Research on micro-decision mechanism of university teachers' mobility based on data mining

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ABSTRACT

After the reform and opening up, the prosperity of market economy has promoted the transformation of China's social structure, and thus promoted the transformation of social human resources management mode. Teachers in universities, like members of other social trade organizations, have more opportunities for communication and re-selection of occupations and posts in the market economy. It is bound to become a trend to use a more effective decision support system for teacher management to provide decision support basis for managers. This article puts forward a micro-decision-making mechanism of teachers' mobility based on data mining (DM). By using DM method to improve the teachers' management system, the decision-making ability of teachers' management is improved. Through the practice of DM technology in teachers' management, the DM is further explored. The results show that the algorithm in this article has obvious advantages in the middle and late period of operation, and the error is reduced by 30.57%. The algorithm has the advantages of simple description, fast classification speed, suitability for large-scale data processing, etc. It can be applied to classification, prediction models, and purposefully classifying a large number of data.

Keywords: Data mining; teacher management; decision-making mechanism

1. INTRODUCTION

University teachers are a group full of wisdom. They are not only disseminators of human civilization, but also pioneers of the times in thought and technology [1]. Although many universities have started to reform the personnel management system based on the needs of development, they have actively established corresponding policies to introduce high-level talents [2-3]. It is of great value to analyze the influencing factors and their forces and explore the internal mechanism of teacher mobility for scientifically explaining the will and behavior of teacher mobility in universities [4]. In order to analyze and process the huge information with geometric growth faster and better, discover the relationships and rules between data, and quickly and accurately acquire useful and precious knowledge from the massive information to better serve the decision makers, it is necessary to have an intelligent knowledge acquisition tool based on computer and information technology to extract all kinds of knowledge buried in the data [5]. DM technology is an effective tool to solve this problem.

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A lot of important information may be hidden in the rapidly increasing data. What people want is to analyze the occupied information at a higher level in order to make full use of these data information. The flow of university teachers includes vertical flow within the system and horizontal flow across the system [6]. Among them, the vertical flow within the system mainly refers to the upward or downward flow of university teachers within the tertiary education system, and the relationship between teachers' personnel management remains unchanged in this process [7]. It is now possible to obtain any information on the Internet, but obtaining accurate and effective information has become the main problem to be solved in the growth of computer technology in China. And information resources are the blood of the information society [8]. Therefore, the degree of development and application of information resources determines the vitality of computer technology. In the known data set, DM initially became a process of discovering various models, summaries and derived values. The current database can realize the following functions, such as data query function, data entry function and data statistics function. However, these systems do not support the mining of important information behind the data. DM technology can help people extract higher-level information and interested knowledge and laws from the relevant data sets of the database. This article puts forward a micro-decision-making mechanism of teachers' mobility based on DM, and improves the teachers' management system by using DM methods, thus improving the decision-making ability of university affairs management.

2. METHODOLOGY

2.1 University teacher management

The concept of the mobility policy of university teachers determines the basic content of the mobility policy of university teachers, and to a certain extent, it also affects the degree of teachers' right to free mobility. It is of great significance for universities to adopt the necessary restraint policies to control the disorderly flow of teachers, which is of great significance to stabilize the high-efficient teaching staff. The construction and management of teachers is a necessary condition to guarantee the teaching quality, which is the foundation of the survival and growth of universities and the inevitable requirement of the internationalization of tertiary education. Establishing a scientific management and evaluation system for university teachers is an important measure to modernize university teaching management and improve teaching quality [9]. The teacher management system in universities is an organic whole composed of a series of interrelated indicators that reflect the objectives of the assessed objects. Using DM technology, we can find out a lot of really valuable information from the data generated by the management of teachers and teaching activities, which can better make quantitative analysis and prediction on the construction and cultivation of teachers in universities.

From the perspective of the growth of personnel management in universities in China, the problem of the mobility of university teachers in China was under the national planned distribution policy at the initial stage, and for a long time, the mobility of university teachers was not allowed. At the present stage, this closed personnel management policy is fundamentally different from the idea of open growth of universities, but it has had a profound impact on the personnel management of universities because of its long existence. Only by establishing a scientific monitoring and evaluation mechanism can we make a correct judgment on teachers' performance, so that incentives can really play a role in mobilizing and maintaining teachers' enthusiasm, and can also provide a more scientific decision-making basis for educational administrators in universities [10]. As many university teachers changed their careers and left their original jobs through mobility, there was a shortage of teachers in some universities. Many universities were forced to restrict the free mobility of teachers in order to ensure the normal operation of college teaching. On the policy of teachers' mobility in universities, the qualifications of teachers' mobility have been improved, and the universities have put forward some corresponding punishment measures for teachers' mobility without authorization.

