compatible (75–89%), Good Match (60–74%), Moderate Match (40–59%), and Low Compatibility (<40%). To enhance transparency and user trust, the platform presents compatibility badges and matching insights that explain the generated recommendations in accordance with the principles of explainable recommendation systems [1], [10], [11].

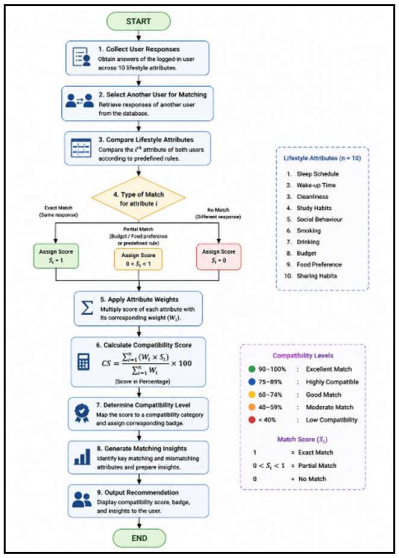

Fig. 3 Flowchart of the weighted compatibility matching algorithm.

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D. MERN Stack Implementation

The proposed system is implemented entirely using the MERN technology stack. React.js provides a responsive and interactive user interface, while Node.js and Express.js implement the backend services through RESTful APIs. MongoDB Atlas manages persistent application data, JWT and bcrypt provide secure authentication and password protection [6], Cloudinary handles cloud- based image uploads, and Socket.IO enables real-time communication between matched users. The modular implementation ensures scalability, maintainability, and flexibility while supporting future integration of advanced AI-driven recommendation techniques [3], [7], [9].

V. Prototype Evaluation

The proposed VIBE ROOMMATE platform was functionally evaluated using a prototype involving 10 test users. The evaluation validated the successful operation of key modules, including user registration, JWT-based authentication, compatibility assessment, accommodation listing management, Cloudinary image uploads, MongoDB Atlas integration, and real-time messaging through Socket.IO. The system successfully generated compatibility scores, assigned compatibility badges, and recommended suitable roommates based on users' lifestyle preferences.

The evaluation demonstrates the successful integration of compatibility assessment, secure authentication, cloud-based data management, and real-time communication within a unified MERN-based application. Although the prototype confirms the technical feasibility and functional effectiveness of the proposed platform, the evaluation was limited to a small user group. Future work will involve large-scale user studies to evaluate recommendation accuracy, usability, and user satisfaction under real-world conditions [1], [2], [10].

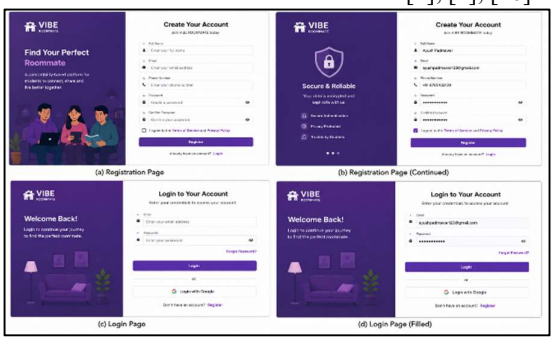

Fig. 4 User registration and JWT-based authentication interface.

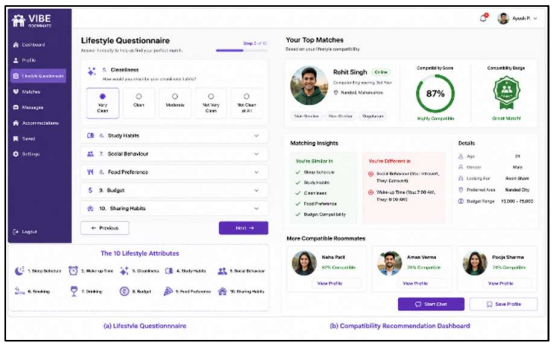

Fig. 5 Lifestyle questionnaire and compatibility recommendation dashboard.

