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A Survey on Product Recommendation System

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ABSTRACT: With the growing popularity of online shopping, the need for effective product recommendation systems has become increasingly important. Hybrid product recommendation systems, which combine multiple recommendation techniques, have been proposed as a solution to provide more accurate and diverse recommendations. This survey paper presents a comprehensive overview of hybrid product recommendation systems, including their motivations, techniques, evaluation metrics, and applications. We review various types of hybrid recommendation approaches, such as content-based and collaborative filtering-based methods, as well as their combinations, such as weighted hybrid and cascade hybrid methods. We also discuss the challenges and opportunities of hybrid recommendation systems, including data sparsity, cold start, and scalability. Furthermore, we provide a comparative analysis of several state-of-the-art hybrid recommendation systems in terms of their performance, efficiency, and user satisfaction. Finally, we identify potential research directions and open issues in hybrid product recommendation systems, such as deep learning-based models, context-aware recommendations, and fairness and diversity considerations. Our survey aims to provide researchers and practitioners with a comprehensive understanding of the current state-of-the-art in hybrid product recommendation systems and guide future research in this area.

KEYWORDS: Product recommendation systems, Hybrid recommendation, Content-based filtering, Collaborative filtering, Deep learning, Evaluation metrics, Applications.

I. INTRODUCTION

Hybrid Product Recommendation System is a solution to provide better recommendations by combining multiple recommendation techniques. It aims to capture various aspects of user behaviour and product characteristics and provide more accurate and diverse recommendations. This survey paper provides a comprehensive overview of the motivations, techniques, evaluation metrics, and applications of hybrid recommendation systems, with a focus on state-of-the-art approaches.

II. LITERATURE SURVEY

A. Memory-Based Collaborative Filtering Recommender System

The research work [1] is done by Stephen et al. Collaborative filtering (CF) is a well-known and popular technique in recommender systems (RS) that uses relationships between users or items to make product recommendations to an active user. The similarity measure used to identify nearest neighbors determines the effectiveness of existing memory-based algorithms. When calculating the similarity between two users or items, similarity measures use only the ratings of co-rated items. The rating matrix in most e-commerce applications is too sparse because even active users of an online system tend to rate only a few items out of the entire set of items.

B. Online Recommendation of Electronic Goods

The research work [2] is done by Abhijit, P. et al. Recommending Systems are new generation dynamic internet tools that assist users in conducting efficient product searches on the internet and receiving information relevant to their priorities. The system will include product data from the local market. It will store all product-related data. Depending on the customer, GPS location recommendations will be provided via an Android app. In addition, product reviews will be used to form recommendations.

C. Context-Aware Collaborative Filtering Recommender Systems

The research work [3] is done by Balrunas, L. Contextual information is important to researchers and practitioners in many fields, including e-commerce personalization, information retrieval, ubiquitous and mobile computing, data mining, marketing, and management. While much research has already been done in the field of recommender systems,



most existing approaches focus on recommending the most relevant items to users without taking into account any additional contextual information, such as time, location, or the company of other people (e.g., for watching movies or dining out). In this chapter, we argue that relevant contextual information matters in recommender systems and that it is critical to consider this information when providing recommendations. We discuss the general concept of context and how it can be modelled in recommender systems.

D. Product Recommendations Using Textual Similarity Based Learning Models

The research work [9] is done by Rahul Shrivastava; Dilip Singh Sisodia International Conference on Computer Communication and Informatics (ICCCI), Jan 2019.[9] -During a live interaction with a customer, recommendation systems may apply different techniques to solve the problem of making a correct and relevant product recommendation. The primary goal of this study is to perform product recommendation using a textual similarity-based Learning model. After data cleaning and text pre-processing, the content-based product recommendation in this study was performed using Bag of Words (BOW) and Term Frequency-Inverse Document Frequency (TF-IDF) based text vectorization techniques. The textual description of the product is converted into an n-dimensional vector, and the Euclidean similarity between the dimensional vector of the queried product and other products can then be calculated. Text-based product similarity via text vectorization is extremely useful.

III. PROBLEM STATEMENT

With the increasing number of products available online, the challenge of providing personalized and accurate product recommendations has become more critical than ever before. Traditional product recommendation systems, such as content-based and collaborative filtering methods, have been widely adopted to address this challenge. However, each method has its limitations that make it difficult to provide accurate and diverse recommendations for all users and items. Hybrid Product Recommendation Systems have emerged as a solution to mitigate these limitations by combining multiple recommendation techniques to take advantage of their complementary features and reduce their drawbacks.

Despite the potential benefits of hybrid recommendation systems, the design and evaluation of such systems face significant challenges. One of the main challenges is data sparsity, where the user-item interaction matrix is sparse, making it difficult to capture the user's preferences accurately. Another challenge is the cold start problem, where new users or items have little to no interaction history, making it challenging to provide accurate recommendations. Scalability is another challenge in hybrid systems as the amount of data and the number of products grow rapidly.

