

Retraction

Retracted: Research and Implementation of Electronic Commerce Intelligent Recommendation System Based on the Fuzzy Rough Set and Improved Cellular Algorithm

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their

agreement or disagreement to this retraction. We have kept a record of any response received.

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- [1] B. Peng, "Research and Implementation of Electronic Commerce Intelligent Recommendation System Based on the Fuzzy Rough Set and Improved Cellular Algorithm," *Mathematical Problems in Engineering*, vol. 2021, Article ID 6671219, 8 pages, 2021.

Research Article

Research and Implementation of Electronic Commerce Intelligent Recommendation System Based on the Fuzzy Rough Set and Improved Cellular Algorithm

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With the continuous development of e-commerce, our society has transitioned from a mechanical era to an intelligent era. There have been many things that have subverted people's traditional concepts, and they have also completely changed the way of life of modern people. Due to the development of e-commerce, people can enjoy the scenery and food from all over the world at home. Online shopping and online ticket purchase have greatly facilitated people's lives and given people more choices. However, due to the excessive selection of things, there is also a phenomenon of information overload. Sometimes, it is difficult for people to find a product or content that they are very satisfied with. So, how to analyze people's browsing behavior and predict what kind of content people want and how to push products on major websites have become a major issue facing major online companies. Based on this, this paper proposes an e-commerce intelligent recommendation technology based on the fuzzy rough set and improved cellular algorithm. It provides personalized recommendations for users based on their browsing history and purchase history. The research of this article is mainly divided into four parts. The first part is to analyze the status quo of technical research in this field. By analyzing the shortcomings of the existing technology, the concept of this article is proposed. The second part introduces the classic intelligent recommendation algorithm, including the principle and process of the fuzzy rough set and improved honeycomb algorithm, and analyzes the difference of various recommendation algorithms to illustrate the adaptability of each algorithm in practical applications and their respective advantages and disadvantages. The third part introduces an intelligent recommendation system based on fuzzy clustering, comprehensively analyzes the characteristics of users and commodities, makes full use of users' evaluation information of commodities, and realizes intelligent recommendation based on content and collaborative filtering. At the end of the article, through comparative analysis experiments, the superiority of the intelligent recommendation system for electronic commerce based on the fuzzy rough set and improved cellular algorithm is further proved, and the accuracy of intelligent recommendation is improved.

1. Introduction

Electronic business generally refers to a wide range of business and trade activities all over the world. Realizing consumers' online shopping, online transactions between merchants, online electronic payments and various business activities, trade activities, financial activities, and other related activities is a new business model of comprehensive service activities [1]. Shopping centers, consumers, products, and logistics are the four major elements of e-commerce. Entering the 21st century, with the diversification of consumer information, it has become a habit of consumers to

understand the product information of local shopping malls through Baidu WeChat, Taobao, JD, and other network channels, thus enjoying the fun of on-site shopping [2].

Rough set is a practical subject. Although it only has a history of more than ten years, it has made great achievements in the fields of approximate reasoning, digital logic analysis and simplification, prediction model construction, decision support, control algorithm acquisition, machine learning algorithm, pattern recognition, and other fields [3]. Rough set can effectively deal with the following problems: uncertain or imprecise expression of knowledge; learning from experience and obtaining knowledge from experience;

analysis of inconsistent information; reasoning based on uncertain and incomplete knowledge; simplifying data without retaining information; and determining and evaluating the dependence between data [4]. The feature of automatic extraction of control rules from rough set provides a new method to solve this problem. A new control strategy, fuzzy rough control, is quietly rising and becoming an attractive development direction. Some people apply this control method to the classical control problem of “trolley inverted pendulum system” and the process control problem of cement kiln. Some representative states in the control process and the control strategies adopted by operators in these states are recorded, and good control effect is achieved. Then, the rough set theory is used to process the data, and the control strategies adopted by the operators under what conditions are analyzed, and a series of control rules are summarized. As a scientific research of intelligent computing, rough set theory has made great progress in theory and practice, showing a broad development prospect [5]. It not only provides new scientific logic and research methods for information science and cognitive science, but also provides effective processing technology for intelligent information processing. With the rapid growth of the number of communication equipment and the diversification of service requirements in wireless network, the contradiction between the limited spectrum resources and the growing wireless spectrum demand is increasingly prominent and intensified. At present, the field of wireless communication is facing the challenges of intelligence, broadband, diversification, integration, and so on. Wireless network environment is becoming more and more complex, diversified, and dynamic [6]. In addition, green network resource management, intelligent network management, and other new concepts are also developing. Therefore, how to optimize spectrum utilization and manage spectrum resources effectively is an urgent problem to be solved.

