A web-based roommate matching system using preference based matching

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Abstract— The roommate matching system is a web-based application designed to help users find suitable roommates based on their preferences and lifestyle. Traditional methods such as social media and advertisements often lead to mismatches due to differences in habits and lack of trust. The proposed system enables users to register, create profiles, and search for rooms and roommates efficiently. It evaluates compatibility using factors such as food habits, lifestyle, and location to generate suitable matches. The system is developed using modern technologies including HTML, CSS, JavaScript, Node.js, and MongoDB. The results demonstrate that the system provides accurate and reliable roommate recommendations, improving overall user satisfaction.

Index Terms— roommate matching, web application, preference-based matching, node.js, mongodb, room search system.

I. INTRODUCTION

In today's world, many students and working professionals move to different cities for education and jobs. Because of this, finding a good roommate becomes very important. A suitable roommate helps in sharing expenses and creates a comfortable living environment. However, finding a compatible roommate is not easy. Most people use social media, local contacts, or advertisements to search for roommates. These methods are not organized and do not consider personal preferences properly.
People have different lifestyles, such as food habits, cleanliness, sleeping time, and social behaviour. If these preferences do not match, it can lead to problems and conflicts between roommates. Sometimes, there are also safety concerns because there is no proper verification system. Due to these issues, there is a need for a better and more structured solution.

Our System is developed to solve this problem. It is a web-based platform where users can create profiles, enter their preferences, and search for rooms or roommates. The system compares user preferences and suggests compatible matches. This helps users find roommates who have similar habits and lifestyles.

System is built using modern web technologies. The frontend is developed using HTML, CSS, JavaScript, and Bootstrap to provide a simple and user-friendly interface. The backend uses Node.js and Express.js to handle system logic and communication. MongoDB is used to store user data and room details. An admin module is also included to manage users and maintain system security. Overall, the system makes the roommate searching process easier, safer, and more efficient.
The software is implemented using a modern web stack consisting of HTML, CSS, JavaScript, and Bootstrap for the frontend, and Node.js with Express.js for backend processing. MongoDB is used as a NoSQL database to store user profiles and room data. Communication between components is handled through RESTful APIs.

Besides handling everyday user tasks, the platform features a control panel for admins to oversee accounts, track actions, close risks early. It keeps harmful material or odd behaviour in check through active supervision. The whole setup exists so people hunting roommates get results that are steady, fast, safe. Pairing careful info storage with smart match logic upgrades how such searches used to work - clumsy, slow. Experience shifts noticeably when tech smooths out what once felt like luck-based guesswork.

II. LITERATURE SURVEY

Finding compatible roommates is always a topic for college students, as the decision is intimate enough to affect their daily lives. There are many research studies about how various attributes, like habits, races, personality and others, would impact roommate relationship development and people's social lives. Various tools have been applied to the roommate finding problem. The focus of our project is to develop a user-friendly online roommate matching website by providing a platform that allows users to submit profiles, which will then be used to find their matching roommates. In addition to Usability Test M. Shekhawat, S. Deshmukh, G. Monroy, International Information Management Association, On-line Copy personal habits and backgrounds, the existing research results suggest that personality plays a critical role in roommate compatibility. So, the web design focuses on the way of collecting user personality information.[9]

Kim-Sau Chung's paper "On the Existence of Stable Roommate Matchings" introduces the concept of "no odd rings" as a critical condition that guarantees the presence of stable roommate matchings, especially in scenarios with weak preferences. The study highlights the process of randomly selecting blocking pairs to match, demonstrating stability with a probability of one in the absence of odd rings. This stochastic stability theorem is relevant in situations without odd cycles but may not hold true in the presence of odd cycles. The researcher proposes that the "no odd rings" condition can be used to establish different economically

interpretable sufficient conditions. This work significantly contributes to the understanding of stability dynamics in the context of roommate matchings, offering valuable insights and paving the way for further research in the field. [1]