Therefore, the problem statement of this survey paper is to provide a comprehensive overview of the current state-of-the-art in hybrid product recommendation systems, their motivations, techniques, evaluation metrics, and applications. We also aim to identify and address the challenges and opportunities of hybrid recommendation systems, including data sparsity, cold start, and scalability. Furthermore, we provide a comparative analysis of several state-of-the-art hybrid recommendation systems in terms of their performance, efficiency, and user satisfaction. This survey paper aims to guide future research in the field of hybrid product recommendation systems and provide a valuable resource for researchers and practitioners in this area.

IV. PROPOSED METHODOLOGY

The proposed methodology implements a hybrid recommendation algorithm in such a way that is able to provide recommendations in multiple ways as well as use them to increase its accuracy.

Moreover, it includes implementation of methods for addressing data sparsity, an important issue for recommendation systems. the efficiency of online evaluation will be low if a large number of recommender algorithms are chosen to be conducted.

Hence, an initial filtering for so many existing recommender algorithms becomes necessary. This is how another methodology offline evaluation is introduced.

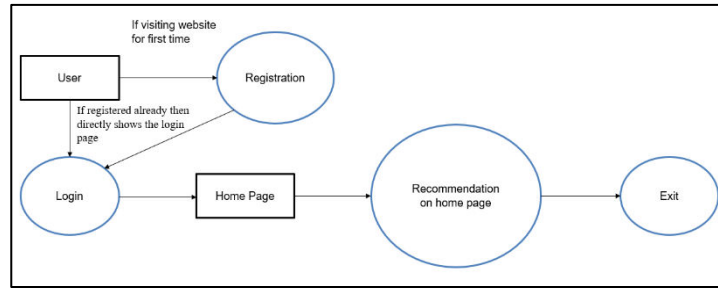


Fig. 1.1 Working of Product Recommendation.

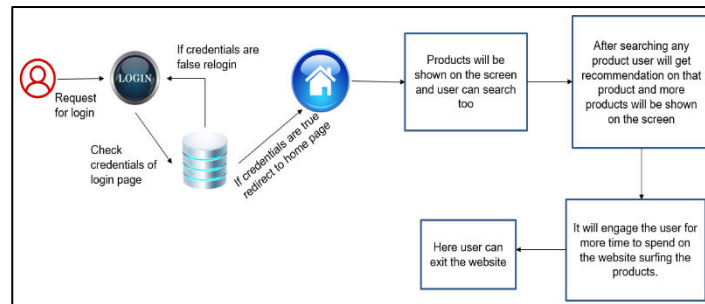


Fig. 1.2 Design and Procedure.

V. PROJECT PURPOSE

The purpose of a project on hybrid product recommendation systems can be to develop a personalized and accurate recommendation system for an online marketplace or e-commerce platform. The project aims to enhance user experience by providing relevant and diverse product recommendations that increase user engagement and satisfaction. The hybrid approach combines multiple recommendation techniques, such as content-based and collaborative filtering, to provide a more accurate and comprehensive view of user preferences and product characteristics. The project can also address the challenges of data sparsity, cold start, and scalability by incorporating appropriate techniques and algorithms. The evaluation of the project can be based on various metrics such as accuracy, diversity, coverage, scalability, and user satisfaction to assess the effectiveness of the system. The project can provide valuable insights into the design and implementation of hybrid product recommendation systems and contribute to the advancement of the field.

VI. FUTURE ENHANCEMENT

There are several future enhancements that can be considered for hybrid product recommendation systems:

1. Incorporating more advanced machine learning algorithms and techniques such as deep learning, reinforcement learning, and graph-based models to enhance the accuracy and scalability of the system.
2. Integrating new data sources and types, such as social media, reviews, and product images, to improve the quality and diversity of the recommendations.
3. Developing more effective feature engineering and selection techniques to better capture the user preferences and product characteristics.
4. Incorporating more user feedback and interaction data to improve the personalization and relevance of the recommendations.
5. Enhancing the interpretability and transparency of the hybrid recommendation system to improve the user's trust and understanding of the recommendations.
6. Developing new evaluation metrics and methods that can capture the different aspects of recommendation quality and user satisfaction.

Overall, the future enhancements aim to further improve the accuracy, diversity, coverage, scalability, and user satisfaction of hybrid product recommendation systems and address the challenges and opportunities in this field.



VII. CONCLUSION

Hybrid product recommendation systems are a powerful approach to address the challenges of traditional recommendation systems, such as data sparsity, cold start, and scalability. By combining multiple recommendation techniques, hybrid systems can provide more accurate and comprehensive recommendations that better capture the user preferences and product characteristics. The success of a hybrid recommendation system depends on the effective combination of different techniques, appropriate evaluation metrics, and consideration of the specific domain and user requirements. The field of hybrid product recommendation systems is continuously evolving, and there are several future enhancements and opportunities that can further improve the quality and relevance of the recommendations. Overall, the development and implementation of effective hybrid recommendation systems have the potential to enhance the user experience, increase user engagement and satisfaction, and provide valuable insights into the design and implementation of personalized recommendation systems.

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