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Travel Package Recommendation System Using Collaborative Filtering Method at Loka Travel

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***Abstract*— The rapid advancement of information technology has increased the need for intelligent systems capable of assisting tourists in determining travel destinations that align with their preferences, interests, and previous experiences. To address this challenge, the Loka Travel application was developed as a web-based platform designed to provide users with a wide selection of tour packages while incorporating a recommendation system that suggests relevant and personalized destinations. This study aims to design and implement a tour package recommendation system using the Collaborative Filtering (CF) method with a memory-based approach. The CF method operates by calculating the degree of similarity between users based on their historical ratings and booking records for tour packages. Through this process, the system can recommend packages that are favored by other users who share similar interests and behavioral patterns. The cosine similarity algorithm is employed to measure user similarity, utilizing interaction data obtained from booking and payment activities within the application environment. The implementation of this recommendation system was carefully carried out using the Laravel framework as the web development platform and the MySQL database for data management. System performance testing was conducted to evaluate the accuracy of the generated recommendations. The experimental results show that the system achieves an accuracy rate of 80.63%, as measured by the Mean Absolute Error (MAE) metric. These findings clearly indicate that the proposed system can effectively assist users in discovering suitable tourist destinations, enhance their decision-making process, and improve the overall user experience when interacting with the Loka Travel application.**

***Keywords*— Recommendation systems; Collaborative Filtering; Cosine Similarity;**

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I. INTRODUCTION

Tourism is one of the economic sectors experiencing rapid growth in Indonesia. With its diverse natural and cultural wealth, Indonesia offers a wide variety of tourist destinations that attract both domestic and international visitors. However, the abundance of destination options often makes it difficult for tourists to determine which destinations best suit their preferences. This situation creates a need for a system that can assist tourists in selecting appropriate destinations [1][3].

Recommendation systems have become an effective solution for helping users find information or products that align with their preferences. In the context of tourism, recommendation systems can provide destination suggestions based on users' previous preferences and behaviors. One commonly used method in recommendation systems is Collaborative Filtering, which works by analyzing similarities among users to generate relevant recommendations [2].

The Collaborative Filtering method offers advantages in providing personalized recommendations, as it considers the preferences of other users who share similar interests with the active user. Several studies have implemented this method in tourism recommendation systems, such as the Heritage tourism recommendation system in Semarang and the tourism destination recommendation system in Aceh. The results of these studies indicate that Collaborative Filtering can improve both recommendation accuracy and user satisfaction [7].

Based on this background, this study aims to develop a tour package recommendation system within the Loka Travel application using the Collaborative Filtering method. This application is expected to help users select tour packages that match their preferences by analyzing their previous interaction data. The system is developed using the Laravel framework and a MySQL database, and it applies the cosine similarity algorithm to calculate the similarity between users [4][9].

II. Research Method

This research is categorized as applied research with a quantitative approach, focusing on the implementation of the Collaborative Filtering (CF) method for a web-based tour package recommendation system. The study is also experimental in nature, as it involves testing the accuracy and performance of the developed recommendation system. The Collaborative Filtering technique was chosen because it has been proven to be effective in providing accurate and personalized recommendations based on the preferences of other users who exhibit similar behavioral patterns. Through this approach, the system can dynamically adapt to user behavior, allowing continuous improvement of recommendation quality over time.

A. System Architecture

The proposed system is designed using a client-server architecture, where users access the Loka Travel application through a web-based interface. Each user can log into the system, browse and select available tour packages, and make bookings directly within the platform. Once a booking or rating is completed, the system automatically records this data to update the interaction matrix. The recommendation module then utilizes these data to generate new suggestions for the active user based on other users who exhibit similar rating or booking patterns. This process ensures that recommendations are adaptive, data-driven, and aligned with user preferences.

B. Collaborative Filtering Method

The Collaborative Filtering (CF) method is a recommendation approach that leverages the experiences and behaviors of other users to predict which items a particular user might prefer. In this study, the Memory-Based User-Based Collaborative Filtering approach is applied. This approach uses user rating data as input and computes the similarity between users based on the tour packages they have rated. The resulting similarity scores are then used to generate personalized recommendations for each user [6][7].

