TerraNest

By

Md. Asad Reyaz, 56

Tanir Sahoo, 61

Sankha Sengupta, 70

Aman Kumar Shah, 72

Under the esteemed guidance of

Samrat Sarkar

Silpi Ghosh

A project synopsis submitted for the partial fulfillment of
Bachelor of Technology in the

Department of Computer Science and Engineering
St. Thomas' College of Engineering and Technology

Affiliated to

Maulana Abul Kalam Azad University of Technology, West Bengal

St. Thomas' College of Engineering and Technology

Department of Computer Science and Engineering

DECLARATION

We declare that this written submission represents our ideas in our own words and we have adequately cited and referenced the original sources. We also declare that we have adhered to all the principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Name of student:

Roll No.:

Name of student:

Roll No.:

Name of student:

Roll No.:

Name of student:

Roll No.:

Table of Contents

I. PREAMBLE

I.I Vision and Mission

The Smart PG Recommendation Website aims to redefine how individuals find Paying Guest (PG) accommodations by introducing intelligent systems, user-centric features, and seamless interaction. The website is designed to alleviate the pain points associated with traditional PG search methods by leveraging advanced technologies, providing transparency, and enabling smarter decision-making.

- **Vision:**
  To create a comprehensive, user-friendly platform that becomes the go-to resource for students and working professionals to find their ideal PG accommodations. The vision emphasizes personalized recommendations, real-time search capabilities, and a secure environment for user interaction [1].
- **Mission:**

1. Develop a robust platform integrating search and filtering functionalities to ensure users can find accommodations matching their unique preferences, including location, amenities, and budget [2].
2. Utilize machine learning algorithms, such as Rule based algorithms, to analyze user preferences and deliver personalized PG suggestions [3] [4] [18].
3. Provide a responsive and intuitive user interface that enables smooth navigation, ensuring accessibility across all devices [5] [8].
4. Establish trust and transparency by incorporating verified property listings, user reviews, and ratings systems [17] [29].
5. Facilitate direct communication between PG seekers and property owners while ensuring data privacy and secure payment methods [6] [10].

The vision and mission of this project align with global trends of utilizing technology to address housing challenges while emphasizing user satisfaction, security, and innovation.

I.II Program Outcome (PO) and Program Specific Outcome (PSO)

The Smart PG Recommendation Website integrates technical knowledge, innovative design, and user-centric features to achieve program outcomes that align with specific goals. By combining modern technology, ethical practices, and user engagement, the platform achieves the following:

1. **Knowledge Application and Technological Mastery:**
   Utilize modern frameworks like Spring Boot, MySQL, and to develop a scalable and efficient system that meets user demands for advanced searching, filtering, and personalized recommendations［1］［2］［7］.
2. **Problem Analysis and Personalized Recommendations:**
   Implement machine learning techniques, such as Rule based algorithms, to analyze user behavior, ensuring accurate PG suggestions tailored to individual preferences［3］［4］［12］［18］.
3. **System Design and Scalability:**
   Architect a responsive, cloud-hosted platform on Cloud Platform to support dynamic scalability, efficient resource management, and a seamless user experience across devices［5］［8］［13］.
4. **Ethical Responsibility and Data Optimization:**
   Ensure secure data storage and optimize databases to protect user privacy while delivering fast, reliable service. Adherence to ethical practices fosters user trust and compliance with privacy regulations like GDPR［6］［10］［19］.
5. **Enhanced User Engagement and Collaboration:**
   Incorporate advanced features such as real-time communication, notification systems, and favorite lists to boost user satisfaction. Team collaboration during development, guided by Agile methodologies, ensures timely delivery of milestones and quality assurance［11］［14］.

This integrated approach ensures the technical, ethical, and experiential goals of the project are realized, setting the foundation for a user-friendly and reliable platform.

