JMSCOWA 6 (1) (2025) Pages:. 1-4

Journal homepage: https://pcijournal.org/index.php/jmscowa

Journal of Mathematics and Scientific Computing with Applications

Published: Pena Cendekia Insani

IMPLEMENTATION OF A CULINARY TOURISM RECOMMENDATION SYSTEM FOR MEDAN CITY USING THE COLLABORATIVE FILTERING METHOD

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Article Info

Article history:

Received 07 07, 2024
Revised 09 25, 2024
Accepted 12 30, 2024

Keywords:

Sistem Rekomendasi, Collaborative Filtering, K-Means, Pearson Correlation Coefficient.

ABSTRACT

Culinary tourism has its own appeal for tourists visiting an area, but the tourists who come may not necessarily know the culinary offerings in that area, so a system is needed that can provide recommendations to tourists. A recommendation system is a system that can provide suggestions to its users regarding a particular item, and the suggestions given are used in various decision-making processes. The method used is Collaborative Filtering. The problem is how to apply the Collaborative Filtering method to recommend food with many influencing factors, resulting in a relevant recommendation. The recommendation process involves grouping users into a specific group through the clustering process using the K-Mean method, after which the software calculates the similarity between the user and the group members. The calculation of similarity between users and their group members uses the Pearson correlation coefficient formula. The determination of the recommendation results provided uses a ranking system with the highest recommendation values. The data used consists of 18 food data, 100 training data, and 10 testing data. The results of the relevance percentage test reached 80%.

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1. INTRODUCTION

Collaborative filtering is a subfield of machine learning used to create algorithms that can predict customer preferences based on the activities of a group of customers, such as purchases or ratings given to a product or item [1]. Collaborative filtering will work by collecting user behavior, differences and similarities among users in a specific domain, and providing results to users in the form of ratings for items in that domain [2].

In recent years, extensive research has been undertaken on the application of collaborative filtering systems. The research conducted by [3] employed user similarity aggregation to enhance the efficacy of the collaborative filtering technique for user-rating data.

A separate investigation into the collaborative filtering method, as detailed in [4], demonstrates the implementation of this technique alongside the k-nearest neighbor graph to enhance the efficiency of recommendation generation and minimize system execution duration.

Recommendation systems are extensively utilized across several domains, such as the tourism sector, where they offer choices for tourist sites based on visual matching and user inputs. This study will present recommendations derived from user patterns or behaviors seen within the system.

Building on prior studies demonstrating the efficacy of collaborative filtering in recommending tourist destinations and news articles, the researcher seeks to apply this strategy to meal recommendations. Numerous factors influence meal recommendations, including personal preferences, individual behaviors, and diverse cultural backgrounds. The researchers want to determine the applicability of the collaborative filtering method in meal suggestions, considering various affecting aspects.

This project seeks to assess the significance of recommendation outcomes derived from the collaborative filtering process within the Medan City Culinary Tourism Recommendation System and to identify an algorithm capable of suggesting meal options.

2. RESEARCH METHODE

A. Collaborative Filtering

Collaborative filtering is a subset of machine learning that develops algorithms that forecast customer preferences based on the behaviors of a collective of customers, such purchases or ratings assigned to a product or item [1].

Collaborative filtering is a methodology utilized in recommendation systems that has been extensively implemented across many applications. Collaborative filtering posits that users with analogous preferences would exhibit similar selections. It operates by aggregating user behavior, distinctions, and resemblances inside a designated domain, subsequently delivering outcomes to users as item ratings within that area [2].

B. K-Means

K-means clustering adalah metode pembagi yang berfungsi membagi data set dari N item kedalam k disjoint dari subset S_j yang mengandung N_j item sehingga mereka akan dekat menurut ukuran jarak tertentu. Masing-masing cluster ditentukan oleh N_j anggota dan centeroid λj. Centeroid dari masing- masing cluster adalah titik minimum dari jumlah jarak semua item [5]

Algoritma k-means bekerja dengan memilih k centeroid secara acak, jumlah centeroid akan mengindikasikan jumlah cluster. Selanjutnya semua item dari subset Sj akan dimasukkan kedalam cluster yang memiliki jarak centeroid terdekat. Centeroid dari masing-masing cluster akan di- update berdasarkan item yang terdapat pada cluster tersebut. Operasi ini akan terus dilakukan sampai nilai centeriod tidak ada mengalami perubahan [6]

C. Recall dan Precision

The computation of recall and precision is predicated on the software's suggestions, encompassing both shown and undisplayed data, in relation to the volume of food data. The software's recommendations are reassessed by the user to confirm their alignment with personal preferences.