C. User Similarity Calculation

The similarity between users is calculated using Cosine Similarity, which is popular in recommendation systems because it is simple and efficient. The cosine similarity formula is as follows:

$$\cos(U_1, U_2) = \frac{\sum_{i=1}^{n}(U_{1i} \cdot U_{2i})}{\sqrt{\sum_{i=1}^{n} U_{1i}^2} \cdot \sqrt{\sum_{i=1}^{n} U_{2i}^2}} \quad (1)$$

Where:

U_{1i} = user 1's rating for item i

U_{2i} = user 2's rating for item i

n = number of items that are rated equally by both users

This method is chosen because it is suitable for handling sparse data such as in a travel recommendation system [8].

D. Determining Recommendations

After the similarity between users is calculated, the system will:

1. Take the most similar user (highest cosine value).
2. View the tour packages that have been selected by the similar user.

Display packages that have never been selected by active users as recommendations [9][10].

III. Results

After the recommendation system is implemented using the Collaborative Filtering method in the Loka Travel application, testing is carried out to ensure that all features run well and the recommendation system functions as it should. The results of this implementation are displayed in several interface displays and the following system outputs:

A. User Dashboard Display

After the user logs in, the system will display a dashboard page containing a list of tour packages and several recommendations that appear based on the booking history of other users who have similar behavior.

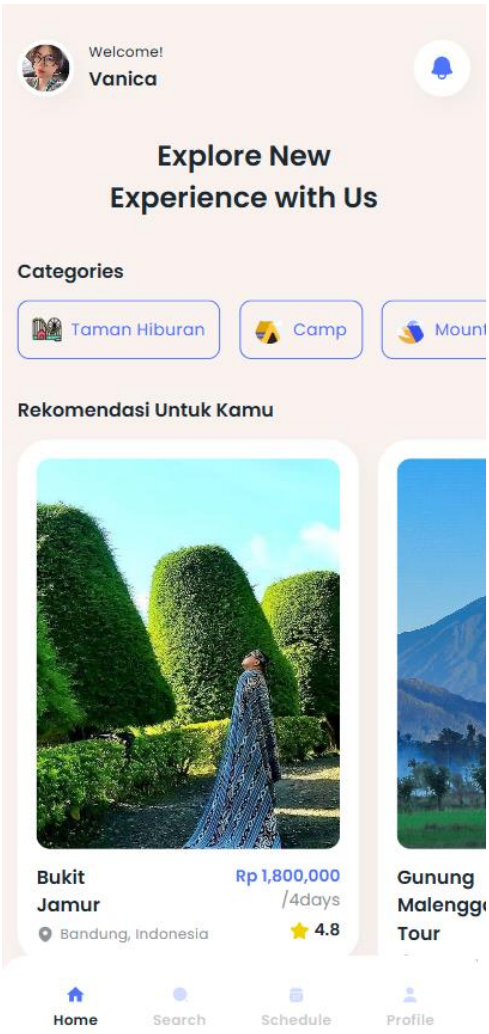

Fig. 1. User Dashboard Display

The image displays a user interface design of a travel recommendation mobile application. The screen greets the user with a personalized message, "Welcome! Vanica," and presents the main heading "Explore New Experience with Us", indicating that the app encourages users to discover new travel destinations.

Below the heading, there is a "Categories" section containing selectable options such as "Taman Hiburan" (Amusement Park), Camp, and Mountain, each represented with an icon. These categories help users filter destinations based on their preferences.

The next section titled "Rekomendasi Untuk Kamu" (Recommendations for You) showcases personalized travel package suggestions. The first recommendation card displays a destination called Bukit Jamur, located in Bandung, Indonesia. The card includes an image of the location, the price (Rp 1,800,000 for 4 days), and a user rating of 4.8 stars.

At the bottom of the interface, a navigation bar provides quick access to main features of the application: Home, Search, Schedule, and Profile.

Overall, this image illustrates a clean, user-friendly mobile interface that integrates personalized travel recommendations through an engaging and modern design.

B. Booking History and Automatic Rating

Every time a user completes a booking and payment, the system automatically gives a rating of 5 to the selected tour package. This data is then used to form an interaction matrix between users.