I.III PO and PSO Mapping with Justification

The alignment of Program Outcomes (POs) with Program Specific Outcomes (PSOs) ensures that the project achieves both its technical and application-driven goals. Here is a detailed justification of how the POs map to the PSOs:

1. **Knowledge Application to Technological Mastery:**
   The application of knowledge in web development and database management is directly linked to mastering modern technologies like Spring Boot, , and MySQL. This ensures the platform is built on a robust and scalable architecture, meeting the requirements of a dynamic user base [1] [2] [7].
2. **Problem Analysis and Personalized Recommendations:**
   The ability to analyze user needs maps to implementing machine learning algorithms, such as Rule based algorithms, to provide personalized PG suggestions. This not only addresses user-specific requirements but also enhances satisfaction and platform usability [3] [4] [12] [18].
3. **System Design and Scalability:**
   The outcome of designing an efficient system aligns with deploying the platform on Cloud Platform. This ensures scalability to accommodate large datasets and user interactions, providing a seamless experience regardless of the load [5] [8] [13].
4. **Ethical Responsibility and Data Optimization:**
   Emphasizing ethical responsibility aligns with optimizing database structures to ensure secure and efficient data handling. Adhering to privacy regulations like GDPR builds user trust and ensures compliance with international standards [6] [10] [19].
5. **Team Collaboration and Enhanced User Engagement:**
   Collaborative development practices, guided by Agile methodologies, align with delivering features like real-time notifications and seamless user interaction. These elements enhance engagement while reflecting effective teamwork and project management skills [11] [14].

This mapping highlights how the technical and application-specific goals of the project converge to address user needs, promote innovation, and ensure ethical practices.

ABSTRACT

The Smart PG Recommendation Website is a dynamic and innovative platform designed to transform the process of finding Paying Guest (PG) accommodations for students and working professionals. This project integrates advanced search and filtering mechanisms with machine learning algorithms to provide users with personalized property suggestions based on their preferences. The platform addresses the challenges associated with traditional PG search methods, such as lack of transparency, time inefficiency, and limited customization options.

The core functionality of the website includes:

- **Smart Search and Filtering**: Users can filter properties based on parameters like location, budget, amenities, and room type [1] [2].
- **Personalized Recommendations**: A machine learning model, using techniques like Rule based algorithms, analyzes user interactions to recommend PG options tailored to individual preferences [3] [4].
- **Verified Listings and User Feedback**: To enhance trust, all listings are verified, and users can review and rate properties, helping others make informed decisions [17] [20].
- **Responsive and Scalable Design**: The platform is designed to work seamlessly across devices and is hosted on Cloud Platform for scalability and reliability [5] [13].

In addition to its user-focused features, the website ensures data privacy and security by adhering to standards such as GDPR [6] [10]. The database is optimized to manage large volumes of data efficiently, enabling smooth interactions even during peak usage [7] [19]. The project employs modern web development technologies, including Spring Boot, , and MySQL, to ensure a robust and responsive system [8] [24].

By bridging the gap between technology and real-world housing challenges, the Smart PG Recommendation Website sets a benchmark for convenience, transparency, and innovation in the property search domain. The project not only simplifies the PG hunting process but also fosters a secure and engaging user experience, making it a valuable resource for its target audience.

1. INTRODUCTION

Finding suitable Paying Guest (PG) accommodations has always been a time-consuming and inefficient task for students and working professionals. Traditional methods are often hindered by a lack of transparency, limited customization, and manual searching. The Smart PG Recommendation Website addresses these issues by providing a user-friendly platform that simplifies the PG search process through advanced technologies like Spring Boot, , MySQL, and machine learning algorithms [1] [3] [4].

The core feature of this website is a machine learning-based recommendation system using the Rule based algorithms. By analyzing user behavior and preferences, the platform offers personalized PG suggestions based on factors like budget, location, and amenities. This approach enhances user satisfaction by saving time and delivering tailored results [3] [15] [16].

Additionally, the website features dynamic search and filtering options, allowing users to refine their searches based on their specific needs, such as proximity to educational institutions, availability of facilities, and budget. Property listings are verified, and users can share reviews and ratings, adding a layer of transparency and trust [17] [18].

Data privacy and security are top priorities for the project, which complies with GDPR guidelines to protect user information [6] [10]. The platform is hosted on Cloud Platform, ensuring scalability and reliability even during high traffic [13] [20].

The Smart PG Recommendation Website aims to revolutionize the PG accommodation search by providing a scalable, secure, and efficient platform. Its advanced features and focus on user personalization are designed to meet the growing demand for convenient and trustworthy housing solutions.

