Personalized Travel Recommendation System Using Machine Learning

Bhargava H C
Department of Computer Science
Bangalore Institute Of Technology
Bengaluru, India
1BI19CS039@bit-bangalore.edu.in

Vijay
Department of Computer Science
Bangalore Institute Of Technology
Bengaluru, India
1BI19CS185@bit-bangalore.edu.in

Suhas M
Department of Computer Science
Bangalore Institute Of Technology
Bengaluru, India
1BI19CS156@bit-bangalore.edu.in

Yashas V
Department of Computer Science
Bangalore Institute Of Technology
Bengaluru, India
1BI16CS350@bit-bangalore.edu.in

Prof. Sunanda H G
Department of Computer Science
Bangalore Institute Of Technology
Bengaluru, India
sunandahg@bit-bangalore.edu.in

ABSTRACT

The tourism industry significantly contributes to economic development and can greatly benefit from the utilization of recommendation systems. These computer-based tools aim to predict and suggest items of high interest to users from a vast pool, facilitating personalized choices aligned with their preferences and interests. By leveraging user and item attributes alongside specific algorithms, recommendation systems address the challenge of data overload on the World Wide Web. Their primary purpose is to offer users a curated selection of products or content, eliminating the need to sift through a massive number of web pages. However, the tourism industry currently lacks a platform that provides personalized information about tourist attractions. To bridge this gap, we propose a hybrid approach that combines content and collaborative filtering methods to develop a personalized travel recommendation system. This system takes into account user preferences, profiles, and past experiences to recommend the best attractions in a specific location. By analyzing the preferences and behaviors of users, as well as their appreciation of previously visited places, the system generates accurate and tailored recommendations. Our research focuses on building a robust recommendation system for the tourism industry, aiming to enhance the overall tourist experience. The system goes beyond simple location-based suggestions by considering individual preferences and interests. With the ability to recommend not only attractions but also local dining and shopping options, the system provides comprehensive support for travelers, making their trip planning process more efficient and enjoyable. In conclusion, our personalized travel recommendation system utilizes a hybrid approach, leveraging content and collaborative filtering techniques, to offer accurate and tailored suggestions to tourists. By providing personalized information about local attractions and facilitating choices aligned with user preferences, our system aims to enhance the tourist experience and contribute to the growth of the tourism industry.

Keywords: *Recommendation systems, Personalized travel recommendation system, Machine Learning, Cosine similarity, SVD algorithm*

1. INTRODUCTION

A Travel Recommendation System is a recommendation system used by tourists and travelers to fulfill their needs, making it easier for users to make decisions such as selecting travel destinations, finding nearby Points of Interest (POI), restaurants, and determining the shortest travel distance and accommodation. Generally, travel recommendation systems are classified into generic types and personalized types. Generic recommendation systems provide destination details such as tourist attractions near Kashmir, while personalized recommendation systems require personal preferences such as gender, type of vacation, number of people, and duration of the trip.

In the tourism field, recommendation systems aim to match the characteristics of tourism and leisure resources or attractions with the user needs. This often involves the use of various recommendation techniques, including stereotypes (standard tourist segments), content-based and collaborative filtering techniques, personalized approaches, and ontology-based approaches.

Tourism plays a vital role in boosting the economy of India. The country's tourism industry generates substantial national revenue each year, offering additional benefits such as exposure to the world, globalization, and cultural exchange with foreigners. Consequently, there is a responsibility to develop tourism further and elevate it to new heights through increased efforts.

2.LITERATURE SURVEY

In the field of recommendation systems, several approaches have been explored to provide effective recommendations. A brief literature survey reveals various techniques and challenges associated with recommendation systems.

Mr. Wagh Rohan et al. (2018) proposed a personalized Travel Recommendation System (TRS) that utilizes travelogue data and community-contributed data to recommend Points of Interest (POIs) to users. They employed the Naïve Bayes algorithm for package selection and content-based collaborative filtering (CBCF) for POI recommendations. However, Naïve Bayes assumes independence among predictors, limiting its applicability in real-world scenarios.

Theriana Ayu et al. (2022) proposed a TRS that uses the Cosine Similarity Algorithm with content-based filtering. While the approach provides accurate recommendations considering various aspects, it does not account for differences in rating scale between users.

Xun Zhou et al. (2019) proposed an incremental algorithm based on Singular Value Decomposition (SVD) for recommender systems. They combined the Incremental SVD algorithm with the Approximating Singular Value Decomposition (ApproSVD) algorithm, addressing scalability issues. However, building an SVD model can be time-consuming, and ApproSVD has limitations in processing growing massive data.

Qilong Ba et al. (2020) proposed a clustering collaborative filtering recommendation system based on the SVD algorithm. Their approach aimed to improve the accuracy of collaborative filtering by combining clustering algorithms with SVD. However, the method is prone to biases if clusters are formed under biased opinions.

