Report on

User-Based Meal

Recommendation System

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1. Abstract: - This report presents the design and implementation of a user-based meal recommendation system using Python and the Scikit-learn library. The system leverages three main data sources: user profiles, recent activity, and a primary meal dataset. The objective is to offer personalized meal recommendations based on a user's dietary preferences and recent interactions with the platform.

The system is encapsulated within a Recommender class, which incorporates various methods to achieve its recommendation goals. These methods include feature extraction, finding similar users, identifying similar meals, user-based recommendations, and recent activity-based recommendations.

The report outlines the functionality of each method and explains how they contribute to generating meal recommendations. The system combines both user-based and recent activity-based recommendations to provide a comprehensive list of suggested meals for a specific user.

Dataset-used:

- ✓ "*user_Profiles.csv*"
- ✓ "recent_activity.csv"
- ✓ "dataset.csv"

The effectiveness of the recommendation system relies on the quality and diversity of the underlying datasets, the choice of similarity metrics, and the number of neighbors used in the recommendation process. Further optimization and evaluation may be required to enhance the system's performance and user satisfaction.

In summary, the user-based meal recommendation system offers a personalized approach to meal suggestions, considering the user's dietary preferences and recent interactions, with the potential to enhance user engagement and satisfaction.

1.1 Keywords: - *Scikit-learn, feature extraction, neighbors.*

2. Introduction

In today's digital age, personalized recommendations have become an integral part of various online platforms, ranging from e-commerce to content streaming services. The ability to provide users with tailored suggestions not only enhances

their experience but also increases user engagement and satisfaction. This report introduces a user-based meal recommendation system, implemented in Python using the Scikit-learn library, designed to offer personalized meal recommendations to users based on their dietary preferences and recent activities.

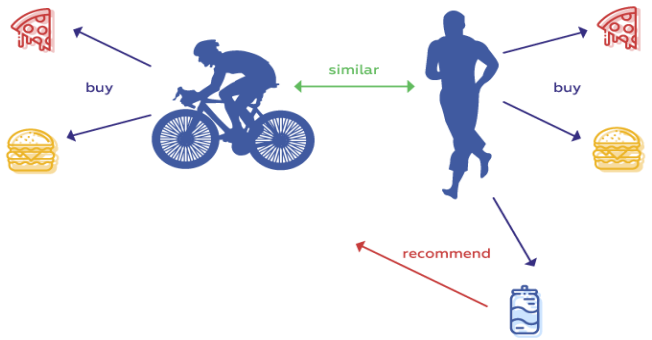

Figure 1: Recommendation System

The user-based meal recommendation system discussed in the report is designed to provide personalized meal recommendations to users based on their dietary preferences and recent activities. The system utilizes user profiles, recent activity data, and a main dataset of meals to generate recommendations. It employs methods such as feature extraction, finding similar users, K-nearest neighbors for meals, user-based recommendations, recent activity-based recommendations, and combines them to offer a comprehensive list of suggested meals. The efficacy of the system depends on the quality of data and various parameters, and further optimization and evaluation may be necessary for improved performance. Overall, the system aims to enhance user experience and satisfaction by providing tailored meal suggestions.

3. System Overview

The "User-Based Meal Recommendation System" is an advanced application designed to provide personalized meal recommendations to users by utilizing a combination of user profiles, recent activity data, and a comprehensive dataset of meals. This section provides an in-depth overview of each of these components and their roles in the system.

3.1. User Profiles

Purpose: User profiles serve as the foundation of the recommendation system, as they contain valuable information about each user's dietary preferences, health conditions, and nutrient preferences.

Attributes: A user profile is associated with a unique User_Id and includes attributes like dietary preferences, specific diseases or health conditions, and preferred nutrients.

Usage: The system uses this information to identify users with similar profiles, allowing for the creation of tailored meal recommendations that align with the user's dietary and health requirements

3.2. Recent Activity Data

Purpose: Recent activity data provides real-time insights into the actions and behavior of the current user on the platform. It plays a crucial role in understanding the user's latest interactions and preferences.

Activities Tracked: The system records a range of user activities, including liked meals, rated meals, search queries, and purchased meals.

Usage: Recent activity data is employed to ensure that the meal recommendations are up-to-date and relevant to the user's most recent interests and behavior.

3.3. Dataset of Meals

Purpose: The dataset of meals is the core source of meal information that the recommendation system uses to make informed suggestions. It includes detailed attributes of each meal, aiding in the understanding of meal properties.

