Personalized Recommendation Method of E-Commerce Products Based on In-Depth User Interest Portraits

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ABSTRACT

In dynamic e-commerce environments, researchers strive to understand users' interests and behaviors to enhance personalized product recommendations. Traditional collaborative filtering (CF) algorithms have encountered computational challenges such as similarity errors and user rating habits. This research addresses these issues by emphasizing user profiling techniques. This article proposes an innovative user profile updating technique that explores the key components of user profile (basic information, behavior, and domain knowledge). An enhanced kernel fuzzy mean clustering algorithm constructs a dynamic user portrait based on domain knowledge mapping. This dynamic portrait is combined with e-commerce personalized recommendation to improve the accuracy of inferring user interests, thus facilitating accurate recommendation on the platform. The method proposed in this article greatly improves the overall performance and provides strong support for developing smarter and more personalized e-commerce product recommendation systems.

KEYWORDS

Clustering, Collaborative Filtering, Knowledge Graph, Recommendation Algorithm, User Portrait

INTRODUCTION

In today's digital age, the e-commerce industry is booming, offering users convenience. However, the vast selection of products can pose challenges for users. A key considering when solving this problem lies in helping users find products that match their interests and needs within the huge product catalog. This is achieved through intelligent personalized recommendation systems (Esmaeili et al., 2020). However, traditional recommendation methods are revealing their limitations when confronted with large-scale and high-dimensional user data. It forces users to seek out more innovative and precise recommendation solutions (Zheng et al., 2021).

An effective recommendation method can help users quickly obtain high-quality information, thereby enhancing the user experience (Lestari & Sudarma, 2017). From the perspective of user demand, group user profiling helps e-commerce platforms grasp the probabilistic behavior of users

in different scenarios. With time, users' interests and preferences change (Vavliakis et al., 2019). For this reason, this article proposes a method to construct a dynamic group user portrait that adapts to users' needs in different scenarios.

Meanwhile, to solve the data sparsity problem in recommendations, a recommendation algorithm, dynamic portrait and intra-group collaborative filtering (DUCF), is introduced and successfully applied to e-commerce platforms. This approach facilitates a personalized recommendation application, providing scientific services for enterprises (Guo et al., 2017).

This research is devoted to the study of group dynamic user portraits. The authors established a domain knowledge graph from the perspective of user needs and generated user labels by analyzing consumers' historical information on e-commerce platforms, employing methods like data mining (Wu & Yin, 2019). In the construction of user profiles, the authors conducted experimental validation. The results showed that the group user profiles constructed in this article achieved significant improvements in both accuracy and recall (Xiang & Zhang, 2020).

Furthermore, the authors designed and implemented a personalized recommendation system based on dynamic user profiling and a collaborative filtering (CF) recommendation algorithm (Heinrich et al., 2021). Through a detailed analysis of the system's functionality and strategically designing the database, the authors developed a personalized recommendation function module to ensure a smooth shopping experience using the Django framework (Koniew et al.,2020). This system aims to provide a more scientific service, allowing users to navigate the platform with ease and efficiency. This allows the users to realize the effectiveness of personalized recommendations, improving the overall shopping experience.

Compared to prior studies that highlight the deep mining of user interests, this study employs deep learning techniques to build user profiles. It also underscores the application of personalized recommendation methods on e-commerce platforms. This approach implies a more comprehensive and accurate gathering of user interest information, aimed at achieving a better personalized recommendation effect. The goal is to elevate the user experience of e-commerce platforms through advancements.

RELATED WORKS

Xia (2016) supposed that if two users share a similar interest, it is very possible for them to select similar products. Thus, Xia designed an e-commerce product recommendation algorithm based on a CF model to compute the recommendation score. Ishida et al. (2017) contributed by showing the review to influence the user's decision-making process. This unique system can generate a recommendation sentence aligned with the user's preferences from a user profile that contains the product tag data.

Recommender systems help users find relevant items of interest, particularly on e-commerce or media streaming sites. Given the practical relevance of the problem, there has been an increased interest in session-based recommendation algorithms, which aim to predict the user's immediate next actions. Ludewig and Jannach (2018) presented the results of an in-depth performance comparison of several such algorithms using a variety of datasets and evaluation measures.

Chen et al. (2019) explored a novel approach to generate personalized product descriptions by combining the power of neural networks and a knowledge base. They proposed a knowledge-based personalized (KOBE) product description generation model in the context of e-commerce. The concept of e-commerce recommendation can be divided into the recommendation based on correlation and recommendation based on causality. Xu and Cui (2022) selected three representative consumer psychologies—consumer motivation, consumer attitude, and consumer interest—to explore product recommendations that consider multiple consumer psychologies.

Understanding the significance of item presentation in gaining and maintaining user attention, Sulikowski et al. (2022) conducted a task-based user eye-tracking study with 30 participants. They examined two variants of an online fashion store—one based on aesthetic rules and one defying

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