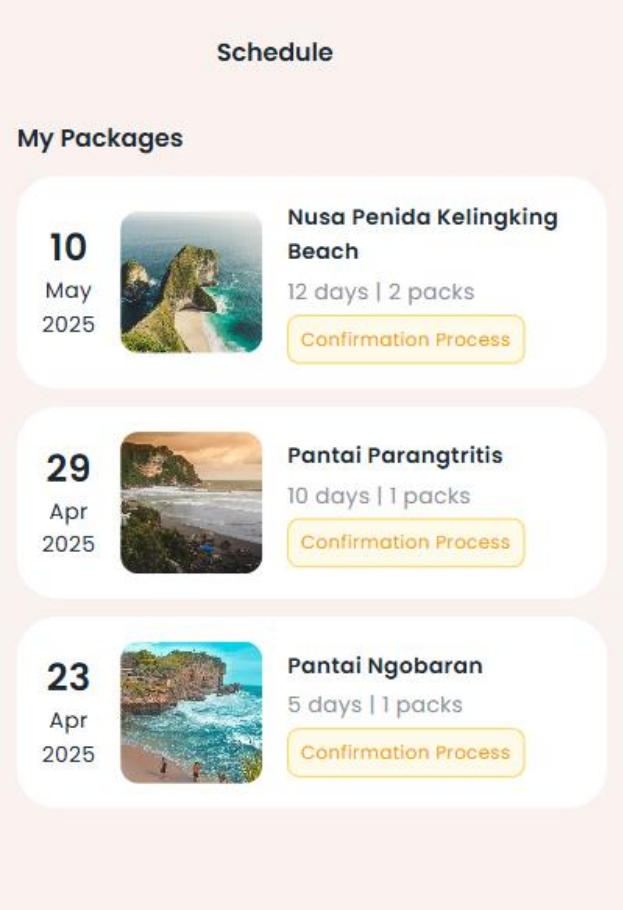

Fig. 2. Booking history display

The image shows the "Schedule" page of a travel booking or recommendation mobile application. This section, titled "My Packages," provides an organized list of travel packages that the user has booked or is in the process of confirming.

Each entry displays key trip information in a clean, card-style layout:

1. On the left side, the date of the trip is shown in bold format (day, month, and year).
2. On the right side, each card includes:
   - A thumbnail image of the travel destination.
   - The destination name, such as Nusa Penida Kelingking Beach, Pantai Parangtritis, and Pantai Ngobaran.
   - The trip duration (e.g., 12 days, 10 days, 5 days) and the number of packages booked (e.g., 2 packs, 1 packs).
   - A yellow-labeled button indicating the "Confirmation Process", suggesting that these bookings are awaiting verification or approval.

The design uses soft colors and consistent typography, giving the interface a modern and minimalist appearance. Functionally, this page helps users easily track their upcoming travel plans, monitor the status of their bookings, and manage their travel schedules efficiently within the application.

C. Recommendations Based on User Similarity

The system recommends tour packages that have never been selected by active users, but have been selected by other users who have high similarities. This process is carried out automatically using the *RecommendationService,* Service Class that has been embedded in the Laravel backend.

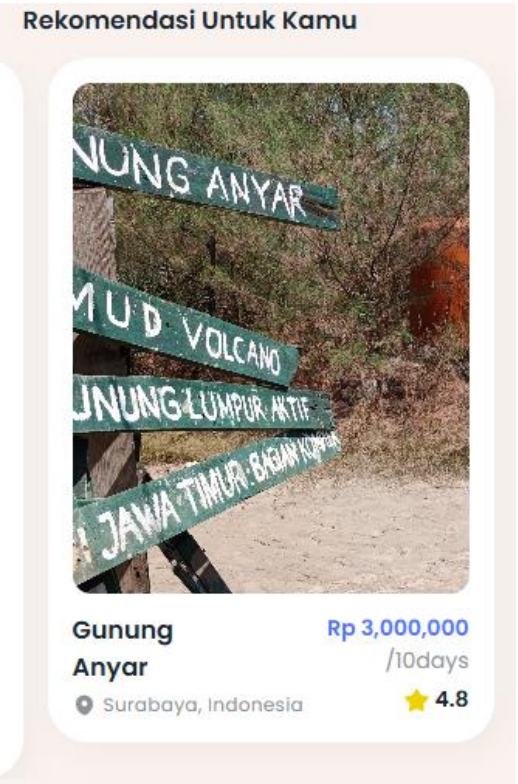

Fig. 3. Results of system recommendations on the user page (1)