Figure 2: Recommended food for fitness

Attributes: Each meal is represented by a unique Meal_Id and features related to nutrient content, meal category, suitability for specific diseases,

dietary attributes, meal description, price, and user reviews.

Usage: The system extracts features from this dataset to create a comprehensive representation of each meal, facilitating the comparison and recommendation process.

4. Recommendation Algorithm

The "User-Based Meal Recommendation System" employs a recommendation algorithm based on user-based collaborative filtering, enhanced by the k-Nearest Neighbors (k-NN) approach.

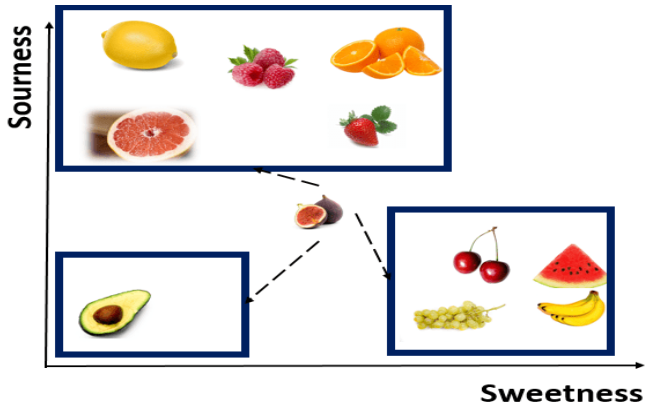

Figure 3: KNN Algorithm

This section provides a detailed overview of the recommendation algorithm, which is at the core of the system's functionality.

4.1. Feature Extraction:

Before the recommendation process begins, the system extracts relevant features from the dataset of meals. These features include nutrient content, disease suitability, and dietary attributes. By converting these attributes into binary values (dummy variables), the system can represent each meal effectively.

4.2. User Identification:

The algorithm starts by identifying users with similar profiles to the current user. It leverages the user profiles' information, including dietary preferences, health conditions, and nutrient preferences.

To identify similar users, the system employs the k-Nearest Neighbors (k-NN) algorithm. The choice of k (the number of neighbors) is crucial, as it determines the degree of similarity considered.

4.3. User-Based Recommendations:

Once similar users are identified and ranked, the system retrieves the recent activities of these top similar users. This includes meals that they have interacted with, such as liked meals, rated meals, searched items, and purchased meals.

To ensure the recommendations are fresh and align with the user's tastes, the system excludes meals that the current user has already reviewed.

4.4. Recent Activity-Based Recommendations:

In addition to user-based recommendations, the system takes into account the user's own recent activity, such as liked meals and search queries. This ensures that the recommendations reflect the user's most recent preferences and actions.

4.5. Final Recommendations:

To provide a comprehensive list of meal recommendations, the system combines both the user-based and recent activity-based recommendations. Duplicate meals are removed to create a list of unique and appealing suggestions.

The final recommendations are presented to the user, offering a variety of meals that align with their dietary preferences, health conditions, and recent interactions with the platform.

The recommendation algorithm's strength lies in its ability to adapt to each user's unique profile and recent behavior. By identifying similar users and considering their preferences and interactions, the system offers personalized meal recommendations, making it a valuable tool for users seeking healthier and more enjoyable meal choices. The k-Nearest Neighbors algorithm is a key component in achieving this level of personalization and relevance in the recommendations.

5. Results

The "User-Based Meal Recommendation System" generates personalized meal recommendations based on user preferences and recent interactions. It considers dietary preferences, health conditions, and nutrient preferences to provide tailored

suggestions. Recent activity data ensures that recommendations are up-to-date. Features are extracted from the meal dataset to enable accurate comparisons. The system uses the k-Nearest Neighbors (k-NN) algorithm to identify similar users and ranks them for recommendations. User-based recommendations leverage the profiles of similar users to suggest meals they have interacted with. Recent activity-based recommendations consider the user's recent interactions, such as liked meals and search queries. The system combines user-based and recent activity-based recommendations to provide

a comprehensive list of suggestions. The final list removes duplicates and allows users to discover meals that match their preferences. The system aims to enhance user experience and satisfaction by offering personalized meal recommendations.