2.2 DM algorithm for university teachers management system

The introduction of many teachers' mobility policies is the result of discussion among relevant personnel managers. In this case, university teachers can only be passive executors of the teacher mobility policy. When conflicts or contradictions arise, because there is no reasonable expression channel and coordination organization, the executors of the teacher mobility policy insist on maintaining the policy, while university teachers violate the policy or unconditionally obey it based on their own interests. The operation of the formal system of teachers' mobility needs to rely on the organizational system of teachers' mobility, and the formal system of teachers' mobility also affects the related behaviors of teachers' mobility through relevant organizations.

DM is based on data warehouse. The data in data warehouse is integrated, which is the result of screening, cleaning, summarizing and gathering the original over-detailed data, and it is more suitable for the needs of decision-making systems. The data in the data warehouse is time-varying. It can add the ever-changing data in the business system to the data warehouse after data cleaning. Data cleaning is the discovery and deletion of duplicate data. Because the data comes from different data sources, multiple copies of the same data often appear in the data warehouse [11]. Because the data quality of each data source is quite different, in order to improve the reliability of the data in the data warehouse, it is necessary to find out these possible duplicate data and delete them. In the era of planned economy, the operating mechanism of the formal flow system of university teachers mainly adopts the planned mechanism in terms of formal mechanism. Under such an institutional environment, university teachers are not allowed to flow, and the flow behavior of university teachers often adopts more restrictive mechanisms to hinder the flow. The micro-decision model of teachers' mobility based on DM is shown in Figure 1.

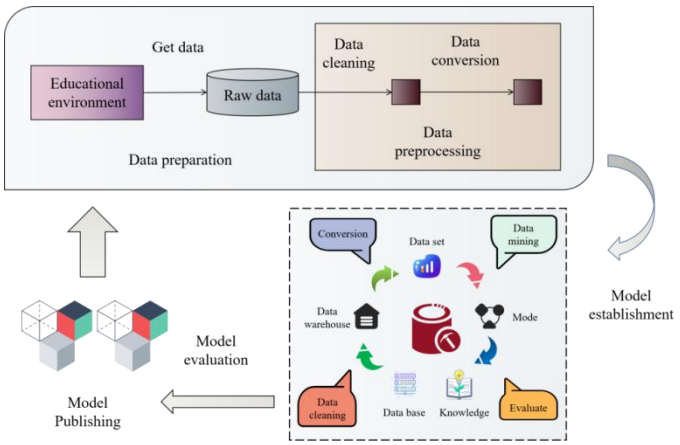

Figure 1. Micro-decision model of teachers' mobility based on DM.

The target group of China's teachers' mobility policy is university teachers, who are precisely a group with diverse interests. However, there is no corresponding channel or way to express this diversified interest demand reasonably. At present, the main body of the policy-making of the flow of university teachers is still the education management departments at all levels and the personnel management departments of universities, so it is difficult for university teachers to have the opportunity to participate or speak in the process of policy-making [12]. As an important part of the formal system of teacher mobility in universities, the operating mechanism system of the formal system of teacher mobility in universities plays a vital role in maintaining the operation of the formal system of teacher mobility in universities, and it is also an important behavioral basis for the management organization activities related to teacher mobility in universities.

Let S be a set containing s data samples, and the category attribute can take m different values, corresponding to m different categories C_i, $i \in \{1,2,3,\ldots,m\}$. Assuming s_i is the quantity of samples in category C_i, the amount of information needed to classify a given data object is:

$$I(s_1, s_2, \ldots, s_m) = -\sum_{i=1}^{m} p_i \log(p_i) \tag{1}$$

Where p_i is the probability that any data object belongs to category C_i, which can be calculated according to s_i / s. Let an attribute A take v different values $\{a_i, a_2, \ldots, a_v\}$. The attribute A can be used to divide the set into v subsets $\{S_1, S_2, \ldots, S_v\}$. S_j contains the data sample of attribute A taking a_j in the set. If attribute A is selected as the test attribute, let s_{ij} be the quantity of samples belonging to C_j category in subset S_j. Then the information entropy required to divide the current sample set by using the attribute A can be calculated as follows:

$$E(A)=\sum_{j=1}^{v}\frac{s_{1j}+s_{2j}+\ldots+s_{mj}}{s}I(s_{1j},\ldots,s_{mj}) \tag{2}$$

