Deep Level Intelligent Mining Method of Online Education Decision Information in Economic Management

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Abstract. The conventional economic management online education decision-making information deep-level intelligent mining method has the problem of fuzzy characteristics of decision-making information, resulting in a long mining time. A new economic management online education decision-making information deep-level intelligent mining method is designed. Combined with the scores in the school online education database, collect the economic management discipline information, define the class density function, extract the hierarchical characteristics of decision-making information, divide the online education types, use the learners' satisfaction to explain the continuous learning behavior, and design a deep-seated intelligent mining method according to the specific situation of the model to be mined. Experimental results: the mining time of the deep-level intelligent mining method of economic management online education decision information in this paper and the other two deep-level intelligent mining methods are 17.168 s, 17.372 s and 10.306 s respectively, which shows that the designed deep-level intelligent mining method of economic management online education decision information has better performance.

Keywords: Economic management · Online education · Decision making information · Deep level · Educational objects · Intelligent mining

1 Introduction

The source of deep intelligent mining of decision information is mainly based on data mining and comes from knowledge discovery in data information base. It can be said that it is a new field of great application value in the research of data information base. With the wide application of computer online education management, the learning, work, reward, punishment and other information of students and teachers are stored in the online education management data information database. Deep intelligent mining of decision information is a new technology to find and extract hidden information from large data information base or data warehouse. The purpose of mining is to help decision makers find potential associations between data. Information mining is a process of extracting hidden, unknown but potentially useful information and knowledge from a

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large number of incomplete, noisy, fuzzy and random practical application data. Through various rules and methods of data mining to mine the data in the data information base, it will be found that there is a certain internal relationship between students' various behaviors and activities, and there are potential laws to follow. It integrates the theories and technologies of data information base, artificial intelligence, machine learning, fuzzy mathematics, statistics and other fields. From the point of view of data analysis, decision information mining is divided into two categories: predictive decision information mining and descriptive decision information mining. Timely formulate corresponding strategies to encourage or stop some behaviors, so as to provide effective support for online education management. Predictive decision-making information can mine and analyze data in-depth intelligence, establish one or a group of models, and generate predictions about data. According to the existing information such as learners' basic information, performance information, learning history, learning preference and knowledge structure, excavate learners' characteristics and help learners correct their learning behavior. Deep intelligent mining of descriptive decision information describes the data in a summary way and provides the general properties of the data. By comparing the results of learner characteristic analysis with the behavior goal standards formulated in advance, teachers can help learners correct their learning behavior, improve their learning ability and improve their personality, which is conducive to the harmonious development of students' quality in all aspects. As a specific step in the process of knowledge discovery, decision information mining is a series of technologies and applications, or a set of methods to investigate and model large-scale data and the relationship between data. In order to find the neglected elements, and this information may be very useful for predicting trends and decision-making behavior. Decision information mining technology involves many technologies, such as data information base, artificial intelligence, machine learning and statistical analysis. Its goal is to transform massive data into useful knowledge and information. Intelligent mining technology can automatically analyze data from large data information base or data warehouse, conduct inductive reasoning, and explore potential patterns.

Huang Shengqing et al. Constructed a mining model using data mining technology. By summarizing the syntax structure and candidate word set for user separation, the topic is extracted from the classification corpus. Analyze and obtain the key information of product design iterative decision, and finally shorten the product development cycle. However, the fuzzy problem of hierarchical characteristics of decision information has not been completely solved [1]. Peng qinjin and other scholars proposed a data self-help mining method of emergency decision system based on the fusion of maximum interval criterion and minimum maximum probability machine. First, collect the demand data, and use the collected data to build the signal model. Combined with the minimum and maximum probability machine algorithm, the demand data in the emergency system are mined independently, but the problem of fuzzy hierarchical characteristics of decision information is ignored in this process [2]. Therefore, the subject of deep-seated intelligent mining of economic management online education decision-making information needs to be further studied.

2 Deep Level Intelligent Mining Method of Online Education Decision Information in Economic Management

With the development of information technology, a variety of information management systems have emerged. The economic management online education decision-making information management system has been gradually established and improved, which has improved the teaching efficiency. However, with the growth of use time, a large amount of data information has been accumulated in the system. How to use these massive information to serve teaching decision-making has become an urgent problem to be solved. In order to accurately find useful data from various massive data, this paper proposes a deep-seated intelligent mining method of economic management online education decision information.

