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Food Recommended System Using AI Techniques

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ABSTRACT :

The rapid growth of online food ordering and digital restaurant services has created a need for intelligent systems that can help customers select suitable food items from a large number of available choices. Traditional food selection methods generally depend on manually browsing menus, customer preferences, or basic search and filtering techniques. These approaches may not provide personalized recommendations based on individual interests. This paper presents an Artificial Intelligence-based Food Recommendation System designed to recommend food items according to customer preferences, previous selections, dietary requirements, food categories, and item characteristics. The proposed system collects relevant user information such as preferred cuisine, favorite food categories, previous orders, ratings, and dietary preferences and processes this information using recommendation techniques. Machine learning methods can be used to identify similarities between users and food items and generate personalized recommendations. The system can also consider factors such as price range, nutritional preferences, popularity, and previous feedback to improve recommendation quality. A web-based interface allows users to view recommended food items and select suitable meals conveniently. The proposed system can improve the food selection experience, reduce the time required to search through menus, and support restaurants in providing personalized services to customers. The system can be implemented using Python, Flask, machine learning libraries, MySQL, HTML, CSS, and Bootstrap.

Keywords: Artificial Intelligence, Food Recommendation, Machine Learning, Personalized Recommendation, Restaurant Management, User Preference, Collaborative Filtering, Content-Based Filtering.

Introduction

Food selection has become increasingly difficult as restaurants and online food platforms provide customers with a large variety of dishes. Customers may have different preferences based on cuisine, taste, price, dietary requirements, previous orders, and nutritional needs. Traditional menu systems generally display food items without considering individual customer preferences, requiring users to manually search through many options before selecting a suitable dish. An intelligent food recommendation system can address this problem by analysing customer information and recommending food items that are more relevant to individual preferences. Artificial Intelligence and Machine Learning provide techniques for identifying patterns in customer behavior and generating personalized recommendations. The proposed Food Recommendation System uses customer preferences, previous orders, ratings, food categories, and item characteristics to generate suitable recommendations. The system can use content-based filtering to recommend items similar to those previously selected by the customer and collaborative filtering to identify food preferences based on similarities between users. By combining these approaches, the system can provide more personalized recommendations and improve the overall food ordering experience. The proposed system can also be integrated with a restaurant management platform, allowing recommendations to be generated directly through a digital menu or QR-based ordering system. Customers often face difficulty in selecting suitable food items when a restaurant provides a large menu. Conventional menu systems usually present the same list of food items to all customers and do not sufficiently consider individual preferences. Customers may spend considerable time searching for suitable dishes, while restaurants may miss opportunities to promote relevant food items. Therefore, an intelligent recommendation system is required to analyze customer preferences and provide personalized food suggestions.

The main objectives of the proposed system are to develop an AI-based mechanism for recommending suitable food items, analyze customer preferences and previous food selections, reduce the time required to search for food items, provide personalized recommendations based on user interests, consider food categories and dietary preferences, improve the customer ordering experience, and support restaurants in delivering personalized services.

Proposed System

The proposed Food Recommendation System consists of several major components, including user registration, preference collection, food database management, recommendation processing, recommendation display, and feedback management. During registration, the system collects basic preference information such as favourite cuisine, food category, preferred price range, and dietary requirements. The system stores food information

including item name, category, ingredients, price, cuisine, nutritional information, popularity, and other relevant attributes. When a customer interacts with the system, their preferences and previous selections are analyzed by the recommendation engine. The system then calculates the similarity between the customer profile and available food items and generates a ranked list of recommended dishes. The recommendations can be continuously improved by considering customer ratings, order history, and feedback.

The proposed architecture contains four main layers: the user interface layer, application layer, AI recommendation layer, and database layer. The user interface allows customers to register, provide preferences, browse food items, view recommendations, place orders, and provide ratings. The application layer manages user requests and communication between the interface and database. The AI recommendation layer analyses user preferences and food-item characteristics to generate recommendations. The database layer stores customer details, food information, order history, ratings, and recommendation-related data. The overall process begins when the customer enters preferences or interacts with the food menu. The application retrieves relevant information from the database and sends it to the recommendation engine. The AI model processes the information and produces a ranked list of food items, which is then displayed to the customer.

Recommendation Methodology

The system can use a combination of content-based filtering and collaborative filtering. In content-based filtering, the system recommends food items that have characteristics similar to items previously selected or rated positively by the customer. For example, if a customer frequently selects vegetarian Indian dishes, the system can recommend other vegetarian Indian food items with similar characteristics. Collaborative filtering uses information from multiple customers to identify users with similar preferences. If two customers have similar ordering and rating patterns, food items preferred by one customer can potentially be recommended to the other. A hybrid recommendation approach can combine both methods to improve personalization. The recommendation score can be calculated using a weighted combination of user preference similarity, food-item similarity, previous ratings, popularity, and other relevant factors. A general recommendation score can be represented as:

$$\text{Recommendation Score} = w_1 \times \text{Preference Similarity} + w_2 \times \text{Item Similarity} + w_3 \times \text{Rating Score} + w_4 \times \text{Popularity Score}$$

1. where w_1 , w_2 , w_3 , and w_4 represent the weights assigned to different recommendation factors. The weights can be adjusted based on the requirements and evaluation of the system.

Machine Learning techniques can be used to identify relationships between customers and food items. Classification techniques may be used to categorize food according to characteristics such as cuisine, dietary type, or food category. Similarity-based techniques can identify food items that are closely related to customer preferences. Clustering can group customers with similar food interests, while collaborative filtering can identify relationships between users and their food selections. Natural Language Processing can also be incorporated to analyze textual reviews and identify customer preferences from feedback. A hybrid AI approach can combine multiple techniques to improve recommendation quality and handle different types of user information.

The proposed system is expected to improve the food selection process by providing customers with personalized suggestions instead of requiring them to manually examine the complete menu. Recommendations based on previous selections and preferences can reduce the time required to identify suitable food items. The integration of ratings and feedback can further improve personalization as more user data becomes available. From the restaurant perspective, personalized recommendations can help highlight relevant food items and improve customer engagement. However, the effectiveness of the recommendation system depends on the quality and quantity of available data. New users with limited or no previous interaction may experience the cold-start problem, where insufficient information is available to generate highly personalized recommendations. This issue can be addressed by collecting initial preferences during registration and combining personalized recommendations with popularity-based or category-based suggestions.

4. Conclusion

This paper presents an Artificial Intelligence-based Food Recommendation System designed to provide personalized food suggestions based on customer preferences, previous orders, ratings, and food characteristics. By applying recommendation techniques such as content-based filtering, collaborative filtering, and hybrid recommendation, the system can provide more relevant food choices than a conventional menu system. The proposed approach can reduce menu-search time, improve customer convenience, and support restaurants in delivering personalized services. Integration with digital menus and QR-based restaurant ordering systems can further improve its practical usefulness. With the addition of larger datasets, advanced Machine Learning models, nutritional analysis, and real-time information, the proposed system can be developed into a comprehensive intelligent food recommendation platform.

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