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# Application of E-Commerce Recommendation Algorithm in Consumer Preference Prediction

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## ABSTRACT

Through user characteristic information, user interaction behavior, commodity characteristic information, recommendation engine, and related technologies in data mining, this paper makes a more in-depth study and analyzes the problems of "big data volume," "cold start," and "data sparsity" in the recommender system in modern business websites. In response to these problems, this paper transforms the problem of large data volume into the problem of large user groups. Then, after using the k-means clustering algorithm to divide the large user group into homogeneous user groups to alleviate the problem, a combination of collaborative filtering algorithm and content-based recommendation algorithm in the homogeneous user group is proposed to alleviate this problem. The experimental precision and recall are both around 0.4, and when W=0.8, the F value is the largest.

## KEYWORDS

Collaborative Filtering Recommendation, Electronic Commerce, Preference Prediction, Recommendation Algorithm

## INTRODUCTION

With the advent of the era of big data, the volume of data on various platforms is growing, especially in e-commerce. E-commerce websites will continue to increase the types and quantities of commodities on the website to attract consumers and meet their diverse requirements. Faced with so many products, consumers spend more time searching for a target, a phenomenon known as "information overload." To satisfy users' passive acceptance of recommendations, solve the problem of information overload, and adhere to the principle of providing users with high-quality and better services, it is becoming more and more important to study consumer preference recommendation systems. Recommender systems can collect as much implicit and explicit data as possible about the interaction between users and websites, and recommender systems are considered a more personalized solution.

When shoppers do not know their needs, general business websites will display them to users based on the current popularity of mobile phones. However, when different users search for the word "mobile phone," the content appears the same, and users still need to filter them to obtain them. The recommendation system, in this case, acts as a shopping guide to select personalized products for users. In this way, it tailors a set of products that the user is most likely to be interested in; users no longer get lost in the vast sea of products, effectively solving the problem of information overload.

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Hybrid recommendation algorithms process the characteristics of users or items and the interaction data between users and websites, which is also the core of this recommendation system research.

This article studies the problems of "data sparsity," "cold start" and "big data" in the recommendation process through the hybrid recommendation algorithm, solves the problems of insufficient information acquisition, difficulties in generating personalized recommendations, and the scarcity of users' rating data when the recommendation system faces new users, making effective recommendations difficult.

## RELATED WORK

With the rapid development of e-commerce, merchants put more categories on the shelves. Understanding consumer preferences and prompting consumers to quickly find their favorite products in many categories requires recommendation algorithms. Wu (2019) analyzed the characteristics of various data in different information sources, proposed a novel recommendation model, which can alleviate the sparsity problem by seamlessly integrating multi-relational data and visual content, and designed a computationally efficient learning algorithm MSRA to optimize the proposed model. The prediction method was introduced into a new vector to represent disease and applied the new vectorized data to a positive unlabeled learning algorithm to predict and rank long non-coding RNA (lncRNA) genes associated with disease (Peng et al., 2017). Bai et al. (2017) studied two main text representations for predicting cross-site purchase preferences, including shallow and deep text features learned by deep neural network models. Using extensive experiments on a large, linked dataset, they provide experimental results showing that leveraging social text to predict purchase preferences is promising. In listening experiments, fan noise signals were adjusted to the same loudness and the same preference compared to the normal reference sound by varying their levels in an adaptive program to quantify how changes in these two indices affect subjects' preference and loudness judgments (Töpken & van de Par, 2019).

Aiming at the two problems of malicious evaluation and the amount of usage affecting prediction accuracy, Zheng et al. (2020) proposed a collaborative filtering recommendation algorithm with item tag features to provide recommendations for users. Experiments show that the algorithm can solve the cold start problem associated with data wells, and the interpretation of the recommendation results is also convincing (Zheng et al., 2020). Collaborative deep learning and its parallelization method was the basis for an improved model for item content optimization, which improved SDAE (stacked denoising auto-encoder) based on CDL (collaborative deep learning) and added private network nodes (Yang et al., 2021). With sharing the network parameters of the model, a private bias term was added for each item, which solved the problem where the recommender system performance dropped sharply when the data is sparse (Yang et al., 2021). Bi et al. (2020) proposed a recommendation algorithm based on a deep neural network where users' basic data and the basic data for commodities are important auxiliary data used to build a regression model for predicting user ratings based on deep neural networks (Bi, 2020). The explosion of reviews has led to a serious problem, information overload. How to mine user interests and understand user preferences from these reviews is critical research and practice. Traditional recommender systems mainly use structured data to mine user interest preferences, such as product categories, user tags, and other social factors. Ma et al. (2018) used the LDA+Word2vec model to mine user interests and proposed a social user emotion measurement method. Finally, they integrated three factors of user topic, user emotion, and interpersonal influence into a recommender system (RS) based on probabilistic matrix factorization. Then, they conducted a series of experiments on the Yelp dataset, and the experimental results show that the proposed method outperforms the existing methods (Ma et al., 2018). Biagi and Falk (2017) provided new empirical evidence on the impact of ICT/e-commerce activities on labor demand. A key feature of the empirical analysis was the use of several advanced ICT activities, and the study's main finding is that increases in ICT/e-commerce activities did not lead to job losses. This applied