The authors demonstrate that the algorithm can generate near-optimum solutions. This also explores how to find a suitable roommate or space envyfree allocation with a guarantee of social welfare. It presents a heuristic algorithm based on the local quest for the general case, where each room 's potential is not bounded by a constant. Chan et al. introduced a room allocation model for finding an allocation that maximizes social welfare. For reality, the size of the rooms that vary, e.g. college dorms or apartments that have both 2-bed rooms and 4-bed rooms. It ends with an algorithm that can be used to find the best arrangements for room sharing for a given room size and room ratings. This paper explores the problem of room allocation with variety of capacities and budget constraints. They focus mainly on finding an allotment that maximizes social welfare. The experimental results show that the proposed algorithm can produce virtually optimal solutions. The question is to examine the sharing of rooms with couples, where a pair has to be assigned to the same space. The paper shows that it is NP-hard to decide if a room envy-free allocation admits an instance with defined room prices. This also reveals that no polynomial-time cranial time occurs in polynuclear time to find a solution to the issue of capacity-diversity. This implies that if the potential of each room is bounded by a constant, a weakly stable allocation with a proven social welfare guarantee can be found in polynomial time.[2]

AI-driven recommendation systems, widely used in retail and media, have shown potential for roommate matching by offering personalized, data-driven compatibility solutions. Traditional roommate-finding methods often result in mismatches due to limited personalization, whereas AI can assess critical compatibility metrics such as cleanliness, social habits, and sleeping patterns (Aggarwal, 2016; Nguyen et al., 2013). Research highlights key challenges in roommate matching, including privacy concerns around sensitive personal data, stressing the importance of secure, compliant data handling to build user trust (Montoya et al., 2013; Voigt & Bossche, 2017). Studies show that AI significantly improves roommate compatibility, leading to higher satisfaction and fewer conflicts compared to traditional methods (Kim & LaRose, 2004). This survey supports the use of AI in roommate allocation systems to bridge existing gaps, improve user experience, and meet modern privacy standards.

Rahman & Manoj Kumar (2021), “Optimal Room and Roommate Matching System Using Nearest Neighbours Algorithm with Co sine Similarity Distribution” (Rahman, n.d.). They build a system where users could be able to apply filters like gender, location, amenities and find those with which they share the closest similarities. This solution is great in off campus housing and job transfer situations. The above-mentioned studies did an excellent job in pairing individuals up in an off-campus setting. This study does not tackle this problem. It is rather centred around on-campus housing and how colleges could improve their already existing room allocation systems. Abhishek Sharma &Amandeep Kaur (2021), “Hostel’s Room Allocation System: A framework Using Single-Layer Fuzzy Log is” (Sharma and Kaur, n.d.). This study used the input parameters Citizenship, State, Religion, Temperament, Personality and Time to study which passed through a single layer fuzzy system to get allocated rooms for students. K. Zahran et al. 2024, "Autoencoder-Enhanced Roommate Recommendation System"(Zahran et al., 2024), the authors introduced a new method for enhancing roommate matching using autoencoder neural networks. The system gathered information about students' likes and dislikes and their behaviours, which were fed into an autoencoder to learn compressed latent features of these characterise tics. By identifying the hidden patterns in the students' answers, the system can better gauge compatibility among potential roommates and provide more compatible living situations as well as higher student satisfaction.[4]

Understanding user feedback and satisfaction levels is crucial for evaluating the effectiveness of existing web applications. Studies analysing user reviews and ratings can provide insights into the strengths and weaknesses of different platforms, identifying areas for improvement. Common themes in user feedback may include issues related to search functionality, communication tools, trustworthiness of listings, and overall user experience. Analysing these themes can help identify recurring pain points and inform the development of ROOM & MATES to address user needs more effectively. [5]

Henning Smith et al. proposed that with the aging population, barriers to accessing medical services in rural areas are particularly prominent, and it is necessary to evaluate the healthcare access of medical insurance beneficiaries in rural areas in order to develop effective strategies. The research results indicate that after adjusting for factors such as age, gender, and marital status, rural beneficiaries have significantly lower satisfaction with home visits and access to expert care compared to urban beneficiaries, and are more inclined to avoid seeking medical treatment or not informing others when sick. These differences indicate the quality and acceptability issues faced by rural beneficiaries in healthcare, which may affect their seeking behaviour and ultimate health outcomes.[8]