Theriana Ayu Waskitaning Tyas et al. (2022) proposed a tourist places recommendation system using the Cosine Similarity and Singular Value Decomposition methods. Their system utilized reviews from Trip Advisor and compared the results of the two algorithms using the Root Mean Square Error method. However, RMSE is dependent on the scale of the data and can be influenced by the size of the test sample.

3.EXISTING MODELS

Existing personalized travel recommendation systems leverage various techniques and data sources to provide tailored recommendations to users based on their preferences, interests, and constraints. These systems aim to enhance the travel experience by suggesting relevant destinations, accommodations, activities, and itineraries.

One of the key components in these systems is user profiling, which involves collecting and analyzing user information such as past travel history, demographic data, social media activity, and explicit preferences expressed through user feedback. This information is used to create personalized user profiles that capture individual travel preferences and behavior patterns.

The recommendation algorithms employed in these systems utilize both collaborative filtering and content-based filtering approaches. Collaborative filtering analyzes the behavior and preferences of similar users to generate recommendations, while content-based filtering relies on item attributes and user preferences to make personalized suggestions. Hybrid approaches that combine both techniques are also commonly used to improve recommendation accuracy.

Evaluation of personalized travel recommendation systems involves metrics such as accuracy, diversity, novelty, and serendipity of recommendations. User feedback and ratings play a crucial role in refining the system's recommendations over time Overall, personalized travel recommendation systems leverage user profiling, recommendation algorithms, and various data sources to deliver tailored recommendations that match individual preferences and enhance the travel experience. Ongoing research focuses on addressing challenges such as cold start problems, data sparsity, and privacy concerns to further improve the effectiveness and personalization of these systems.

4. METHODOLOGY

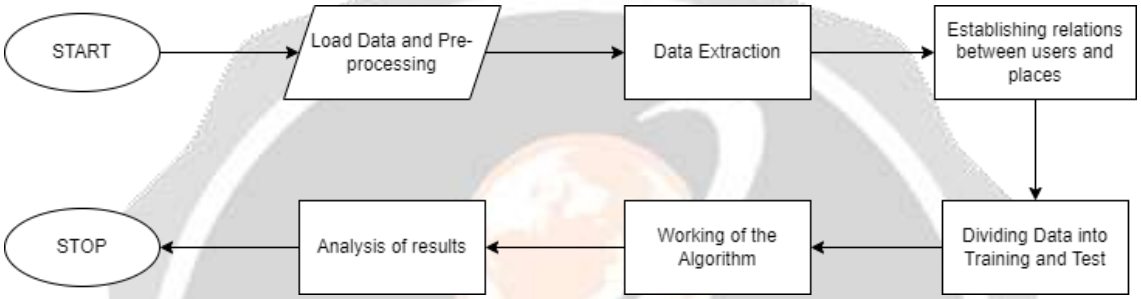

Fig -1 Methodology of proposed system

The methodology for our research project consists of several stages to develop a personalized travel recommendation system using machine learning. The first stage is to load data and perform preprocessing. We collect data from users through a form displayed to them, allowing them to provide information about their preferences, such as the type of vacation, preferred destinations, and specific interests.

After the data is collected, the next stage is data extraction. We extract relevant information from the collected data, including the user's preferences, profile, and previous travel experiences. This extracted data serves as the foundation for generating personalized recommendations.

In the third stage, we establish relations between users and places by analyzing their preferences and previous experiences. This step helps us understand the individual preferences and interests of users and their suitability for different travel destinations.

Once the data is processed and relationships are established, we move on to the fourth stage, which involves dividing the data into training and test sets. This division allows us to train our machine learning model using the training set and evaluate its performance using the test set.

The fifth stage focuses on the working of the algorithm. We employ machine learning techniques such as cosine similarity and Singular Value Decomposition (SVD) to analyze the user data and generate personalized recommendations. The algorithm takes into account the extracted features and preferences to identify the best attractions and places for each user.

Finally, in the sixth stage, we analyze the results obtained from the recommendation system. We evaluate the accuracy and effectiveness of the system by comparing the recommended attractions with the user's actual preferences and feedback. This analysis helps us assess the performance of the system and identify areas for improvement.

By following this methodology, our research aims to develop a personalized travel recommendation system that leverages user preferences, profile data, and machine learning algorithms to provide accurate and tailored recommendations for tourist attractions.