At present, the mainstream solutions are clustering algorithm, neural network, and genetic algorithm, but there are some technical problems in the actual effect. Therefore, this paper proposes a recommendation scheme of e-commerce intelligent system based on fuzzy rough set and improved cellular algorithm in order to improve the recommendation accuracy of intelligent recommendation system.

This paper describes the e-commerce intelligent system based on fuzzy rough set and improved cellular algorithm, introduces the application of neural network algorithm in the field of intelligent recommendation, and points out the disadvantages of using only neural network technology. On the basis of previous research, this paper introduces fuzzy rough set theory as optimization algorithm, combines fuzzy rough set with improved cellular algorithm, and applies it to intelligent recommendation of online enterprises. The low precision problem of traditional algorithm is improved by fuzzy neural network algorithm, and the advantages of fuzzy theory and neural network are combined. In order to verify the actual effect of this algorithm, this paper establishes a comparative experiment between content-based recommendation and original website method. Through a number

of comparative experiments, it proves that the algorithm based on fuzzy rough set and improved cellular algorithm has more accurate characteristics in intelligent recommendation of online enterprises.

The content of this paper is arranged as follows. In the second part of this paper, the relevant contributions of predecessors are introduced, and the main problems are found out, and the optimization model in this paper is put forward. The third section introduces the basic theory of e-commerce intelligent system based on fuzzy rough set and improved cellular algorithm. In the fourth section, according to the shortcomings of previous algorithms, an e-commerce intelligent system method based on the fuzzy rough set and improved cellular algorithm is proposed, which makes online enterprises have more accurate intelligent recommendation, so that users can find the desired items when browsing the content. In the fifth section, through the experimental part, the simulation experiment is carried out to show the advantages of the proposed method. The sixth section summarizes the advantages of the algorithm and the significance of this study.

2. Related Works

Intelligent recommendation is to recommend information and products that users are interested in based on the user's interest characteristics and purchasing behavior, helping customers decide how to purchase products, and how to use e-commerce systems to help customers purchase products. With the continuous expansion of the scale of e-commerce and the rapid growth of the number and types of goods, consumers need to spend a lot of time to find the goods they want to buy.

In the research of recommendation result evaluation interpretation model, general e-commerce websites only use simple methods, such as directly using the store's sales ranking or other users' praise of the product to explain recommendations to users. For example, Felfernig et al. designed the Koba4MS system. If the customer cannot choose the correct solution in the system, they will guide the customer to choose the correct solution in the system [7]. In order to persuade customers to use the recommendation system or provide recommendations, e-commerce sites need to explain the reasons for the recommendations to users. At present, the website of the e-commerce intelligent recommendation system can only meet the needs of one website and the limited centralized recommendation system, which is far from meeting the large-scale needs, especially the intelligent recommendation requirements of distributed e-commerce websites. Han Peng and others studied distributed collaborative filtering algorithm, a distributed filtering algorithm, analyzed how to implement the algorithm on distributed hash table under P2P structure, and finally proposed a distributed collaborative filtering intelligence based on P2P structure Push system [8]. This article adopts e-commerce intelligent recommendation based on fuzzy rough set and improved cellular algorithm, which can make up for the defects of previous online websites and achieve individuality in various aspects such as activity

recommendation, new product recommendation, ranking recommendation, hot-selling recommendation, evaluation recommendation, and praise recommendation.

3. Basic Theory and Core Concepts

3.1. Commonly Used Smart Recommendation System Methods. More machine learning methods are needed to describe the content characteristics from the case capture user's interest information. In a content-based recommendation system, an item or object is defined by attributes of related characteristics. According to the characteristics of the user's evaluation object, the system understands the user's interests and hobbies and verifies the matching degree of the user's information with the items to be predicted. Content-based user profiles are historical data of users, and the user profile model changes with user preferences. The biggest advantage of content-based prediction is that it can provide users with content that they are interested in, and they can also see why they are recommended [9].