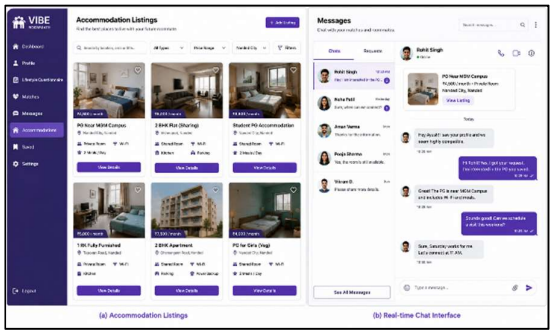

Fig. 6 Accommodation listing and real-time messaging interface.

Table II. Prototype Validation Results

Evaluation Metric	Observation
Test Users	10
User Registration	Successful
JWT Authentication	Successful
Compatibility Score Generation	Successful
Roommate Recommendation	Successful
CRUD Operations	Successful
Cloudinary Integration	Successful
MongoDB Atlas Integration	Successful
Socket.IO Messaging	Successful

VI. Advantages

The proposed VIBE ROOMMATE platform offers several advantages over conventional roommate-finding systems:

- Lifestyle-based matching using ten compatibility attributes to improve roommate selection.
- Explainable recommendations through compatibility scores, badges, and matching insights, enabling users to better understand the recommendation process [1].
- Integrated functionality combining roommate matching, accommodation listings, secure authentication, and real-time messaging within a unified platform.
- Enhanced security through JWT-based authentication, bcrypt password encryption, and protected RESTful APIs [6].
- Scalable cloud-based architecture implemented using the MERN stack with MongoDB Atlas, Cloudinary, and Socket.IO for efficient and reliable system operation.
- Extensible system design that supports future integration of AI-based recommendation models, mobile applications, and advanced analytics [3], [11].

Overall, the proposed platform provides a secure, scalable, and user-centric solution for compatibility-based roommate matching while establishing a flexible foundation for future intelligent recommendation systems.

VII. Challenges and Limitations

The proposed VIBE ROOMMATE platform has several limitations. The current recommendation engine employs a rule-based weighted scoring approach that does not adapt to evolving user behaviour or learn from previous matching outcomes. In addition, the prototype was evaluated using a limited number of users, restricting validation across larger and more diverse student populations.

The quality of recommendations depends on the accuracy and completeness of user-provided information and is limited to ten predefined lifestyle attributes, which may not capture all factors influencing roommate compatibility. Furthermore, as a cloud-based application, the platform requires reliable internet connectivity and robust measures to ensure user privacy and data security.

Although the modular MERN-based architecture supports scalability, further optimization will be necessary for large-scale deployment. Future enhancements will focus on integrating AI- and ML-based recommendation techniques, expanding compatibility factors, conducting extensive user evaluations, and improving system security, scalability, and recommendation accuracy [3], [11], [12].

VIII. Future Scope

The proposed VIBE ROOMMATE platform provides a strong foundation for future advancements in compatibility-based roommate recommendation. Future work will focus on integrating Artificial Intelligence (AI) and Machine Learning (ML) techniques to enable adaptive, personalized, and data-driven recommendation models, thereby improving matching accuracy and user satisfaction [3], [11], [12]. Additional enhancements, including personality-based profiling, verified college authentication, mobile application support, push notifications, and location-aware recommendations, can further enrich the overall user experience.

The platform can also be extended with voice and video communication, AI-assisted user interactions, and advanced administrative analytics for improved system management. Furthermore, large-scale evaluation involving students from multiple institutions will enable comprehensive assessment of recommendation accuracy, usability, and user satisfaction while validating the scalability of the proposed approach. These enhancements will strengthen the platform's intelligence, reliability, and practical applicability for real-world student accommodation environments [1], [2], [3].

IX. Conclusion

This paper presented VIBE ROOMMATE, a compatibility-based roommate matching platform that addresses the limitations of conventional accommodation systems by emphasizing lifestyle compatibility. The proposed platform employs a weighted score-based algorithm to generate explainable compatibility recommendations and integrates accommodation management, secure authentication, cloud-based storage, and real-time communication within a unified MERN-based application.

Prototype evaluation demonstrated the successful implementation of the platform's core functionalities, confirming its technical feasibility and practical applicability. Although the current system uses a rule-based recommendation approach and was evaluated on a limited scale, it provides a strong foundation for future enhancements. Integrating AI-based recommendation techniques, personality analysis, and large-scale user evaluation can further improve recommendation accuracy and user experience. Overall, VIBE ROOMMATE offers a scalable and user-centric solution for intelligent roommate matching.

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