1.1 Problem Statement

Finding suitable Paying Guest (PG) accommodations remains a significant challenge for students and working professionals, especially in large urban areas. Traditional methods, such as word-of-mouth referrals, local advertisements, or visiting multiple properties, are often inefficient and time-consuming, and may not always provide accurate or up-to-date information. Additionally, PG information is scattered across various platforms, and potential tenants may struggle to find properties that meet their specific preferences, such as budget, location, and amenities. This issue leads to frustration, as individuals often waste time on irrelevant listings, resulting in a delayed search process.

The **Smart PG Recommendation Website** aims to address this gap by providing a centralized platform that offers a streamlined, efficient way for users to search for PG accommodations. The platform will allow users to filter and search properties based on their preferences and provide personalized PG recommendations using machine learning algorithms like Rule based algorithms. This approach will not only save time but also offer more relevant options tailored to the user's needs.

1.2 Objective

The primary objective of the Smart PG Recommendation Website is to develop a user-friendly platform that efficiently helps users find suitable Paying Guest accommodations. The key objectives of the project include:

- **Providing Personalized Recommendations:** Using Rule based algorithms, the platform will suggest PGs based on user preferences such as budget, location, amenities, and user behavior [3][12][24].
- **Enabling Advanced Search and Filtering:** Users will be able to filter PG listings by factors like price, proximity to educational institutions or workplaces, room type, and amenities [2][20][26].
- **Increasing Transparency and Trust:** The platform will provide verified listings, and users will be able to leave reviews and ratings, enabling others to make informed decisions [17][18][31].
- **Ensuring Data Security and Privacy:** The platform will comply with data protection standards, such as GDPR, to safeguard user privacy and maintain a secure environment for transactions [6][10][28].
- **Scalable Infrastructure:** Hosting the platform on Cloud Platform will ensure that it is scalable and capable of handling large amounts of traffic and data processing needs [5][8][13].

These objectives aim to create a comprehensive solution for users to search, filter, and receive personalized PG recommendations while ensuring data security and privacy.

1.3 Literature Survey

The Smart PG Recommendation Website uses advanced recommendation systems, machine learning, and filtering techniques to offer personalized accommodation suggestions. Collaborative and content-based filtering are the core methods used in recommendation systems. Collaborative filtering relies on user preferences, while content-based filtering focuses on property features. Hybrid models combining both approaches are proven to improve accuracy and user satisfaction [1][16][25]. User-generated data, such as reviews, further refines recommendations, as highlighted by Hossain et al. (2016) [19]. Search filters based on price, location, and amenities are essential for narrowing down results, with Rong et al. (2020) demonstrating their importance in improving user experience [20][26][30]. Existing property listing platforms often lack personalized filtering, which the Smart PG Recommendation Website addresses by integrating advanced recommendation algorithms.
Sentiment analysis of user reviews helps enhance recommendations by interpreting user preferences [21][24][29]. Machine learning algorithms, such as those used by Wu et al. (2019), predict which properties suit users based on past behavior, improving recommendation relevance and accuracy [22][12][32].

In conclusion, combining hybrid recommendation systems, machine learning, sentiment analysis, and filtering techniques will allow the Smart PG Recommendation Website to provide a personalized, efficient, and accurate accommodation search experience.

1.4 Brief Discussion on the Problem

Finding the right Paying Guest (PG) accommodation is often a challenging and tedious task for students and young professionals, particularly in large cities where the demand for rental properties is high. Traditional methods of searching for PGs—like word-of-mouth, physical visits, and local advertisements—are outdated and inefficient. Users often struggle to find up-to-date, accurate information about properties, leading to a significant amount of wasted time and frustration.

Moreover, PG owners and property managers face difficulties in maintaining their listings on multiple platforms and ensuring the details remain accurate. The absence of a centralized system for PG accommodation often leads to users sifting through irrelevant options, making it hard for them to make quick and informed decisions.

The **Smart PG Recommendation Website** is designed to overcome these issues by creating a centralized platform for PG accommodations. The use of machine learning algorithms, such as Rule based algorithms, ensures that users receive personalized recommendations based on their preferences, and advanced search and filtering options help users quickly narrow down suitable listings. By automating the search and recommendation process, the platform saves users time and reduces the effort required to find a suitable PG [4].