The biggest advantage of collaborative filtering is that it has no special requirements for recommended objects and can handle complex unstructured objects, such as music and movies.

The recommendation based on association rules has the purchased goods as the rule header and the rule body as the recommended object. The management rules calculate the proportion of group x goods and group y goods in the transaction database, which can directly reflect the user's purchase tendency for other commodities when purchasing a certain commodity. For example, many people buy bread as well as milk [10]. Therefore, the utility model of the system depends on the utility model to a great extent [11]. Therefore, user information can be any knowledge structure that supports reasoning, can be a standardized query of users, or a more detailed representation of user requirements [12].

3.2. Introduction to Rough Set Theory. Rough set theory is an ideal algorithm to deal with big data, incomplete data, and inconsistent data. Rough set theory introduces the concept of knowledge granularity, which makes it more accurate. The accuracy of knowledge granularity description is the main index to judge whether a concept is accurate. Rough set theory is mainly to preprocess the original data, through a series of data preprocessing to mine the data, which can meet the needs, summarize the data, reduce the relationship between data feature dimensions, and put it into the corresponding database. Rough set theory does not need any additional prior information, only the dataset of related problems. Therefore, the theories that need some prior knowledge have strong complementarity when dealing with inaccuracies and inconsistencies. Rough set theory cannot deal with the data of continuous attributes but can solve the problem of discretization of continuous attributes. In addition, it can process incomplete data through data integrity operation and deal with incompatible data under the premise of allowing certain error processing.

The definition of the fuzzy rough set is as follows: let U be a nonempty finite, R be U a fuzzy relation on, that is, $R \in F(U \times U)$, called (U, R) , that is, it is a fuzzy approximation space. For any $A \in F(U)$, (U, R) of A is the upper $\overline{R}(A)$, and lower approximations $\underline{R}(A)$ are defined as follows: for any $x \in U$ [13],

$$\begin{cases} \overline{R}(A)(x) = \vee(R(x, u) \wedge A(u)), \\ \underline{R}(A)(x) = \vee(1 - R(x, u) \wedge A(u)). \end{cases} \quad (1)$$

Definition 1. Set up a knowledge representation system:

$$KS = (U, At, \{Va|a \in At\}), \{Ia \in At\}. \quad (2)$$

At is knowledge of U in the domain of discourse. For a subset on a mine X , X is the positive domain of is defined as [14]

$$POS_R(X) = R(X). \quad (3)$$

For X is a subset of U , the boundary domain of X is defined as

$$BND_R(X) = \overline{R}(X) - \underline{R}(X). \quad (4)$$

For X is a subset of U , the negative field of X is defined as

$$NEG_R(X) = U - \underline{R}(X). \quad (5)$$

Knowledge domain $K = (U, At\{Va|a \in At\}, \{Ia|a \in At\})$ is defined as knowledge representation in system, and At is knowledge in the domain of U discourse. For X subsets of U , the approximation precision of X is defined as [15]

$$a(X) = \frac{|\overline{R}(X)|}{|\underline{R}(X)|} \quad (6)$$

The roughness of X is defined as

$$P(X) = 1 - a(X) = 1 - \frac{|\overline{R}(X)|}{|\underline{R}(X)|} \quad (7)$$

In this case, $|\bullet|$ denotes its cardinal number. The degree of certainty of X is approximate precision expression for the middle set knowledge of a knowledge representation system, and the uncertainty degree of X is rough degree expression for the knowledge of middle set of a knowledge representation system, $0 \leq a(X) \leq 1$, $0 \leq P(X) \leq 1$.

3.3. Introduction to Improved Cellular Algorithm. Cellular algorithm is mainly aimed at the multiobjective optimization problem of resource allocation, but the effect of common cellular algorithm on resource allocation is not very good. Therefore, this paper proposes an improved cellular network algorithm. The gradient descent method is used to train the weights of DNN to complete the reverse training process of the algorithm. The simulation results show that the algorithm can set the deviation degree of resource allocation scheme independently, and the convergence speed is fast. The algorithm is superior to other algorithms in

transmission rate optimization and system energy consumption optimization.

