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The Construction and Application of Student Quality Evaluation System in Application-Oriented Universities Based on Decision Tree Algorithm

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Abstract: The continuous growth of the amount of data puts forward higher requirements for data storage, management and analysis. People urgently need a new generation of computer technology and tools, which can intelligently extract useful information and knowledge from a large number of data. Applying data mining technology to education will help to find hidden useful information from a large number of educational data and guide educational work. This paper first selects the evaluation index, and then sets the corresponding weight of the index. At the same time, combined with the actual situation of application-oriented universities, using the constructed application-oriented university student quality evaluation system, this paper develops a set of evaluation system based on Internet technology, intuitive interface and simple operation, which can realize the dynamic modification of each evaluation index and weight to adapt to the education evaluation With the continuous development of the theory and the demand of the times for talents, and with the existing Wan fang Data System of student work fine management department to achieve data sharing. The results show that with the increase of the number of attributes, the accuracy value of the test set and the average absolute error of the training set are decreasing, but when the number of attributes is 3, there is an inflection point. The time (s) of the attribute selection algorithm is 28.82% less than the original data, and the number of cuts is 28.6% less than the original data The application of sex selection algorithm in the data set of students' quality evaluation in Application-oriented Universities greatly reduces the amount of calculation and improves the efficiency of the system.

1. Introduction

With the development of information technology, various industries have accumulated a large

amount of data in recent years. Database system only provides data management and simple processing functions. Although people can analyze and study these data, they are more advanced in processing. For level processing (such as the discovery of rules and standards), it is very difficult to manually process such a large amount of data [1-2]. At the same time, with the increasing importance of data in daily decision-making, people have higher and higher requirements for data processing technology, such as: obtaining the overall data characteristics and predicting the development trend [3-4].

With the continuous development of education, how to improve the quality of students in Application-oriented Universities and how to scientifically evaluate the quality of students in application-oriented universities have become the focus of university administrators [5-6]. Scientific evaluation of the quality of students in application-oriented universities is not only related to the development of students themselves, but also related to the cultivation of high-quality talents. In recent years, the scale of higher education in China has developed from elite education to mass education [7-8]. At present, with the increasingly fierce competition and the increasingly severe employment situation, the society puts forward higher requirements for the quality of college students [9]. How to cultivate qualified college students and pay attention to students' performance and ability is a problem faced by all colleges and universities [10].

The lack of a set of traditional scientific evaluation system can not explain the students' quality. In this paper, by selecting the evaluation index, and then setting the corresponding weight of the index, combined with the actual situation of application-oriented universities, using the constructed application-oriented university student quality evaluation system, we develop a set of evaluation system based on Internet technology, intuitive interface, simple operation, so as to realize the dynamic modification of the evaluation index and weight, so as to adapt to the education evaluation Price theory and the continuous development of the demand for talents of the times, and realize data sharing with Wanfang Data System of the existing student work fine management department.

2. Decision Tree Algorithm and Evaluation System

2.1. Construction Principles of Evaluation System

Because there are many factors involved in the evaluation of students' quality, and their importance is different, it is difficult to get an accurate and comprehensive evaluation of students' comprehensive quality. Therefore, the key to build a student evaluation system is to abstract the characteristics that can reflect the quality of application-oriented undergraduate college students, and these characteristics can just reflect the students' strengths and abilities in all aspects. Only in this way can the evaluation system have guiding significance and practical value. At the same time, the following principles should be followed when constructing the student evaluation system.

(1) Scientific principles

As a practical activity to evaluate the quality of students, it should be guided and standardized by the theory of educational science. The evaluation system is a specific guidance and standardization event. The introduction of evaluation system should not only reflect the objective law of students' education, but also meet the needs of talents.

(2) Principle of independence

The principle of independence is the basic requirement of establishing index system. The comprehensive quality of college students includes many factors, each of which is relatively independent and can reflect some aspects of students. By observing the changes of different indicators in different periods, we can understand the changes of students' psychological status,

attitude and learning behavior.