Among them, the $\frac{s_{1j}+s_{2j}+\ldots+s_{mj}}{S}$ term is regarded as the weight of the j -th subset, which is the sum of the samples whose a_j values are taken by the attributes A in all subsets divided by the total quantity of samples in the set. The information for a given subset S_j is:

$$I(s_{1j},s_{2j},\ldots,s_{mj})=-\sum_{i=1}^{m}p_{ij}\log(p_{ij}) \tag{3}$$

Among them:

$$p_{ij}=\frac{s_{ij}}{|S_j|} \tag{4}$$

The establishment and formation of the management organization system of the formal system of teacher mobility in universities is also constantly changing. Under different institutional environments, the management organization system of the formal system of teacher mobility in universities is different, and the perfection and perfection of the organization system depends on the perfection and perfection of the system to a great extent. The establishment of the operating mechanism of the formal system of teacher mobility in universities is carried out simultaneously with the establishment of the formal system of teacher mobility in universities, and its development and change are changed with the changes of mainstream values in the formal system of teacher mobility in universities.

3. RESULT ANALYSIS AND DISCUSSION

The flow of university teachers is one of the important means to improve the overall level of university teachers in China, and it is also an important way to realize the personal development interests of university teachers and the overall development interests of universities. The flow policy of university teachers is an important guide for the flow of university teachers. The ultimate goal of data collection and maintenance is for decision-makers. Although simple data query or statistics can meet some low-level needs, it is more necessary to dig out general knowledge from a large number of data resources that is of guiding significance to all kinds of decisions. This knowledge is a high generalization and abstraction of a large number of data. The quality of data is the key to DM, and the quality of mining model construction is determined by the quality of data. In order to reduce the error, we can make multiple comparisons and compare the samples from different angles. The data outlier removal process is shown in Figure 2.

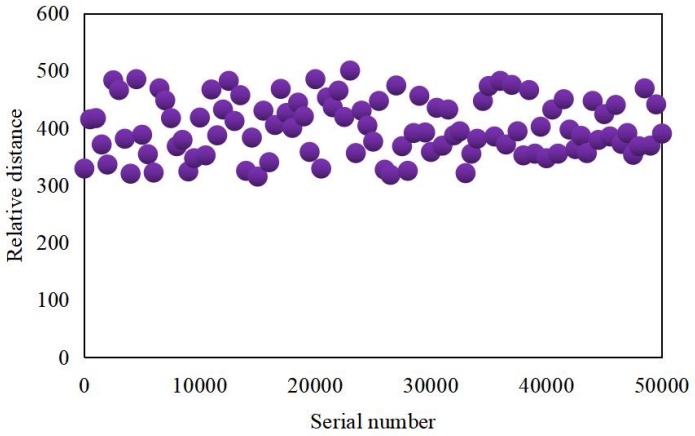

Figure 2. Data outlier removal processing.

Using these data to train the designed micro-decision-making model of teacher mobility, we can get better network weight. Then, the basic model of teacher management decision can be formed by substituting the obtained network weights into the algorithm. A large number of interconnected network structures in the teacher's mobile micro-decision model can process large-scale data in parallel, realize global real-time information analysis, and quickly coordinate the relationship between various input information for a specific problem and find the global optimal solution quickly.

Although the cohesive force and repulsive force in the process of teachers' mobility in universities act in the same direction, they jointly form a resultant force that hinders teachers' mobility, but they play their roles independently and the degree of mutual reaction is not high. Evaluate the knowledge of DM results to understand the meaning of each rule and attribute. If you are not satisfied with the generated rule set, make relevant adjustments to continue mining. If the rules are meaningful, professional processing and result interpretation are carried out, and knowledge is extracted or stored in the knowledge base. The comparison of the average absolute error of the algorithm is shown in Figure 3.

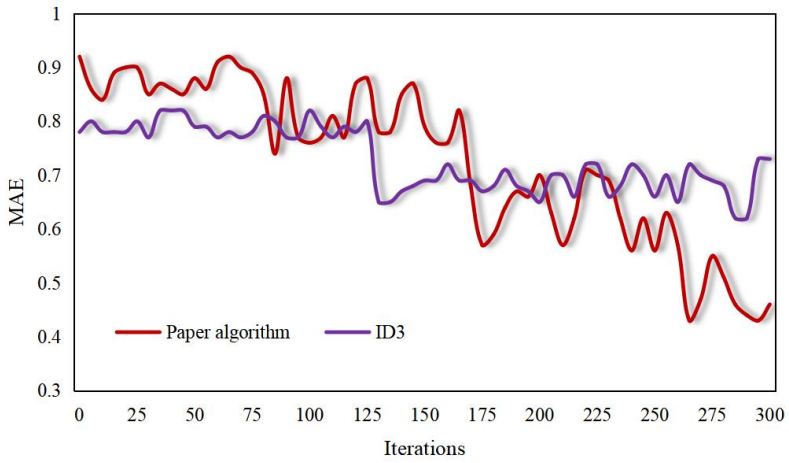

Figure 3. Comparison of average absolute errors of algorithms.