4. Intelligent Recommendation System Based on the Fuzzy Rough Set and Cellular Algorithm

As a scientific research of intelligent computing, rough set theory has made great progress in both theoretical research and practical application, showing a broad application prospect. The improved rough set is applied to the data mining of association rules in cellular algorithm. The improvement of cellular algorithm can optimize the data mining scheme and effectively improve the recommendation efficiency of e-commerce intelligent recommendation system based on rough set theory. This section first introduces e-commerce personalized service recommendation system and then proposes an association rule mining model based on rough set. Then, according to the recommendation set of user page and the user's browsing volume recommendation engine, the data recommendation set is generated, and the generated data recommendation set is added to the user's latest request page and finally transmitted to the user's browser to realize personalized service. After the user completes the e-commerce behavior, the relevant data source is modified to realize dynamic recommendation adjustment, so as to facilitate the next page browsing recommend new content and improve the accuracy of the recommendation.

4.1. Data Preprocessing. The requirement of rough set theory to data must be discrete and complete data, and it usually needs to deal with the relevant knowledge of data. The data mining method based on rough set is used to organize and

solve the content of data table. Rough set theory is a good tool to deal with discrete attributes, but it does not deal with continuous attributes directly. Discretization of continuous attributes is an important issue in data preprocessing. In people's daily life, a large number of data are continuous. The diversity of data also leads to the diversity of data types. However, not all types of data can be used as processing objects in data mining. Some data are not suitable for data mining due to the continuity of data, and some data are not suitable for data mining due to incomplete factors such as insufficient data. Therefore, data completion is an indispensable step in data mining.

After preprocessing the experimental data, the data table is shown in Table 1.

4.2. Reduction Algorithm of the Fuzzy Rough Set. Reduction algorithm is based on the discernibility matrix [16].

Enter the decision table:

$$\begin{aligned} U &= \{X1, X2, K, Xm\}, \\ R &= \{C1, K, Cn, d1, K, dk\}, \\ T &= \{U, R, V, f\}. \end{aligned} \quad (8)$$

The output is the simplified discernibility matrix $D(T)'$.

We use the difference matrix $D(T)'$ obtained after simplification and then judge $D(T)'$. There is a row with all 0 or no 0 in it; if it exists, delete the row and judge whether there are duplicates at the same time; if there are any, delete the duplicate data. Finally, output the matrix.

$$M_{m \times n} = (cij)_{m \times n} = \begin{cases} \alpha \in C \mid f(x, a) \neq f(y, a), ([X]_c \neq [Y]_c \text{ 且 } [X]_D \neq [Y]_D) \\ 0, ([X]_c \neq [Y]_c \text{ 且 } [X]_D \neq [Y]_D) \end{cases} \quad (9)$$

Among them, C and D are the condition attribute set and the decision attribute set, respectively.

It can be seen from formula (6) that the discernibility matrix is a symmetric matrix, so only the upper triangle or the lower triangle can be calculated. The difference of the discernibility matrix is generated by comparing the differences between two objects. Therefore, when deleting an attribute, it is necessary to calculate whether there is only one attribute distinguishing two objects. If there is only one, it cannot be deleted.

The main idea is to calculate the discernibility matrix, find the core, then combine all the attributes containing the core, and finally judge whether the reduction condition is satisfied, so as to obtain the attribute reduction. The method improves the attribute reduction method based on discernibility matrix, increases the importance of attributes, greatly reduces the amount of calculation, and improves performance efficiency.

4.3. Improved Cellular Algorithm for Data Analysis of Association Rules. Association rule mining can find high-frequency frequent item sets in transaction databases with large transaction volume according to the minimum support and then generate association rules according to the minimum confidence level of the found high-frequency sets [17]. The first step is a key and complex step. The superiority of the algorithm directly determines the complexity and efficiency of the step. The second step is relatively simple. Based on the first step of generating frequent item sets, the method of subset generation is used to generate association rules.

The original cellular operator model is used for the assignment of multiobjective communication problem [18]. The personalized interface recommended in this paper can also be applied to the assignment of multiobjective problem. The algorithm flow of this experiment is [19]. For the multiobjective optimization problem in the system model,

TABLE 1: Teachers' data after preprocessing.