(3) The principle of convergence

The principle of objective consistency means that the evaluation index of planning must be consistent with the evaluation objective. The specific contents of each sub index in the rating system should be compatible with each other. The conflicting indexes should not be placed in the same system. The consistency also includes the consistency of calculation methods, time and space restrictions, measurement units, etc.

(4) Guiding principle

Student evaluation system should reflect the basic requirements of College Students' quality education, and introduce the investigation of a large number of students participating in specific activities. It can play a guiding role in the cultivation and development of students' comprehensive quality, and make full use of the evaluation system to make students' knowledge, ability and character develop comprehensively and harmoniously, which is conducive to promoting students' all-round development.

2.2. Introduction of Decision Tree Algorithm

(1) Decision tree algorithm

Classification analysis method is to analyze the data in the training set, describe each class accurately, or introduce analysis model or mining classification rules, and use classification rules to classify the items in other databases in the database. Decision tree is a commonly used algorithm in classification prediction model. By deliberately classifying a large number of data, we can find some valuable potential information.

(2) The choice of algorithm

First, the decision tree method can create understandable rules, because the end-user of the system teaches the administrator data mining knowledge, so the interpretation of mining method is very important. Compared with other methods, the calculation of decision tree method is small, which greatly shortens the calculation time and improves the efficiency of the system. Thirdly, decision tree method can deal with continuous and discrete data. The data of quality assessment covers a wide range, including many types, not only qualitative attributes (i.e. discrete data), but also quantitative attributes (i.e. continuous attributes).

(3) Construction of decision tree

As the name suggests, the so-called "decision tree" is a tree structure. According to different levels, nodes are divided into root node, inner node and leaf node. The construction of decision tree usually includes two steps: one is to use the training set to generate the decision tree, and then prune the decision tree. The generation of decision tree is a recursive process from the root node to the bottom, usually using the divide and conquer method. The decision tree is constructed by continuously dividing the training samples into several subsets. The branch of decision tree is the process of branching the structure and attributes of the tree Remove unnecessary branches. The second is to use the decision tree to classify the new samples. The root node will check the characteristics of the samples, and determine the next node according to the test results until the plate node reaches, and the category identified by the leaf node is the prediction category of the new samples.

(4)ID3 Algorithm of Decision Tree

Calculate the expected information of a given sample classification,Let s be a set of s data samples. Suppose that the attribute of the target class has m different values, divide s into m

independent classes CI (I = 1, 2,... M), let Si be the sample class, and the expected information I is:

$$I(s_{1,}s_{2,},...,s_m)=-\sum_{i=1}^{m}p_i\log_2(p_i) \tag{1}$$

Let attribute a have v different values, and attribute a divide s into {S1, S2, SV}. If the number of samples similar to Ci in Sj is Sij, then the information entropy of molecular set is:

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

The information gain obtained by branching on a is as follows:

$$Gain(A)=I(s1,s2,...,sm)-E(A) \tag{3}$$

3. Ideas and Methods

3.1. Research Conception

Firstly, the evaluation index is selected, and then the corresponding weight is set for the index, and the setting standard is the influence degree of the index on the students' quality evaluation. In order to ensure the rationality of the evaluation system, this paper uses scientific methods, such as analytic hierarchy process, literature review method, to design the index and weight, and complete the establishment of the student quality evaluation system.

3.2. Research Methods

(1) Investigation and research method

Investigation and research method is the main research method of this paper, mainly through interviews and questionnaires, combined with the actual situation of application-oriented universities, using the constructed application-oriented university students' quality evaluation system, we develop a set of evaluation system based on Internet technology, intuitive interface and simple operation, which can realize the dynamic modification of various evaluation indexes and weights, so as to adapt to the actual situation With the continuous development of education evaluation theory and the demand for talents in the era, we should share data with Wanfang Data System of the existing student work fine management department, and obtain the score information of various indicators from it. At the same time, we should have certain statistical analysis function and data mining function.

(2) Literature analysis

This paper collects and studies the literature of student quality evaluation system of Application-oriented Universities in China, understands the research status of student quality evaluation system of application-oriented universities, analyzes the existing problems, and puts forward opinions and suggestions.