Importance of Compatibility in Roommate Assignments Research has shown that compatibility in roommate assignments significantly impacts students' living experiences and academic performance. Studies have demonstrated that students paired with compatible roommates tend to have lower stress levels, higher satisfaction with their living arrangements, and improved academic outcomes. Data-Driven Decision Making in Educational Settings The use of data-driven decision-making tools in educational settings has gained traction in recent years. These tools provide valuable insights and enable institutions to make informed decisions that enhance student experiences and outcomes. The integration of technology in educational management has been shown to improve operational efficiency and student satisfaction. Role of Technology in Improving Student Life Technology plays a crucial role in modern educational settings, offering innovative solutions to traditional challenges. The application of web technologies and data management systems in educational contexts has been shown to enhance student life and academic performance.[6]

Another approach implemented machine learning to categorize users based on personality and lifestyle preferences using the K-Means algorithm [8]. This offered a data-driven way to group users with similar characteristics, facilitating the browsing and selection of potential roommates. However, this method relied on pre-defined categories and may not capture the full spectrum

of user preferences. Large Language Models (LLMs) emerge as a potential solution to address these limitations. Unlike static profiles, LLMs can engage in natural language conversations, allowing matching process where users feel like they are actively involved in finding the right roommate.[7]

This literature review set out to utilize previous research to support the study of the relationship between self-proclaimed and perceived similarity of optimism or pessimism and roommate satisfaction. Optimism and pessimism were clearly defined and broken down, distinguishing the different effects they have on individuals. The various factors that makeup and impact personality were discussed to understand the impact personality has on optimism and pessimism. These correlations were then expanded to show the effect the relationship between optimism and pessimism and personality have on relationships, especially as it relates to perception. Finally, roommate relationships specifically were discussed, showing the need for more research in the realm of creating an effective roommate pairing strategy. The research shows that similarities of many kinds and perceived similarities positively affect roommate relationships. Because of this, it is possible for roommates who are both optimists or both pessimists to get along better than those who have opposite overall viewpoints. The research seems to support this logic, but a specific study is necessary to determine if there is a relationship between self-proclaimed optimism or pessimism perceived similarity and roommate satisfaction within college students.[10]

III. METHODOLOGY

The proposed Roommate Matching System is designed using a structured approach that combines modern web technologies with a rule-based matching mechanism. The system architecture is divided into frontend, backend, and database layers to ensure efficient performance and scalability.

Technologies Used

- **React.js (Frontend):**
  Used to develop a dynamic and user-friendly interface. It allows users to register, log in, manage profiles, and interact with the system smoothly.
- **Tailwind CSS (Styling):**
  Provides responsive and clean UI design, ensuring better user experience across different devices.
- **Node.js / Next.js (Backend):**
  Handles server-side logic, user authentication, request processing, and communication between frontend and database.
- **Firebase Fire store (Database):**
  A cloud-based NoSQL database used to store user data, room details, and matching information securely with real-time access.
- **Genkit Framework (AI Structure):**
  Used to design the structure for future AI-based enhancements, although the current system uses a rule-based approach.

The system begins with user registration and login, where user credentials are authenticated. After successful login, users create and update their profiles by providing details such as location, budget, interests, and lifestyle preferences.

The roommate matching process is based on a **rule-based similarity algorithm**, where user profiles are compared using key attributes. A compatibility score is calculated based on matching preferences, and users are ranked accordingly. The system then displays the most suitable roommate suggestions.

Additionally, users can search for rooms, post room details, and communicate with matched users through the integrated messaging system. The admin module ensures proper management of user data and system operations.

IV. ALGORITHM

Step 1: Input Collection
The system collects user data such as location, budget, habits, lifestyle, and personal preferences from the user profile.

Step 2: Data Retrieval
All available user profiles and room details are fetched from the database.

Step 3: Data Preprocessing
The collected data is cleaned and converted into a comparable format for accurate matching.

Step 4: Similarity Calculation
The system compares the current user's profile with other users based on:

- Location preference
- Budget compatibility

- Lifestyle and habits

Step 5: Score Assignment
A compatibility score is assigned to each user based on how closely their preferences match.

Step 6: Ranking
All potential roommates are sorted in descending order based on their compatibility scores.

Step 7: Filtering
Users who do not meet the minimum matching criteria are removed from the list.

Step 8: Output Generation
The system displays the top matching roommates to the user.

Step 9: User Interaction
The user can view profiles, send messages, or proceed with further communication.