2.1 Collecting Information of Economic Management Discipline

The main function of online education of economic management is to be responsible for relevant classroom online education and make up for the limitations of time and distance. Due to different discipline characteristics, the judgment of the importance of the same index will be very different. Therefore, when mining the online education data information of economic management discipline education, the fuzzy borde data analysis method based on grid acquisition method is used to determine the weight. In the process of understanding the connotation and extension of the research on the training mode of economic and management undergraduates, it is particularly necessary to accurately define the training mode of economic and management undergraduates. This method not only analyzes the different characteristics of online education evaluation of subject education, but also emphasizes the ranking of various indicators of online education evaluation of subject education under different subject characteristics. The course study of students in school is gradual. And there is a certain correlation and sequential relationship between courses. As the name suggests, undergraduate students of economics and management refer to the group of students who receive systematic professional higher education and primary scientific research training in the field of economics and management [3]. Then, it will be extremely important to confirm the relevant professional regulations of economics and management. Before learning the economic management course, you must take some advanced courses. If you don't learn the advanced courses well, it will inevitably affect the learning of subsequent courses. In addition, different majors in the same grade study the same course. Due to different teachers and professional background knowledge, the overall scores of students in the class sometimes vary greatly. According to relevant regulations, economics in the specialty setting includes a category of economics, as shown in Fig. 1:

According to Fig. 1, economics mainly includes four majors: economics, international economy and trade, finance and finance. Using the examination results of students of different majors stored in the school online education database, combined with the correlation analysis and time series analysis of decision information mining, we can mine useful information from these massive data. According to this provision, all college students majoring in more than one major will belong to the research scope of this paper, that is, the audience of economic management online education. Help analyze the

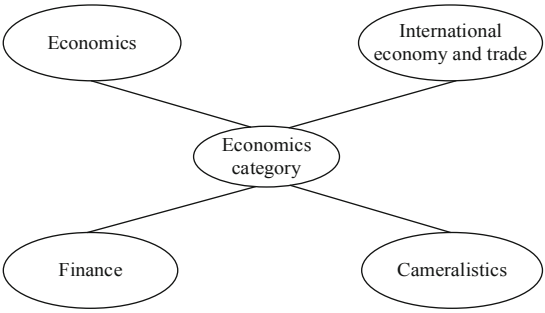

Fig. 1. Main disciplines of economics

correlation and regression between these data, and get some valuable rules and results. Finally, find the reasons that affect students' performance. The description of the connotation and extension of the ability training of economic and management undergraduates is inseparable from the grasp of the basic characteristics of economic and management undergraduates. On this basis, make reasonable arrangements for the curriculum. Examination is the test of the effect of teaching and learning. It is one of the indispensable links in online education. Whether it can promote teaching and learning largely depends on the quality of the test questions. The discipline categories of management are shown in Fig. 2:

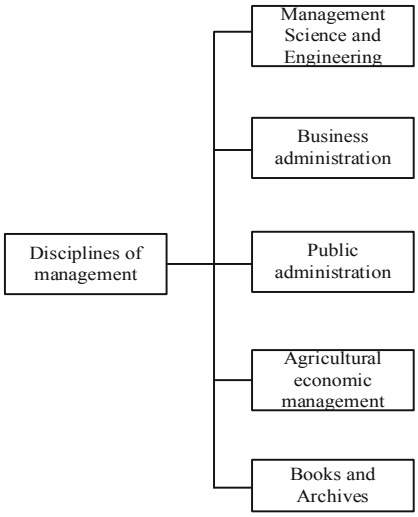

Fig. 2. Main disciplines of management

As can be seen from Fig. 2, management includes 5 categories and 18 majors, such as management science and engineering, business administration, public management, agricultural economic management, books and archives.

Based on the definition of the concept of economic management undergraduates, this paper believes that economic management undergraduates not only have some basic characteristics that all college students have, but also receive professional learning and preliminary scientific research training of economic management. Therefore, exploring effective methods to evaluate the quality of test questions is of great significance in the actual online education process. At present, most schools simply draw the score distribution curve according to students' test scores. If it is normal distribution, it is considered that the difficulty and discrimination of test questions basically meet the requirements. Based on the above description, complete the steps of collecting economic management online education subject information.