4. Analysis of Index Weight and Student Quality Evaluation System

4.1. Evaluation Index Weight Analysis

According to the analytic hierarchy process, the weight of the first level index of the rating

system is calculated. In order to ensure the accuracy and objectivity of the judgment matrix, the weight opinions are analyzed and weighed, and the judgment results are shown in Table 1 and Figure 1.

Table 1. Index weight judgment results

U	Ideological and moral quality	Knowledge, ability and quality	Physical and mental quality	Practice and innovation quality
Ideological and moral quality	1	1/4	2	1/3
Knowledge, ability and quality	4	1	4	2
Physical and mental quality	1/2	1/4	1	1/4
Practice and innovation quality	3	1/2	4	1

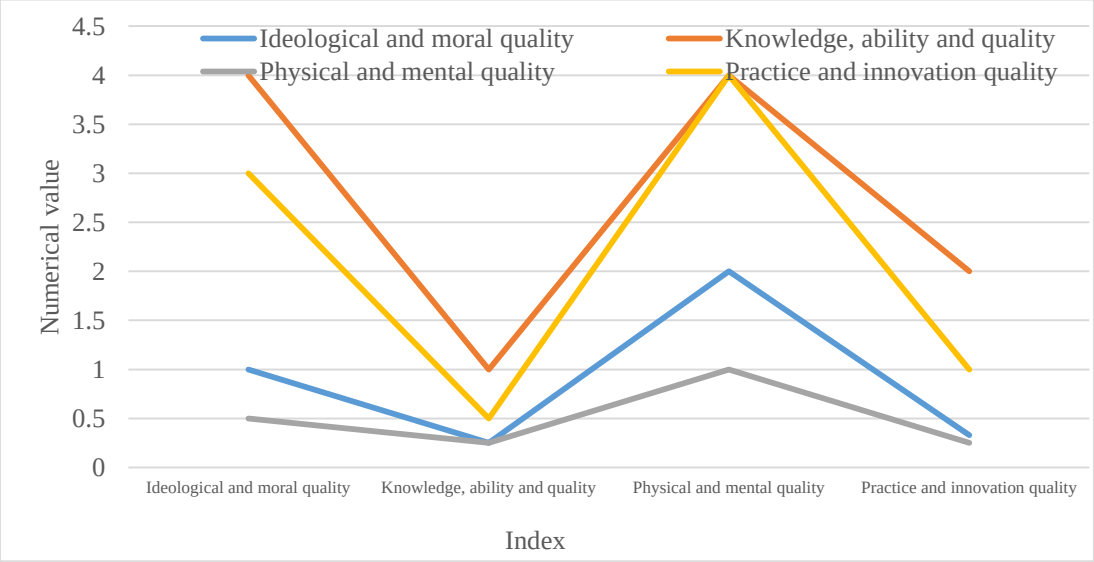

Figure 1. Index weight judgment results

It can be seen from Table 1 and Figure 1 that the weight vector obtained is the weight coefficient of the first level index, that is, the proportion of Ideological and moral quality is 0.132, the proportion of knowledge and ability quality is 0.452, the proportion of physical and mental quality is 0.079, and the proportion of practice and innovation quality is 0.315. When constructing the index system, facing the simple evaluation problem, the index system can be a horizontal structure, that is, multiple parallel indexes. But for the general complex comprehensive evaluation problems, the hierarchical structure is generally adopted, that is, there is a subordinate relationship between them. Because the quality evaluation index of application-oriented undergraduate college students involves many complex indexes, there is an obvious subordinate relationship between the indexes at all levels.

4.2. Analysis of Student Quality Evaluation System

In this experiment, ID3 algorithm is used to carry out classification experiments on the original

attribute set of experimental data and the attribute set selected by the attribute selection algorithm. The experimental comparison is shown in Table 2 and Figure 2.