5. RESULTS

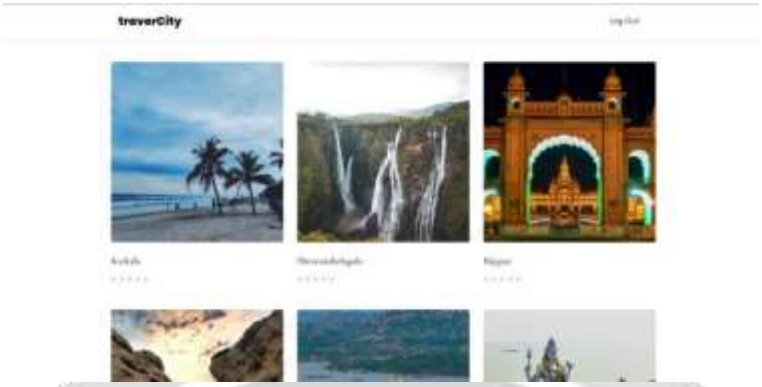

Fig -2 Recommendation Page

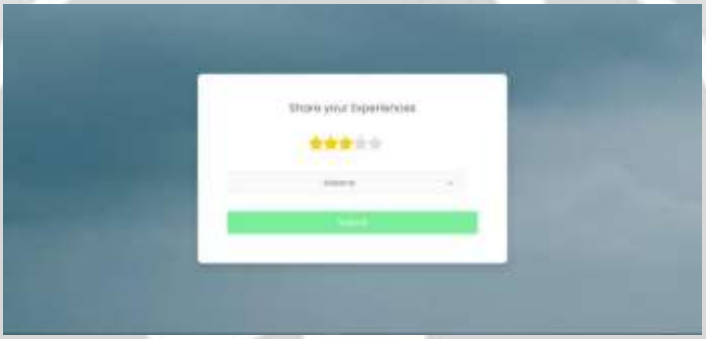

Fig -3 Rating Page

6. EVALUATION

We focused on the evaluation of a personalized travel recommendation system. The main objective was to assess how effectively the system predicts users' preferences and matches them with relevant travel options. To accomplish this, we employed various evaluation metrics, including precision, recall, and F1 score, which were used to compare the recommended items with the user-provided data. Additionally, we utilized a confusion matrix to gain further insights into the performance of our recommendation system

Classification Report:

	precision	recall	f1-score	support
0	0.20	0.25	0.22	4
1	0.97	0.96	0.96	95
accuracy			0.93	99
macro avg	0.58	0.60	0.59	99
weighted avg	0.94	0.93	0.93	99

Fig -4 Classification Report

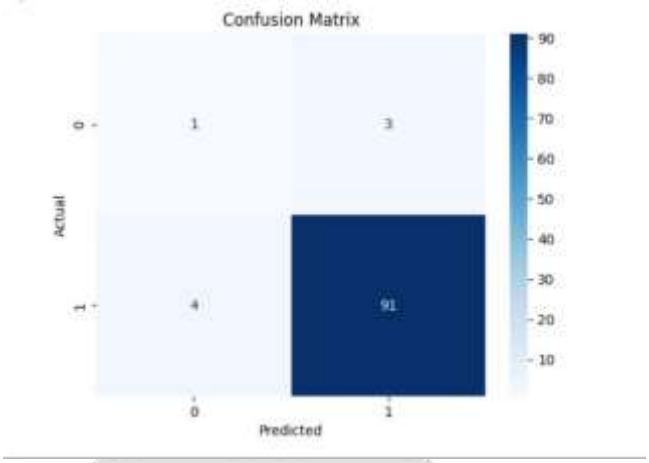

Fig -5 Confusion Matrix

7. CONCLUSION

In conclusion, this research project successfully developed a travel recommendation system that effectively provides personalized travel recommendations to users. By incorporating users' interests, preferences, and travel history, the system ensures that the recommendations are tailored to their individual needs. The combination of cosine similarity and Singular Value Decomposition (SVD) algorithms contributes to the accuracy of the recommendations and helps address the cold start problem often encountered in recommendation systems.

The modular architecture of the system allows for easy integration with other systems and future enhancements. This flexibility ensures that the system can adapt to changing technological requirements and accommodate additional features or data sources as needed. The system's modular nature also facilitates scalability, enabling it to handle larger user bases and increasing volumes of data.

Overall, the travel recommendation system presented in this paper has the potential to greatly enhance the travel experience for users. By providing personalized and relevant recommendations, the system assists users in discovering new destinations, attractions, and activities that align with their preferences. This personalized approach not only saves users time and effort in planning their trips but also enhances their overall satisfaction by offering recommendations that resonate with their individual interests.

8. FUTURE SCOPE

Our proposed approach for personalized travel recommendation has shown promising results. However, there is still room for improvement, and future research can focus on the following areas:

- Integration with social media: You could integrate the system with social media platforms like Instagram and Facebook to allow users to share their travel experiences and recommendations with their friends and followers. This could help to expand the system's reach and improve its accuracy by incorporating more personalized data.
- Mobile application development: You could develop a mobile application to make the system more accessible to users on the go. The application could include features like real-time recommendations based on location, user reviews and ratings, and personalized travel itineraries.
- Integration with booking platforms: You could integrate the system with popular travel booking platforms like Expedia or Booking.com to enable users to make reservations directly from the recommendation system. This could streamline the travel booking process and provide users with a more comprehensive travel planning experience.
- Expansion to other domains: You could consider expanding the system to recommend other domains like restaurants, activities, or events based on user interests and preferences. This could help to make the system more versatile and provide users with a more comprehensive travel planning experience.

By addressing these areas of future research, the personalized travel recommendation system can continue to evolve and deliver even more accurate, timely, and user-centric recommendations. These advancements will contribute to enhancing the overall travel experience for users and providing them with personalized and relevant travel recommendations.

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