2.2 Extracting Hierarchical Features of Decision Information

As an effective tool to realize lifelong education, online education decision information has great differences in its educational objects, which are mainly reflected in different learning objectives, learning abilities and cognitive styles. Including the analysis of student management function, combined with the actual situation of students' learning and life, comprehensively manage students' learning situation, personal information, life background, learning stage, identity nature and other relevant information, so as to realize data information management and control. This requires that online education must adapt to the requirements of different educational objects and provide personalized services. On the online education website, after a period of accumulation, a large amount of teaching information can be used (such as registration information, question answering information, examination results, homework, exchange information and learning progress). If these information is not used, it will cause a waste of resources. The management function of teacher related decision-making information is to analyze the teacher's qualification, curriculum, education and substitute class content. On the premise of realizing teaching resource management and information control, it lays a foundation for subsequent decision-making information mining and management [4]. Using intelligent mining technology to mine various web data, including web page structure, web page content and web page log, can extract abstract, potential and useful knowledge, and can well meet the personalized needs of online education. Evaluation data analysis is from the perspective of mutual evaluation between teachers and students, student achievement and performance evaluation. Based on the improvement and implementation of the function of decision-making information, the comprehensive improvement of the effect of data analysis and teaching affairs management is realized through data information management, information mining and management. For example, using intelligent structure mining can provide different search paths for different learners. Using decision information content mining, we can find the close relationship between the contents in the page and provide learning content to meet the needs of different learners. Let α be the original sample set considered, the number of samples is i, some samples are redundant or several sample categories are inconsistent with the index value, β is the processed sample set, and the calculation formula of category correction

method is as follows:

$$H = \sum_{i=1}^{n} \frac{\beta(1-\alpha)^2}{\sum h_i} \tag{1}$$

In formula (1), h_i represents the sample eigenvector. Log mining can be used to analyze the relevance of web pages and user access patterns. In the process of mining decision information, the function of decision information is improved and implemented. Its focus is to realize the effective analysis and application of teaching management data on the premise of data information management and control based on data exchange and data mining. It can be realized by statistical analysis, association rules, clustering, classification and other algorithms. In short, only by transforming the rules, patterns and statistical data found in Web mining into useful knowledge, and then discovering similar learner groups, similar pages and frequent access paths, can we carry out targeted teaching on this basis, so as to truly reflect the personalized characteristics of online education. In decision-making information, the integration and management of data information is the center. On the premise of managing different information data, it also needs to be improved from the perspective of user authority management and data information management. Therefore, the functional requirements design of decision-making information is carried out. The definition of class discrimination conditions can be analyzed according to specific problems. This paper defines class discrimination conditions according to class density. The class density function is defined as follows:

$$Y(m) = \frac{\sum_{i=1}^{n} m_i}{T_{h-1}} \tag{2}$$

In formula (2), m represents the class density of the i-th sample and T represents the number of i-th samples. Online course is one of the key elements of online education system, and its quality determines the development of online education to a great extent. Use data mining technology to find potential and useful patterns or information in data. Its practical application needs to be analyzed from the perspective of comprehensive analysis and data information processing, so as to improve the practical application effect of decision information. In the process of analyzing the functional requirements of decision-making information, there are obvious differences in the operation users of teaching management data analysis, authority operation and data requirements. Model users according to their usage records. Combined with the user's basic information, analyze his usage habits and personal hobbies, in order to provide users with unique personalized services in the network environment. Second, site modification. The structure and content of the site is the key to attracting users. Therefore, on the premise of realizing the design and improvement of decision information, it is necessary to take teaching related data management and data information transmission control as the goal, and improve it from the perspective of data information transmission and teaching management control, so as to improve the practical application effect of decision information. Intelligent usage mining provides improvement basis for site designers by mining user behavior records and feedback [5–7]. Based on the above description, the steps of extracting hierarchical features of decision information are completed.

2.3 Classification of Online Education Types

Because online education learners cannot be completely equal to consumers in the general business field, and the learning related information system is only the core tool of online education, it is inevitable to be biased to explain learners' continuous learning behavior from a certain angle. However, other services are only a supplement, which is different from the professional online education platform. Learning subject is the leading force of learning style and the fundamental internal factor affecting learning style. Learners' knowledge level, age, learning attitude and emotion play a decisive role in learning style. Online education can be divided into three types according to service methods, including curriculum, question bank and Q & A. Learners in online education can be regarded as consumers who buy educational products of educational institutions. Their consumption cost includes not only the payment that can be converted into money, but also the time and energy invested. Courses are online education platforms that provide learners with different kinds of courses. Such online education platforms mainly provide corresponding courses for different groups. From the perspective of consumer psychology, some studies use learners' satisfaction with online education to explain their continuous learning behavior. These courses include live classes that can be cached and video classes that students can choose according to their time or needs. Courses are the service content of most online education platforms at present. If the data sample l to be mined is known, the distance from the sample point farthest from the sample center v_0 to v_p in all w samples is expressed as:

$$r = \max \frac{|v_p - v_0|}{Q} - l \tag{3}$$

If the class discrimination condition stipulates that some sample points are classified into a class, and the ratio of class density to large class density reaches or exceeds a certain constant e, e is called the class density threshold of the i-th sample, and the expression formula is:

$$G = \sum_{i=1}^{n} \frac{\eta}{e_i}(1-\eta)^2 \tag{4}$$

In formula (4), η represents the original measured value. Other studies use information technology acceptance model and information system continuous use model in the field of information management to explain continuous learning behavior from the perspective of learners' adoption or continuous use of information systems related to online learning. This kind of platform mainly provides various exercises for students at different stages, such as exercises synchronized with teaching materials, special exercises or model test exercises, etc. The platform reviews the exercises made by students, then provides answers, analyzes the wrong questions, and pushes relevant exercises for consolidation training. Q & a class provides students with exercise answers and analysis. More studies use the dropout theory and dropout model in the field of pedagogy to analyze the dropout behavior of online learners. In general, the mining object is defined as the data information base, and in a broader sense, decision information mining means finding patterns from a set of facts or observed data. At present, in addition to

providing their own main service contents, these three types of platforms also begin to dabble in other services. For example, the question bank corresponding to their courses will also be provided in the course platform, the question bank also has online counseling services, and the question answering class also begins to provide students with courses, exercises and other services. Or create associations and establish new business models to help decision makers adjust market strategies and make correct decisions. Decision information mining shows that knowledge is hidden in a large amount of daily accumulated data, and knowledge cannot be found only by complex algorithms and reasoning. Learning objects have certain restrictions on learning methods. Different learning contents and objects must be suitable for different learning methods. Based on this, complete the steps of dividing online education types.

2.4 Design Deep Level Intelligent Mining Method

The purpose of deep level intelligent mining is to condense the data and give its compact description. The traditional and simplest deep-level intelligent mining method is to calculate the sum value, average value, variance value and other statistical values on each field of the database, or express them in the form of histogram, pie chart and other graphics. At the same time, their future work will be basically limited to the economic management posts of enterprises with economic management industry background or other enterprises. This mining method gives a rough evaluation of the quality of test questions, and does not play a good role in promoting and guiding the actual online education. Data generalization is a process of abstracting the relevant data in the database from a low level to a high level. According to the specific situation of the patterns to be mined, a function that can measure the advantages and disadvantages of individuals clustered according to the above clustering criteria is defined as the fitness function. The fitness function is defined as follows:

$$k = d_1 W_t + \frac{d_2}{P_t} \tag{5}$$

In formula (5), W_t represents the number of population classes of the t-th individual after clustering according to the clustering criteria, d_1 and d_2 represent the weighting factors, and P_t represents the average class density of the class of the t-th individual. The association rules in intelligent mining are applied to the test paper analysis database (mainly including question number, score segment, number of students and other fields). According to the students' scores, the difficulty, discrimination, correlation and other indicators of each question can be analyzed. Because the information contained in the data or objects in the database is always the most original and basic information (in order not to omit any potentially useful data information), people sometimes want to process or browse the data from a higher-level view. Therefore, it is necessary to generalize the data at different levels to meet various mining requirements. The cultivation of economic management students should start with book knowledge. It is difficult to imagine that economic management undergraduates without professional knowledge will have excellent work performance after graduation. These aspects are the problems that need to be paid attention to in the online curriculum of our colleges and universities. At present, there are two main technologies of data generalization: multidimensional

data analysis method and attribute oriented induction method. Multidimensional data analysis method is a data warehouse technology, also known as online analytical processing. Data warehouse is a decision support oriented, integrated, stable and different time historical data set. Therefore, teachers can make a more accurate evaluation of the quality of test questions, which can be used to check their online education and students' mastery, and provide guidance for online education in the future. The premise of decision-making is data analysis. Set operations such as summation, total, average, maximum and minimum are often used in data analysis. The amount of calculation of such operations is particularly large. Therefore, a very natural idea is to pre calculate and store the set operation results, so as to facilitate the use of deep-seated intelligent mining. Online education has different degrees of impact on these three parts. Online education directly affects learning intermediaries, namely learning means and learning tools. Online education enables students to use new technologies for online learning through mobile phones, computers and other devices in addition to face-to-face learning. Classification is a very important task of data mining, which is most widely used in business. The school online education management data information database records the learning, work, social activities, rewards and punishment of students and teachers in each session, and uses the association analysis of decision information mining to find the internal relationship between teachers and students' various behavior activities. Different from the regression method, the output of classification is discrete category value, while the output of regression is continuous value. To construct a classifier, we need a training sample data set as input. The object of mining is not only the data information base, but also the file system or any other decision information set organized together.