Attribute	Gender	Major	Political outlook	First degree	Highest education	Graduated school	Current job title	Assess age	Educational changes	Teaching skills	Research ability	Growing up
1	0	2	4	4	4	2	1	3	1	3	3	3
2	1	2	3	2	2	2	1	2	1	3	3	2
3	1	2	2	3	3	2	1	3	1	2	2	1
...
123	1	1	2	2	3	2	3	1	1	2	2	1
124	0	2	1	3	2	2	2	3	1	3	3	2

the resource allocation algorithm based on deep reinforcement learning is mainly divided into forward transfer process and reverse training process. In the training process, the energy efficiency is the goal, the maximum error in the training process is the goal, and the minimum TD is the reverse training DNN.

The problem of transmission rate constrained optimization is transformed into unconstrained optimization problem by using augmented Lagrange multiplier method.

$$\varphi(D_{m,n}^K, P_{m,n}^K, u_m, \eta) = -R + \frac{1}{2\eta} \sum_{m=1}^M \left\{ \left[\max \left(0, u_m - \eta \left(P_m^{\max} - \sum_{n=1}^N \sum_{k=1}^K L_{m,n} D_{m,n}^K P_{m,n}^K \right) \right) \right] \right\}. \quad (10)$$

The partial derivatives of $D_{m,n}^K$ and $P_{m,n}^K$ are obtained, and the Lagrange multiplier iterative equation is obtained, thus forming the digital flow. Then, the neural network is constructed according to the iterative data stream, including input layer, multiplier layer, and output layer. The depth depends on the number of iterations. Then, using the constructed neural network, the user information is used as input to output each spectrum allocation scheme to find the best allocation resource. In reverse training, error function should be constructed to minimize the value of loss function.

5. Comparison of Experimental Results and Analysis

5.1. Comparison and Analysis of Fuzzy Rough Set Performance. Compared with traditional algorithms and content-based algorithms, the fuzzy rough set algorithm performed in this experiment has greatly improved the prediction accuracy. This experiment first performs data preprocessing and deletes all zeros or all nonzeros. Then, the fuzzy rough set algorithm is performed to greatly improve the prediction accuracy of the system, and the recommended products and content can better meet the needs of users.

From the data in Figure 1 and Table 2, it can be seen that the recommendation accuracy based on fuzzy rough set algorithm on major online websites is the highest. On the first online website, the accuracy based on fuzzy rough set is higher than that based on content. The recommendation algorithm and the original website algorithm are 0.14 higher, but on the third APP, the algorithm based on fuzzy rough set is only 0.07 higher than the content-based recommendation algorithm and the original website algorithm. On the fourth APP, the algorithm based on fuzzy rough set is only 0.15

higher than the recommendation algorithm based on content and the algorithm of the original website. According to Figure 1, the original algorithm of the website has the lowest accuracy. Since accuracy is the most important content of this article, to improve the accuracy of users' online browsing content and give personalized intelligent recommendations, the use of fuzzy rough set-based algorithms is the best.

In the experiment, we should not only improve the accuracy of smart recommendations when users browse, but also improve the real-time performance of smart recommendations when users browse data. The faster the recommendation time, the users can find what they want in the fastest time. Browse the content and purchase the items you want, so you cannot ignore the real-time nature while intelligently recommending the content.

As shown in Figure 2 and Table 3, the response time of the fuzzy rough set-based algorithm on APP1 is 0.21 s, and the response time of the content-based recommendation algorithm on APP1 is 0.33 s. The response time of the fuzzy rough set-based algorithm on APP3 is 0.2 s, and the response time of the content-based recommendation algorithm on APP1 is 0.3 s. The response time of the fuzzy rough set-based algorithm on APP4 is 0.23 s, and the response time of the content-based recommendation algorithm on APP4 is 0.23 s. The fuzzy rough set algorithm increases the attraction between the element and the nearest cluster center, enhances the attraction between the element and the nearest cluster center, enhances the attraction between the element and the winner, and reduces the attraction between the element and the winner. The attraction speeds up the convergence speed of the algorithm. This greatly improves the response time of the system.