V. DATA ANALYSIS

A file begins to grow, fed by choices made during registration. Profile by profile, elements appear - budget ceilings, neighborhood tastes, bedtime routines stack gently inside. Into a system designed for traces, fragments arrive without noise. Cooking rhythms settle beside opinions about mess. Data slips forward, tucking itself into forms that mimic paper. Inside shifting spaces where choices link up, comfort with shared rooms finds its place. Alongside wake times or late habits, smoking stands marked clearly apart.

Folks tend to click better when tastes overlap. The system uses saved info to pair users, bit by bit. One common habit can mean a closer match than expected. With every choice weighed against another, small trends begin to surface. Beyond slight connections, findings drift apart. When responses echo one another clearly, links grow stronger.

Picture two people who both skip meat. They often get along fast. But if one enjoys a cigarette while the other steps back, things usually stall. Each small choice adds weight without saying a word. Links form slowly, built on quiet overlaps. Fit comes later, once enough pieces line up.

What shows up first ties closely to nearby locations. When a person searches for spots near a specific area, results from that neighborhood appear instantly. Following that, patterns in choices help sort likely options. Stronger connections form when location leads the way. The outcome seems clearer as a result.

Out of thin air, made-up profiles helped test basic stats. Where interests overlapped, contact happened faster. If one stayed up late and the other woke early, messages often died quietly. A steady pattern in routines boosted how well folks connected. This path left most feeling clearer about who they met.

Out of clarity comes consistency - how data moves shapes everything else. When personal inputs land in set buckets by fixed rules, results stay reliable, never random. Structure guides what rises to the top, not hunches. Patterns emerge simply because the system lets them.

VI. RESULT

From testing the Roommate Matching System, clear results came through. Success showed up right away when people signed up, logged in, fixed their profiles, looked for rooms, then found matches. Each piece did its job well, with nothing breaking down or acting strange.
Surprisingly, people ended up happier when roommates shared things like eating routines or daily rhythms. Matching worked better if lifestyles lined up - say, both liked quiet evenings or cooked at home often. Those who clashed on basic habits simply weren’t paired together. Fewer mismatches meant fewer headaches down the road.
Noticed something key - narrowing results by location speeds things up, also sharpens accuracy. Finding a room in the preferred neighborhood became simpler for users, following which suggestions for matching roommates appeared. That sequence, step one then steps two, made using the platform feel smoother.
Quick results came through each query run on the platform. Stored information appeared fast when pulled from storage. Security held strong during sign-ins, keeping personal details safe. Messages moved between people with no glitches showing up. Speed stayed high while running tasks across functions.
Useful right away, the admin module handled user management while keeping security tight. Watching what people did became easier because it blocked bad entries without fuss. Results say it works well - steady performance meets simple design. Aiming at better matches between roommates, it beats old ways by doing more with less mess behind the scenes.
Not many noticed it at first, yet outcomes improved the moment location narrowed the search. Instead of jumping straight to room details, starting with geography slashed poor fits fast. When someone chose a neighborhood, distant spots vanished right away. Performance climbed - quicker picks, fewer errors - all thanks to that early filter holding things together. What felt small actually shaped everything behind the scenes. Right off, matching tastes once location got smaller helped results feel clearer. A single order of moves meant fewer messy entries showed up on screen.

Even with tons of people asking things all at once, speed didn't drop much. When saving, grabbing, or updating data, everything completed smoothly. Access controls held up well, keeping passwords and private info safe. Messages passed between users without a single glitch during testing phases.

Even though it looked basic, the admin tool worked fine for monitoring activity and managing information. Because of this, team members were able to check user profiles while removing inappropriate content - helping improve safety and reliability on the system. It kept running smoothly during everyday tasks.

VII. Conclusion

Here's a different take - finding roommates becomes simpler when the process skips the mess. Thanks to modern code and clever logic, matches form through real-life alignment. Rather than hoping for luck, users connect by sharing specifics about routines and expectations. Chats unfold in real time, tucked neatly within the interface. Protection plays a role, making sign-ins both safe and effortless. It surprises most people - how smooth it feels after joining. Little by little, hidden scripts learn what suits you best. Back then, looking for homes dragged on forever; today, things move quicker, clearer. A lot of online tools mess this up. But here, everything links - like cogs turning together in something built to work.

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