3 Application Test

3.1 Test Preparation

The DTS tool of SQL Server completes the conversion and cleaning of most data. After conversion, different source data can be uniformly and orderly stored in the SQL Server database on the server side to prepare data for data mining. In different mining tasks, mining the operation module and mining the corresponding mining models from the mining database, different mining models carry out different data mining operations. These mining algorithm packages are relatively independent of each other. What they have in common is that they are managed by the mining library management module, obtain data through the storage control module, and write the mining results into the database. In this way of using plug-in algorithm to realize data mining, other database products can also be used. However, because the teaching management system uses SQL Server database and compares its many advantages in data mining, it is designated to use SQL Server database. Different database access technologies are also different. The main data access method of Microsoft is ADO. It is a simple object model. Using this model in applications can more easily interact with the database.

The experimental data comes from the online education decision-making document of economic management published on the official website of a university, totaling 200 M. During the experiment, noise is added to verify the mining performance of clustering algorithm, application network and different methods in this paper.

3.2 Test Results

This paper selects the deep-level intelligent mining method of economic management online educational decision information based on clustering algorithm and the deep-level intelligent mining method of economic management online educational decision information based on application network, compares them with the deep-level intelligent mining method of economic management online educational decision information in this paper, and tests them under different data noise conditions, The mining time of the three intelligent mining methods is long, and the experimental results are shown in Tables 1 and 2:

Table 1. Data noise 5 dB mining time(s)

Number of experiments	Clustering algorithm	Application network	Method in this paper
1	8.779	9.485	6.228
2	7.993	8.363	6.455
3	8.336	9.557	6.397
4	9.058	8.334	5.884
5	8.488	9.164	6.224
6	9.637	8.552	5.788
7	8.554	9.155	6.021
8	9.112	8.366	6.007
9	8.553	9.445	5.595
10	9.111	9.162	6.221

It can be seen from Table 1 that the mining time of the deep-level intelligent mining method of economic management online education decision information in this paper and the other two deep-level intelligent mining methods are 6.082 s, 8.762 s and 8.958 s respectively; It can be seen from Table 2 that the mining time of the economic management online education decision information deep-level intelligent mining method and the other two deep-level intelligent mining methods are 25.574 s, 25.787 s and 14.530 respectively.

Figure 3 shows the comparison of three methods to evaluate the accuracy of online education decision information mining in economic management.

Table 2. Data noise 20 dB mining time(s)

Number of experiments	Clustering algorithm	Application network	Method in this paper
1	26.147	25.588	15.616
2	25.339	26.194	14.332
3	24.817	25.377	15.227
4	26.003	26.086	15.298
5	25.818	25.114	14.776
6	24.110	26.379	15.331
7	25.313	25.010	14.208
8	26.009	26.776	13.772
9	26.117	25.233	13.255
10	26.070	26.108	13.484

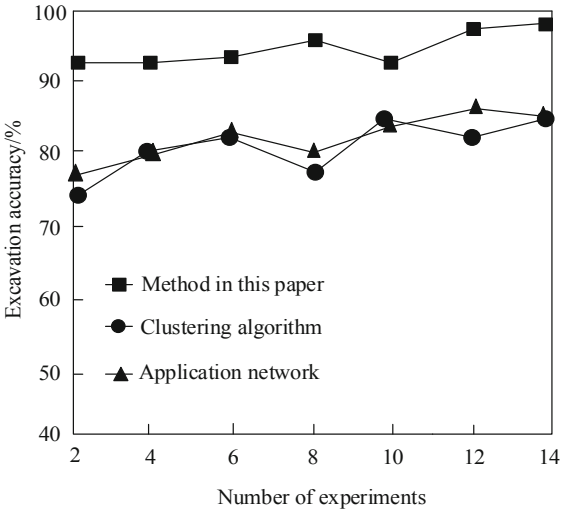

Fig. 3. Comparison of excavation accuracy

It can be seen from Fig. 3 that the deep-level intelligent mining method of economic management online education decision information in this paper has the highest mining accuracy, which is higher than the other two deep-level intelligent mining methods. This is because this method extracts the hierarchical features of decision information in advance, which not only ensures the timeliness of mining, but also ensures the accuracy of mining.

4 Conclusion

This paper combines the collected information of economic management disciplines, extracts the hierarchical characteristics of decision-making information through the density function, and divides the types of online education. Based on the use of learner satisfaction to explain continuous learning behavior, according to the specific situation of the patterns to be mined, a deep-seated intelligent mining method is designed. The experimental results show that this method has better performance. It improves the data mining method, expands the mining scope, and enriches the academic literature on decision information mining. In the future, rotor vibration is needed to continuously improve the diversity of mining objects and mining rules.

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