Food Recommender-System Using Machine Learningand Graph Clustering

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Abstract - Food recommender-systems are considered an effective tool to help users adjust their eating habits and achieve a healthier diet. This paper aims to develop a new hybrid food recommender-system to overcome the disadvantages of previous systems, such as ignoring food ingredients, time factor, cold start users, cold start food items and community aspects. The proposed method involves two phases: food content-based recommendation and user-based recommendation. Graph clustering is used in the first phase, and a machine learning based approach is used in the second phase to cluster both users and food items. Besides a holistic-like approach is employed to account for time and user-community related issues in a way that improves the quality of the recommendation provided to the user. Experiments using dataset extracted from "Allrecipes.com" demonstrated that the developed food recommender-system performed best.

Key Words: Food ingredients, Time factor, cold start users and food items, Community aspects.

1. INTRODUCTION

The internet has become an important part of people's daily lives and used in various tasks, ranging from leisure (i.e., chatting with other users, shopping, searching for hotels, travel deals) to professional development (i.e., using a web platform to develop professional services). The tremendous amount of information from tens of thousands of sources that can be accessed by a user as part of his/her request creates important uncertainty and ambiguity that can easily divert the user from his original request. Although search engines have attempted to address the problem of redundancy of information in recent decades, they have not been very successful in personalizing search results and reducing the amount of noisy information. Many of these systems return the same results even for users with completely different proles and interests. In recent years, researchers have become more interested in recommender-systems as one of the most successful personalization tools on the web. It can be used to help the user identify the right service, reduce the information overload, guide the user towards some personalized behaviour, and find user's favourite items within a large

amount of information, among others. In a typical recommender-system, users' interests are discovered and items and services are recommended accordingly. In a variety of lifestyle applications and services, food recommendation plays an important role as a tool for assisting users to change behaviour and adopt healthy lifestyle.
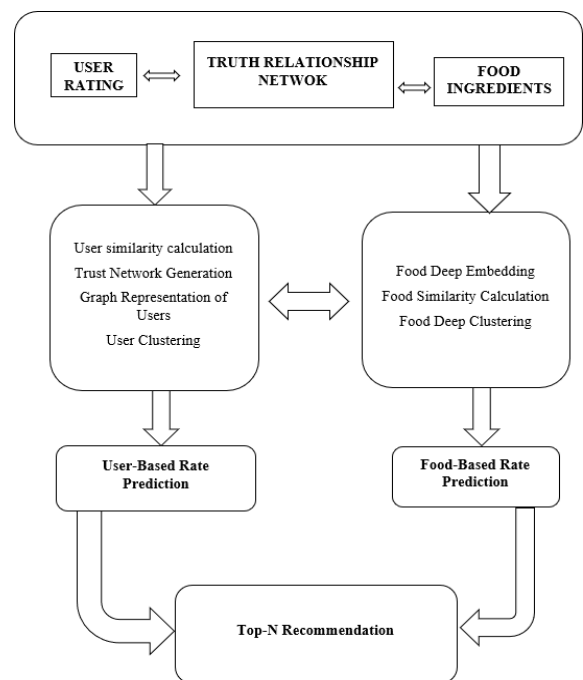

Fig -1: System Architecture

2. IDENTIFY, RESEARCH AND COLLECT IDEA

In [1], Charu Aggarwal, Hui Wang, and Jianfeng Xu (2018)-"A Hybrid Approach to Recommending Healthy Food" by This paper presents a hybrid approach that combines collaborative filtering and content-based filtering to recommend healthy food options to users.

In [2], Shuo Yang, Yanqiao Zhu, and Shijie Sun (2018) - "Recommending Healthy and Personalized Meals Using Recurrent Neural Networks" This paper proposes a

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recommendation system that utilizes recurrent neural networks (RNNs) to generate personalized meal plans for users based on their dietary preferences and health goals.

In [3], Ahmet Cakir, Ali Selman Aydin, and Mustafa Yildirim (2020) - "A Food Recommender System based on Food Image Recognition and Nutritional Values" This paper presents a food recommender system that utilizes food image recognition and nutritional values to provide users with personalized food recommendations.

In [4], Peng Li, Chen Liang, and Zhiyong Cheng (2017) - "Food Recommender Systems: From Basic to Hybrid Approaches" This paper provides an overview of food recommender systems and discusses various approaches, including content-based filtering, collaborative filtering, and hybrid approaches.

In [5], Seunghwan Kim, Hyeonjin Kim, and Minsoo Lee (2019) - "A Context-Aware Recommender System for Food and Beverage Pairing" This paper proposes a context-aware recommender system for food and beverage pairing that takes into account various contextual factors, such as the user's mood, occasion, and food preferences.

3. PROPOSED APPROACH

An original combination of collaborative filtering-based and content-based recommender-system is developed.

1) Ingredients-aware food recommender-system: Unlike traditional collaborative-based food recommender systems, our model integrates both collaborative filtering- based model (user-based phase) and content-based model (food-based phase). As a result, a set of foods that both suit the user's preferences and utilize his/her previous ratings are recommended.

2) Time-aware food recommender-system: A novel time-aware similarity measure that takes into account changes in food preferences or diet over time is developed in this paper. This makes the proposal suitable to handle cases where users change his/her rating / preferences over time.

3) Trust-aware food recommender-system: A trust-aware food recommender-system is developed to overcome the cold start user and cold start foods problems of the traditional collaborative filtering-based food recommender- systems. Our proposed model builds a trust network of users based on trust (follower following) statements to predict user ratings efficiently.

4. FUTURE WORK

Incorporating user feedback: One way to improve the performance of the recommender system is to incorporate user feedback into the algorithm. This can be achieved by allowing users to rate the recommended food items and adjusting the recommendations accordingly.

5. CONCLUSION

With the development and increasing popularity of the Internet and the growing number of web users, recommender systems that select items that are reasonably appropriate to the needs of users are gradually becoming more widespread. A variety of lifestyle applications rely on food recommender systems, which are integral parts of many lifestyle services. A novel hybrid food recommender-system is developed in this paper to overcome the disadvantages of previous food recommender-systems, such as ignoring food ingredients, time stamp, cold start users and cold start foods and user community. Using user-based and content-based models as well as using time information, trust network, and user communities, the proposed method addresses all four issues simultaneously and aims to improve the final accuracy of the recommender-system.

In addition, a proper eating habit can lessen the severity of symptoms associated with non-infectious diseases. In future works, we aim to use nutritional characteristics of each food as additional information and recommend foods according to each person's health status and diseases.

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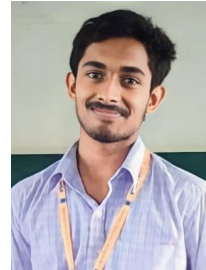
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