The formula for calculating recall is the number of recommendations accepted by users divided by the total number of recommendations displayed and not displayed. The precision formula is calculated by dividing the number of recommendations accepted by the user by the total number of recommendations displayed.

3. RESULT AND ANALYSIS

A. Analysis of the Recommendation Process

The recommendation process is the final step in the recommendation system. This process serves to display food recommendations obtained from the results of calculations of user similarities. Food recommendations are displayed based on the highest recommendation values.

B. Software Requirements Analysis

The analysis of software requirements in this research consists of three points: a general description of the software, software requirements specifications, and use case models.

a) General Description Software

The developed software is a program that can provide food and dining place recommendations. The recommendations provided are based on data obtained from questionnaires as well as the researchers' observations. The software has the following features:

i. Can receive feedback in the form of food ratings given by users.
ii. Can produce output in the form of food recommendations sorted by the highest rating
iii. Can search for food based on the name of the food entered.

b) Software Requirements Specification

The software developed in this research is expected to meet the functional requirements in Table 1 and the non-functional requirements in Table 2.

Table 1. Functional Requirements of Software

No.	Needs
1.	The software enables user login.
2.	The software enables user login.
3.	Software can offer culinary suggestions.
4.	The app enables users to evaluate meals.
5.	The app enables users to search for food by its name.
6.	The software is capable of doing user clustering with the K-Means Clustering technique.
7.	The software can utilize the outcomes of K-Means Clustering to compute ratings through the Collaborative Filtering Method.

Table 2. Non-Functional Software Specifications

No.	Need
1.	The app features an intuitive and accessible interface.

A. Implementation of Interface

The graphic below illustrates the implementation of the interface derived from the design presented in the preceding chapter.

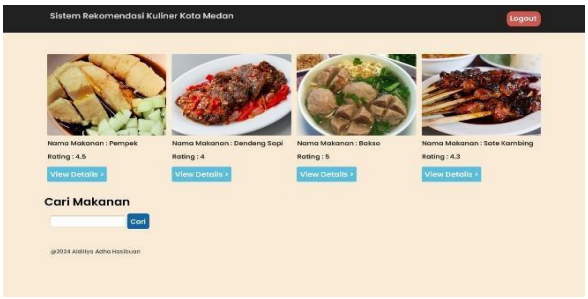

Figure 1. User Interface

B. Software Testing Results

The outcomes of the preceding black box testing phase indicate that the performance of the Palembang culinary tourist recommendation system is commendable and operates effectively. The completion of the test case scenarios indicates that all outcomes were "accepted" or fulfilled expectations. Subsequently, a comprehensive elucidation of the outcomes, analysis, and experimental methodologies pertaining to the data set.

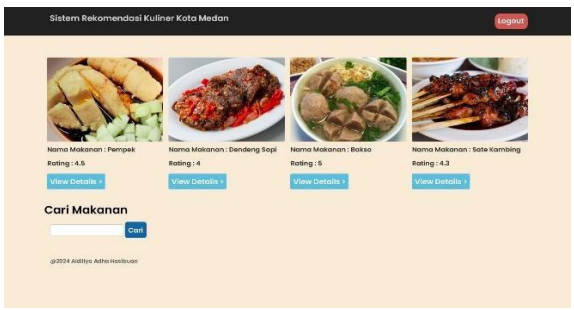

Figure 2. Examination Outcomes

4. CONCLUSION

This work built a Culinary Tourism Recommendation System for the City of Medan utilizing the Collaborative Filtering approach. The outcomes of the recall and precision evaluations of the system were 15.556% and 70%, respectively. The relevancy score is 80%, as determined by user evaluations. The Mean Absolute Error test results with the Collaborative Filtering approach are 0.723948146.

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