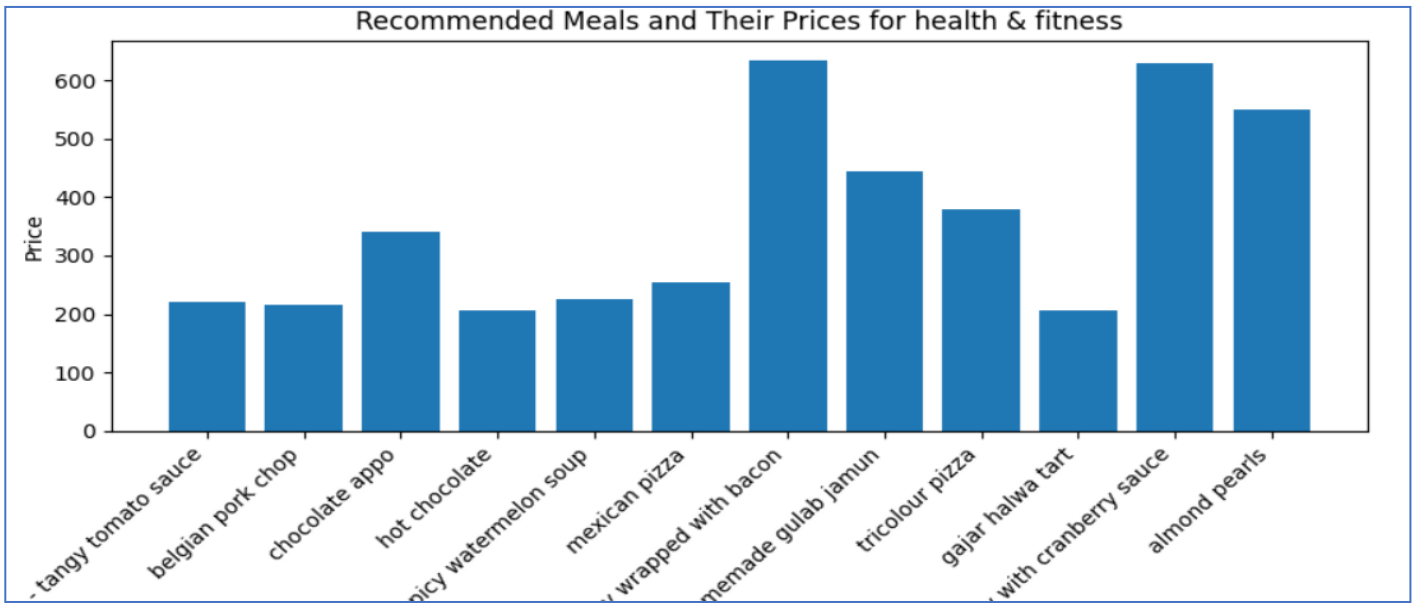

Figure 4: Graph for recommended Meal

The "User-Based Meal Recommendation System" has the potential to significantly enhance the user experience on food and nutrition platforms. By leveraging the k-Nearest Neighbors algorithm and a rich dataset of meals, it empowers users to make informed and enjoyable meal choices based on their individual profiles and recent interactions. The system's adaptability and personalization make it a valuable tool for users seeking healthier and more satisfying meal options.

6. Conclusion

The "User-Based Meal Recommendation System" is a sophisticated and effective application designed to offer personalized meal recommendations to users based on their dietary preferences, health conditions, and recent interactions with the platform. It utilizes a combination of user profiles, recent activity data, and a comprehensive meal dataset, underpinned by a recommendation algorithm that combines user-based collaborative filtering with the k-Nearest Neighbors (k-NN) approach.

The user-based meal recommendation system offers personalized and relevant meal suggestions based on dietary preferences and health conditions. It ensures real-time relevance by incorporating recent activity data. The system effectively extracts features from the meal dataset to enable accurate comparisons. It ranks users with similar profiles and offers comprehensive recommendations by combining user-based and recent activity-based approaches. The system aims to enhance user satisfaction and facilitate informed meal choices.

The "User-Based Meal Recommendation System" has the potential to significantly enhance the user experience on food and nutrition platforms, helping users make healthier and more enjoyable

meal choices. This system not only serves as a valuable tool for individual users but also offers businesses in the food and nutrition industry a powerful means to engage and assist their customers. With (Weiqing Min, 2019)its adaptability and personalization, the system is well-positioned to make a positive impact in the realm of meal recommendations, ultimately contributing to better eating habits and customer satisfaction.

7. References

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