International Journal of e-Collaboration
Volume 20 • Issue 1 • January-December 2024

Enhancing Community E-Commerce Repurchase Prediction Through Information Entropy Analysis

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ABSTRACT

In this study, we delve into the prediction and recommendation algorithm for user repurchase behavior within the community e-commerce landscape, leveraging the framework of information entropy. By analyzing consumer behavior data from a product-centered perspective, we observe that the majority of consumers engage in approximately 0-8 information search clicks before making a purchase, primarily focusing on product details, with an average of about 4 browsing interactions. Subsequently, a minimal portion of consumers exhibit 0-5 instances of preference behavior after browsing activities. Similarly, consumers who add items to their shopping carts typically engage in this behavior from 0 to 4 times, showcasing limited participation. Leveraging attribute probability, information entropy serves as a driving force for predicting community e-commerce users' repurchase behavior, contrasting with traditional outlier detection methods and underscoring the advantages of information entropy.

KEYWORDS

Information Entropy Analysis, Consumer Behavior, Recommendation Algorithm, Predictive Analytics, Data-Driven Decision-Making, User Engagement, Retention

ENHANCING COMMUNITY E-COMMERCE REPURCHASE PREDICTION THROUGH INFORMATION ENTROPY ANALYSIS

When internet users purchase goods on e-commerce platforms, they are accompanied by various online operations, such as browsing, collecting and putting into shopping carts (Chen et al., 2023). These operational behaviors generate a large amount of user shopping history data (Li et al., 2023). In the era of big data, the data available to e-commerce platforms are growing exponentially, and traditional online analysis methods are no longer applicable (Kalka & Şahin, 2023). Therefore, we need to fully utilize every user interaction on the platform's front end and explore the potential value of data through data mining techniques. Fully analyzing these data can better predict user shopping habits, preferences, or shopping intentions. Predicting users' purchasing behavior can help improve their shopping experience and promote the sustainable development of e-commerce. In order to provide good service, enterprises need to fully understand consumer behavior and preferences. Therefore, enterprises should have close contact with consumers and make full use of every browsing history, consumption history, and other relevant information to explore consumer preferences. Establishing a

DOI: 10.4018/IJeC.349897

personalized recommendation system based on the analysis of large-scale user purchasing behavior can provide appropriate purchasing suggestions for consumers when purchasing goods, improve their shopping experience, and help promote the sustainable development of transactions and e-commerce platforms (Zhao, 2023). This article uses information entropy to calculate similarity, in order to improve the accuracy of recommendation algorithms and adapt to changes in user interests over time. However, the information entropy method only analyzes data from a single perspective and does not fully utilize the synergistic relationship between data and features. Collaborative relationships exist in the same data and relational data, which provides great assistance for data analysis (Dong et al., 2022). By using information entropy methods, we can obtain more objective results from raw data, which are less affected by human factors. The prediction of repeat purchase is based on the personal information and behavior data of internet users and uses information entropy technology to predict customers' future purchase behavior. Many current recommendation system problems use deep neural network models such as information entropy (Shao et al., 2024). Compared with traditional machine-learning methods, these neural network-based models can learn features from unlabeled data through unsupervised learning mechanisms, mine deep level features, automatically learn potential correlations between data, and accurately simulate any complex nonlinear functions, thus achieving good results in many classification problems (Su et al., 2023). This article helps to improve user satisfaction and loyalty, increase sales of e-commerce platforms, and promote the prosperity and development of the e-commerce industry. The similarity calculation method based on information entropy proposed in this article provides new ideas and methods for the research of recommendation systems and user purchase behavior prediction. This method can be applied to data analysis and mining in other fields, promoting further development of related academic research, and promoting cooperation and exchange between academia and industry.

The innovations of this paper are two-fold.

1. A collaborative filtering recommendation algorithm is proposed in this paper. The algorithm constructs a user-item scoring matrix according to the historical scores of different users on items and uses the similarity calculation formula to calculate the similarity between different users or different items in the matrix. Among similar users, choosing an appropriate algorithm for recommendation can not only be used to predict users' specific ratings on items, but also to generate a list to recommend a class of items.
2. The user-commodity model diagram is constructed. Through data analysis and mining, users' preferences can be found. According to the obtained information, the problems existing in the sales platform of enterprises can be solved, and the sales platform can be improved, so as to improve users' purchasing experience and customer satisfaction and achieve the ultimate goal, that is, to increase the sales scale and increase the turnover of e-commerce platform.

The overall structure of this paper consists of five parts. The first section introduces the background and significance of e-commerce users' repurchase behavior prediction and recommendation algorithm and then introduces the main work of this paper. The second section mainly introduces the literature review of e-commerce users' repurchase behavior prediction and recommendation algorithm. The third section introduces the information entropy and collaborative filtering recommendation algorithm and constructs the system model. In the fourth section, the simulation experiment is carried out, and the results are obtained and analyzed. The fifth section is a summary of the full text.

LITERATURE REVIEW

The prediction of user purchasing behavior covers two fields: classification and regression. In recent years, many scholars have tried to combine machine-learning algorithms with data features in various fields to build a prediction model, and they have achieved considerable results (H. Zhang,