Table 2. Experimental comparison before and after attribute selection of College Students' comprehensive quality evaluation data set

The time of original data establishment(s)	Data tree time after attribute selection(s)	Tree building time reduction (s)	Reduction rate of construction time
13.581	9.667	3.914	28.82%
The number of cut points needed to be calculated in the construction of experimental original data tree	The number of cuts to be calculated for data tree building after attribute selection	Reduction of number of cuts	Reduction rate of cut points
17149.1	12262	4588.2	28.6%

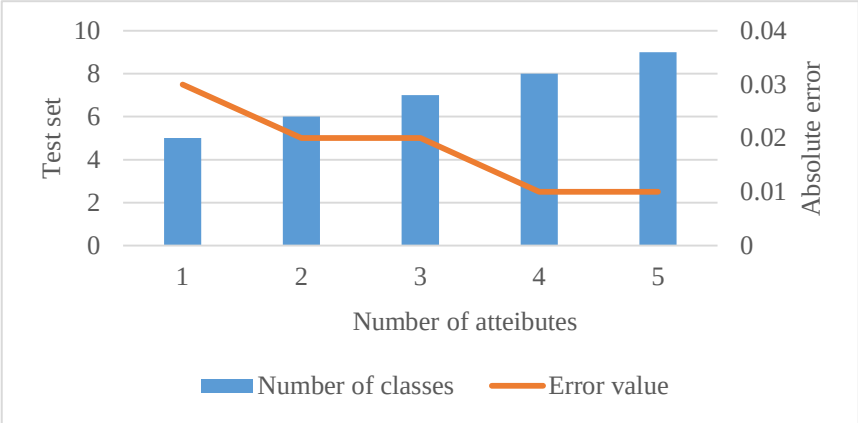

Figure 2. Mean absolute error

It can be seen from Table 2 and Figure 2 that with the increase of the number of attributes, the accuracy of the test set and the average absolute error of the training set are decreasing, but when the number of attributes is 3, there is an inflection point, and when the number of attributes is 4, with the increase of the number of attributes, the average absolute error of the training set and the test set almost does not change, and tends to be stable The classification accuracy and average absolute error of student quality evaluation data set begin to tend to the classification accuracy and average absolute error when the attribute set is 5. Compared with the original experimental data, the time (s) of the attribute selection algorithm is reduced by 28.82%, and the number of cut points is reduced by 28.6%. Therefore, the application of attribute selection algorithm in the data set of Application-oriented Undergraduate Students' quality evaluation greatly reduces the amount of calculation and improves the efficiency of the system.

4.3. System Conclusion

(1) University curriculum evaluation determines the overall evaluation of students' quality. Through the hierarchical structure of the decision tree, we can get the relativity of attribute importance. From the results, the university curriculum evaluation is the most important. The overall quality evaluation of the students with poor university curriculum evaluation is poor, but the overall quality evaluation of the students with excellent university curriculum evaluation is good. This shows that the quality evaluation of the students with good university curriculum evaluation is

good.

(2) There is no direct relationship between college entrance examination results and college students' quality evaluation. The quality of male and female college students is different, so we should not only judge the ability of students by gender factors.

(3) The students with better evaluation of extracurricular practical activities also have higher quality evaluation, and the students with better evaluation of extracurricular practical activities are more rated as "excellent".

(4) The higher the overall evaluation is, the higher the quality of the students whose evaluation of both university curriculum and extracurricular practical activities is, and the higher the quality of the students whose evaluation of both university curriculum and extracurricular practical activities is.

(5) The quality of IQ data evaluation is closely related to the overall quality evaluation, but the impact is not too great. Students with high intelligence do not do better than other students in the overall evaluation of students' quality.

5. Conclusion

With the rapid development of modern society, especially the continuous development of computer and communication technology, the amount of information is increasing every day. At the same time, a large amount of data is also produced. Colleges and universities have accumulated a large amount of data in information management. Data mining technology can efficiently and automatically analyze data, and mine hidden and useful information that has guiding value for college work, So as to help colleges and universities make the right decision. The construction and application of the evaluation index system of students' quality in application-oriented universities is an exploratory work, which is still in the exploratory stage. In order to make the evaluation work scientific, reasonable and effective, it is necessary to establish a suitable teaching management environment to improve the quality of students; it is necessary to pay attention to the study of university culture courses, guide students' extracurricular practical activities in time, and clarify the training objectives, Hierarchical education and training, strive to shape and comprehensively optimize the quality of application-oriented undergraduates, so that they can obtain the maximum value orientation in learning, knowledge updating and work.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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