Fig. 4. Results of system recommendations on the user page(2)

1. First Image – Gunung Anyar

The first card showcases Gunung Anyar, a natural destination located in Surabaya, Indonesia. The visual element includes a photo of wooden direction signs pointing toward local attractions such as "Mud Volcano" and "Gunung Lumpur Aktif," highlighting its geological and outdoor tourism appeal.

- Price: Rp 3,000,000
- Duration: 10 days
- Rating: ★ 4.8

This card provides essential information including location, cost, trip duration, and user rating, helping travelers make informed decisions.

2. Second Image – Gunung Agung

The second card features Gunung Agung, a famous mountain located in Denpasar, Indonesia. The accompanying image displays a scenic view of the mountain surrounded by lush greenery and small traditional houses, emphasizing natural beauty and cultural harmony.

- Price: Rp 2,400,000
- Duration: 8 days
- Rating: ★ 4.8

The layout follows a consistent design, ensuring clarity and visual balance with key travel details such as destination name, cost, duration, and rating.

Overall, both images represent how the Loka Travel application delivers personalized travel package recommendations in a visually appealing and user-friendly format, encouraging users to explore various natural destinations in Indonesia.

D. Recommendation Function Testing

Testing was conducted on five users to see the system's response to the process of calculating interaction, similarity, and recommendation results. The system execution time from matrix creation to recommendation output was on average below 7 seconds.

TABLE I. SYSTEM RESPONSE TO THE PROCESS OF CALCULATING INTERACTIONS, SIMILARITY AND RECOMMENDATION RESULTS

User	Matrix Creation	Cosine Similarity	Generate Recommendations	Total Time
User 1	4.90 s	0.02 s	0.01 s	4.93 s
User 2	5.30 s	0.04 s	0.10 s	5.44 s
User 3	5.50 s	0.03 s	0.12 s	5.65 s
User 4	5.56 s	0.03 s	0.11 s	5.70 s
User 5	4.68 s	0.02 s	0.01 s	4.71 s

E. System Accuracy Testing

Accuracy evaluation is done using the Mean Absolute Error (MAE) method. The average MAE result is 0.9689, which means the system has a low level of prediction error.

MAE formula:

$$MAE = \frac{1}{n}\sum_{i=1}^{n}\left|y_{i,\text{pred}} - y_{i,\text{true}}\right| \quad (2)$$

With calculated accuracy:

$$\text{Accuracy} = \left(\frac{5-MAE}{5}\right) \times 100\% \quad (3)$$

below 7 seconds.

TABLE II. SYSTEM RESPONSE TO THE PROCESS OF CALCULATING INTERACTIONS, SIMILARITY AND RECOMMENDATION RESULTS

Fold	MAE	Accuracy (%)
1	0.96637	80.67%
2	0.96817	80.63%
3	0.96733	80.65%
4	0.96847	80.63%
5	0.97108	80.57%
Average	0.9689	80.63%

Based on the implementation and testing results, the recommendation system built has run as expected. The system is able to provide recommendations automatically to users based on the preferences of other similar users, without the need for manual intervention. The accuracy value obtained is quite high (80.63%), which indicates that the Collaborative Filtering method with the cosine similarity approach is effective in the context of the Loka Travel application.

IV. CONCLUSION

Based on the results of the research and implementation that has been done, it can be concluded that the Collaborative Filtering-based tour package recommendation system on the Loka Travel application has been successfully built and functions well. This system can provide relevant recommendations based on the similarity of user behavior in ordering tour packages. The Memory-Based Collaborative Filtering method with the Cosine Similarity algorithm has been proven to be able to calculate similarities between users efficiently. This system has succeeded in recommending tour packages that have never been selected by active users but are liked by other similar users, with a recommendation accuracy level reaching 80.63% based on MAE testing. The use of Laravel as a web development framework has been proven to support the implementation of system features well and allows modular recommendation system integration through Service Class.

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