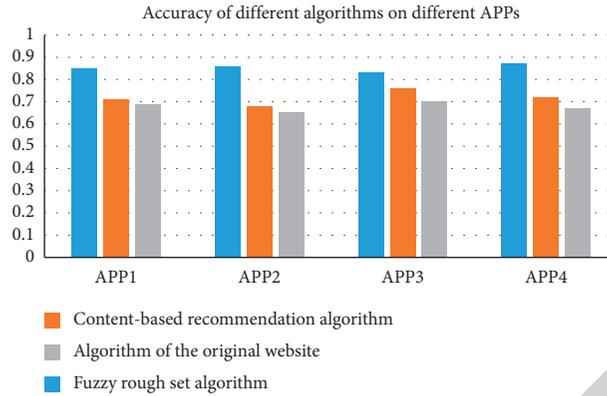


FIGURE 1: Accuracy of different algorithms on different APPs.

TABLE 2: Accuracy of different algorithms on different APPs.

Precision	Based on fuzzy rough set algorithm	Content-based recommendation algorithm	Algorithm of the original website
APP1	0.85	0.71	0.69
APP2	0.86	0.68	0.65
APP3	0.83	0.76	0.7
APP4	0.87	0.72	0.67

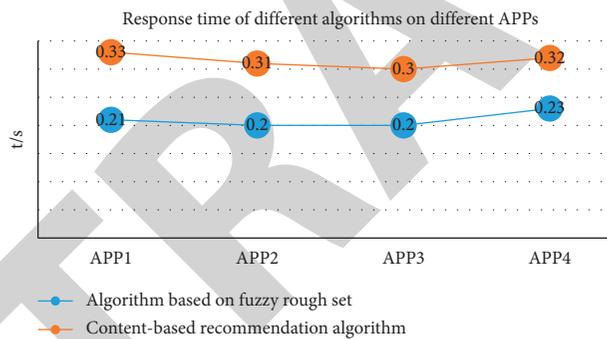


FIGURE 2: Response time of different algorithms on different APPs.

TABLE 3: Response time of different algorithms on different APPs.

Time	Algorithm based on the fuzzy rough set	Content-based recommendation algorithm
APP1	0.21	0.33
APP2	0.2	0.31
APP3	0.2	0.3
APP4	0.23	0.32

5.2. Proportion of Personalized Intelligent Recommendation.

Different people have different browsing habits, and the content of browsing is the same, so the personalized recommendation of intelligent recommendation is very important. This paper adopts e-commerce intelligent recommendation based on fuzzy rough set and improved cellular algorithm. The content recommended by intelligent recommendation is different for everyone, and the content recommended by intelligent recommendation makes people very satisfied, and the precision of recommended content is also very high. In this paper, the experimental group adopts e-commerce intelligent recommendation based on fuzzy rough set and improved cellular algorithm, while the control

group adopts the comparison of content-based recommendation algorithm. The comparison results are shown in Figure 3.

In the data in Figure 3, the data on the left are the accuracy of the content-based recommendation algorithm used in the control group, and the data on the right are the e-commerce smart recommendation based on the fuzzy rough set and improved cellular algorithm used in this experiment. From the data in Figure 3, one can be seen that the accuracy of e-commerce intelligent recommendation based on fuzzy rough set and improved cellular algorithm is 86%, and the accuracy of algorithm based on content recommendation is 70%. It can be seen from the above that the e-commerce intelligent

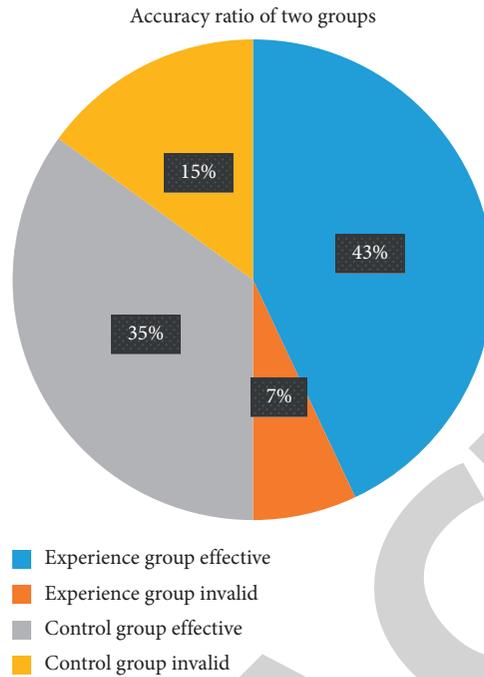


FIGURE 3: Accuracy ratio of two groups.