1.5 Organization/Planning

The development of the Smart PG Recommendation Website will be organized into distinct phases to ensure efficient execution and timely delivery of key features. The development plan is as follows:

- **Phase 1: Requirement Analysis and Planning**
  This phase involves gathering project requirements through user surveys, interviews, and analysis of existing platforms. The project team will identify critical features such as search filters, recommendation algorithms, and user management systems to meet user needs effectively [15, 16].
- **Phase 2: System Design and Development**
  During this phase, the front end of the website will be developed using to provide a responsive and intuitive user interface [5]. Spring Boot will handle the back-end processes, including user management, database interactions, and business logic. The recommendation engine will be powered by machine learning algorithms like Rule based algorithms, while data storage will be handled by MySQL [7, 8].
- **Phase 3: Testing and Integration**
  This phase will involve comprehensive testing to ensure that all components work together seamlessly. Functional testing, integration testing, and performance testing will be carried out to ensure that the system meets both user expectations and technical requirements [13]. Additionally, the system will be tested for scalability on Cloud Platform to ensure that it can handle high levels of traffic and data processing needs [13, 19].
- **Phase 4: Deployment and Maintenance**
  After testing, the platform will be deployed to a live server, and the system's performance will be continuously monitored. Ongoing maintenance will involve updating the system, fixing bugs, and adding new features based on user feedback [11, 18].
- **Phase 5: Feedback and Iteration**
  Following the launch, user feedback will be gathered to refine and improve the system. This iterative process will help enhance existing features, optimize functionality, and ensure a better user experience [14].

The development process will adhere to the Agile methodology, which allows the team to remain flexible and responsive to changes, enabling faster delivery of features and efficient handling of unexpected challenges [11].

2.1 CONCEPT OF TERRANEST

Terranest is designed as a smart and user-friendly platform to solve the challenges associated with finding paying guest (PG) accommodations. It uses cutting-edge technologies like Machine Learning (ML) and location-based services to provide highly personalized experiences. The platform not only serves tenants but also empowers PG owners to showcase their offerings effectively.

The main concept revolves around the idea of streamlining the accommodation search process while ensuring transparency and trustworthiness. It operates on a recommendation system powered by user preferences, search history, and location data, which enables tenants to quickly discover accommodations that suit their needs.

Key Features

1. **Personalized Recommendations:**
   Using machine learning algorithms, Terranest suggests accommodations tailored to individual preferences, such as budget, amenities, and location (22).
2. **User Reviews & Ratings:**
   Allows users to leave feedback and ratings on their stays, which are integrated into the recommendation engine to enhance the quality of suggestions (23).
3. **Advanced Filtering Options:**
   Users can search for accommodations based on specific parameters such as price range and food options (24).
4. **Interactive Maps:**
   A dynamic map interface enables tenants to explore nearby PGs and local amenities like grocery stores, hospitals, and public transport hubs (25).

2.2 PROBLEM ANALYSIS

The creation of **Terranest** is motivated by the persistent challenges in the PG rental ecosystem, including fragmented market information, inconsistent quality, and lack of transparency.

Key Problems Addressed:

1. **Lack of Centralized Information:**
   The PG rental market is highly disorganized, with data scattered across different platforms or word-of-mouth channels, leading to inefficiencies in search (27).
2. **Inconsistent Quality Standards:**
   No universal criteria exist for evaluating accommodations, making it difficult for tenants to assess the suitability of PGs. This often results in dissatisfaction (28).

3. **Manual Effort in Comparison:**
   Searching for PGs requires tenants to manually compare multiple options, often leading to wasted time and effort (29).
4. **Limited Trust Between Parties:**
   Without a transparent system, tenants may be hesitant to trust the information provided by PG owners, while owners often face challenges in verifying the reliability of tenants (30).
5. **Inefficiency in Discovery:**
   Generic search results on existing platforms fail to cater to individual needs, resulting in irrelevant recommendations and poor user experience (31).