Compared with ID3 algorithm, this algorithm has obvious advantages in the middle and late stage of operation, and the error is reduced by 30.57%. Dynamics is the change and growth of things in time. If a series of index values reflecting this development and change process are arranged in chronological order, a dynamic sequence will be formed. By analyzing the development speed and increase and decrease speed of dynamic sequence, the basic trend and law of sports development in a certain aspect of training are displayed. The test results of test samples using ID3 algorithm are shown in Figure 4. The results of testing samples using the algorithm in this article are shown in Figure 5.

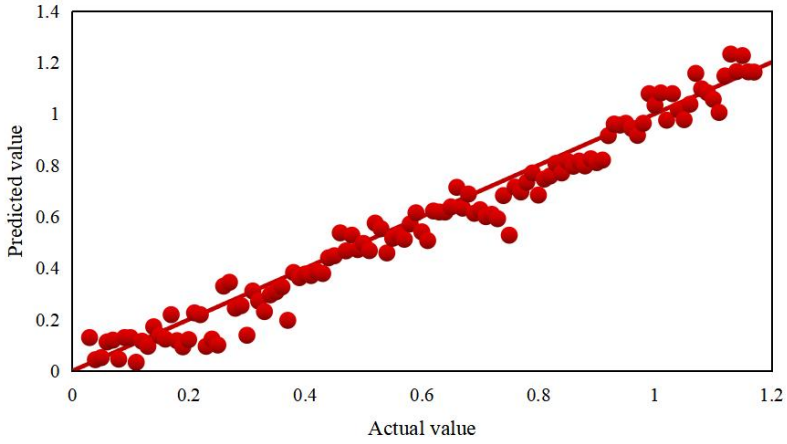

Figure 4. Test results of ID3 algorithm.

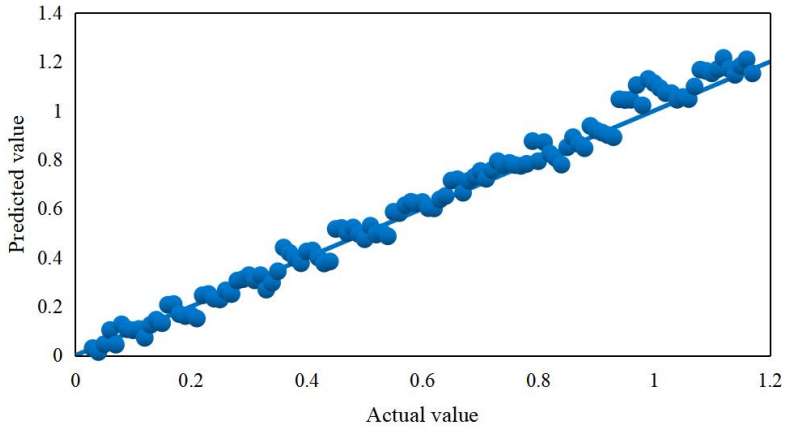

Figure 5. Test results of this algorithm

It can be analyzed that the micro-decision-making model of teacher mobility based on this algorithm is better than ID3 algorithm in both accuracy and efficiency. When preparing for DM, we must evaluate the existing data to determine whether the problem can be solved by DM. The movement of objective things is regular. By mastering the development trend of things through statistical analysis, we can infer the future.

4. CONCLUSIONS

As an important way to improve teachers' professional level, the effective flow of university teachers has been recognized by more and more society. How to reasonably and effectively guide the flow of university teachers and make it a driving force for the growth of tertiary education in China has become the focus of many researchers. This article puts forward a micro-decision-making mechanism of teachers' mobility based on DM, and improves the teachers' management system by using DM methods, thus improving the decision-making ability of university affairs management. The microscopic decision-making model of teacher mobility based on this algorithm is better than ID3 algorithm in both accuracy and efficiency. Compared with ID3 algorithm, this algorithm has obvious advantages in the middle and late stage of operation, and the error is reduced by 30.57%. When preparing for DM, we must evaluate the existing data to determine whether the problem can be solved by DM. As a tool for information extraction, DM's output is a reference for decision analysis, which can't replace the analysis work of professional analysts in the industry, and the mining method to solve a certain problem is not unique. The application of specific methods depends on the modeling ability and industry experience of data miners.

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