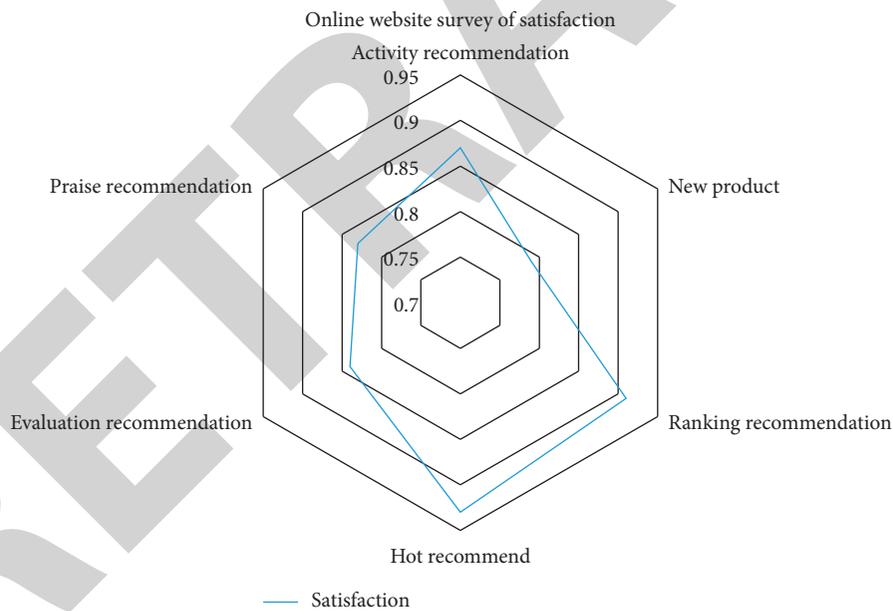


FIGURE 4: Online website survey of satisfaction.

recommendation based on fuzzy rough set and improved cellular algorithm used in this experiment has higher accuracy than the algorithm based on content recommendation and can be applied to major online websites.

At the end, we applied the algorithm used in this experiment to some online websites and found a lot of people to test it and conducted a survey on activity recommendation, new product recommendation, ranking recommendation, hot recommendation, evaluation recommendation, and favorable recommendation. The results of the survey are shown in Figure 4.

It can be seen from the data in Figure 4 that the e-commerce smart recommendation based on fuzzy rough set and improved cellular algorithm used in this experiment has the highest satisfaction in content ranking recommendation and hot recommendation, accounting for 0.91 and 0.93, respectively. Satisfaction is relatively low in new product recommendation and high praise recommendation, with satisfaction levels of 0.79 and 0.83, respectively. It shows that there are still some difficulties in the new product recommendation. In the intelligent personalized recommendation, the new product recommendation is not very

effective. In this experiment, we are quite satisfied with the results of satisfaction, and the overall satisfaction is relatively high. In future algorithms, we will also improve the effect of new product recommendation to make it more satisfying for everyone during online surveys.

6. Conclusions

In electronic business, intelligent recommendation is a popular recommendation technology. In this experiment, the precision of e-commerce intelligent recommendation based on fuzzy rough set and improved cellular algorithm is higher than the traditional intelligent recommendation. In this paper, the experimental data are preprocessed, the repeated and incomplete data are deleted, and the perfect data are processed by fuzzy rough set and improved cellular operator neural network. According to the experimental results, we can see that in the comparative analysis of fuzzy rough set performance, the original website algorithm has the lowest accuracy. The fuzzy rough set algorithm increases the attraction between the elements and the nearest cluster center, accelerates the convergence speed of the algorithm, greatly improves the response time of the system, and makes the waiting time of users become shorter and shorter when browsing the online website pages. Finally, we tested the usability of the system, and got very satisfactory results on activity recommendation, new product recommendation, ranking recommendation, hot sale recommendation, evaluation recommendation, and praise recommendation. Among them, our algorithm will recommend more popular content for customers. In this paper, the e-commerce intelligent recommendation based on fuzzy rough set and improved cellular algorithm is better than the previous algorithm. We also believe that the online website recommendation system will make people more and more satisfied.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author declares no conflicts of interest.

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