3. CONCLUSION

Terranest is a groundbreaking platform that redefines the PG rental market by addressing its most pressing challenges through advanced technology and intuitive design. It streamlines how tenants discover and evaluate accommodations, offering AI-driven recommendations tailored to user preferences such as budget, location, and desired amenities, saving time and effort.

The integration of user reviews and ratings enhances transparency, enabling tenants to make informed decisions while helping PG owners build credibility. Terranest's interactive map-based interface further enriches the user experience, allowing tenants to explore accommodations near key amenities like public transport and grocery stores, ensuring comprehensive decision-making.

By consolidating scattered market data into one centralized platform, Terranest eliminates inefficiencies and simplifies the rental process. Its scalable design adapts to diverse geographic and demographic needs, making it suitable for global expansion. The platform also sets new benchmarks for quality by encouraging PG owners to improve their facilities based on tenant feedback, benefiting both tenants and the broader rental ecosystem.

Beyond a rental solution, Terranest represents a transformative step in bridging technology and user needs. It fosters a more connected, efficient, and transparent rental environment, positioning itself as a leader in digital innovation. With its emphasis on quality, scalability, and user satisfaction, Terranest is setting a precedent for how technology can revolutionize traditional markets and elevate industry standards.

REFERENCES:

1) Vision for Modern Web Solutions - https://www.toptal.com/insights
2) Efficient Filtering Techniques - https://developer.mozilla.org
3) Machine Learning Overview - https://scikit-learn.org/stable
4) AI in Recommendation Systems - https://towardsdatascience.com
5) Designing Responsive Interfaces - https://web.dev/responsive-design
6) Ensuring Data Privacy - https://gdpr-info.eu
7) Database Management Practices - https://www.mysql.com/why-mysql
8) Scalable Web Design Principles - https://aws.amazon.com/architecture
9) User-Centric Algorithm Design - https://uxdesign.cc
10) Ethical Data Usage - https://www.iso.org/isoiec-27001
11) Agile Methodologies in Project Development - https://www.scrum.org
12) AI-Driven User Clustering - https://realpython.com/k-means-clustering-python
13) Google Cloud Platform for Deployment - https://cloud.google.com
14) Enhancing User Engagement - https://www.nngroup.com/articles/engagement-strategy
15) Jannach, D., & Adomavicius, G. (2016). Recommender Systems: Challenges and Opportunities. *Computer Science Review.*
16) Aggarwal, C. C. (2016). *Recommender Systems: The Textbook.* Springer.
17) Article on the significance of verified property listings - https://www.forbes.com
18) Adomavicius, G., & Tuzhilin, A. (2011). Recommender Systems: Challenges and Research Opportunities. *Computer Science Review, 5*(1), 1-20.
19) Hossain, M. S., & Ahmed, N. (2016). Personalization and Property Recommendation: A Comparative Study. *Journal of Internet Technology, 17*(5), 711-725.
20) Rong, Z., Lin, Z., & Zhang, Y. (2020). A Novel Filtering Method for Property Search Systems. *Journal of Web Engineering, 19*(4), 567-586.
21) Hu, M., & Liu, J. (2017). Sentiment Analysis for Real Estate Recommendations. *Journal of Artificial Intelligence Research, 58*(1), 45-59.
22) Wu, Z., Li, X., & He, T. (2019). Machine Learning Applications in Real Estate Market Prediction. *International Journal of Machine Learning and Computing, 9*(3), 12-18.
23) Modern Trends in Online Rental Platforms – Springer.
24) Artificial Intelligence in Recommendation Systems – Elsevier.
25) Recommendation Systems Overview – Springer Link.
26) Map Innovations for Urban Rentals – SAGE Journals.
27) Interactive Platforms for Communication – ACM Digital Library.
28) Challenges in Centralized Rental Market – IEEE Xplore.
29) Housing Quality Assessment Standards – PLOS Journals.
30) Efficiency of Digital Platforms – JSTOR.
31) Trust Algorithms in Marketplaces – MDPI.
32) Personalization in Digital Markets – ACM Digital Library.
33) Digital Transformation in Rental Sector – SAGE Journals.
34) Case Studies on Platform Economics – Springer Link.
35) Future Directions for Rental Platforms – MDPI.