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Research of Teaching Evaluation Model based on ID3 Decision Making Tree for polytechnic

Wuxue Jiang[1], Yinzhen Zhong[2]
[1] *Department of Computer Engineering, Dongguan Polytechnic, Dongguan, 523808, China*
[2] *Department of Finance, Dongguan Polytechnic, Dongguan, 523808, China*

Abstract*:* In order to conduct an effective evaluation of the vocational school-enterprise cooperation practical education, this article constructs a vocational students' graduation design evaluation index system based on the university-enterprise cooperation, which regards the vocational graduation design as vector and the experience as foundation. According to the AHP, this article has educed the right weight ratio of the primary and secondary index and applies the consistency check to the reasonableness of the weights for verification. Combined with comprehensive fuzzy theory, the article builds the evaluation findings, processes the questionnaire data in accordance with the fuzzy decision-making process and makes the appropriate conclusions. Case shows that the evaluation system is available to proceeding effectively evaluation of the university-enterprise cooperation graduation design practical teaching effectiveness and has good maneuverability.

Keywords AHP, fuzzy, teaching evaluation model, polytechnic practice teaching, ID3 Decision Making Tree

INTRODUCTION

Teaching quality evaluation of teacher is the important constitution and content of university teaching quality management. The existing study on the classroom teaching quality evaluation mainly focuses on four aspects: First, study on the evaluation means or methods, second, study on the subject of the evaluation, third, study on the content of the evaluation study, fourth, study on the evaluation index. The vocational education is skills-based education with particular emphasis on practical teaching. Currently, the study on evaluation of vocational practice teaching has become a hot spot. The university-enterprise cooperation is one of the main training modes of higher vocational education. The students' graduate design from some institutions have been directed by universities and businesses jointly, such as university-enterprise cooperation topics, university-enterprise cooperation to guide the design process, enterprises to participate in graduation reply process and university-enterprise to conduct evaluation of graduation design jointly etc. Because of the participation of the enterprises, it has increased the difficulty of the evaluation of graduation design teaching.

DATA MINING AND IMPROVEMENT STRATEGIES

Data Mining is from a large number of incomplete, noisy, fuzzy and random practical application data extracted implicit in them, people do not know in advance, but is potentially useful information and process knowledge [1][2]. Data mining technology in teaching management in recent years has been attempted. Currently, evaluation of classroom teaching quality, through mining techniques for the evaluation of indicators continue to improve, meanwhile, this teaching evaluation data on the growing, although intuitive query, sorting and other methods to predict a certain trend, but a lot of relevance for the hidden factors and trends in the data, no way of knowing [3]. Data mining technology has a variety of analytical methods can be applied for different characteristics, the choice of appropriate analytical methods, conduct research excavation, from the limited representation of the data, digging into a lot of really valuable information, the better for college managers to provide scientific information for decision making, have targeted specific measures to strengthen the teaching management, thereby enhancing the management level and timeliness. Apriori algorithm is the basic algorithm for mining frequent itemsets to generate the desired Boolean association rules; association rules it is also a very influential algorithm. The algorithm uses a hierarchical order of the loop method to complete the excavation work search frequent item sets [4]. The specific approach is: first find frequent 1-itemsets, denoted L1; then use L1 to tap L2, namely frequent 2-item set, constantly so the cycle continues until you cannot find more frequent K-itemsets so far. Each mining level Lk need to scan the entire database again.

Based on sampling method. Select the database D given a random sample S, then, instead of searching in the S frequent items in D. In this approach sacrifices some accuracy in exchange for effectiveness. Select this sample size S, so that you can set the frequent entry in the memory search in S;

thus, a total of only scan S total transactions. As the search for S instead of D in frequent item sets, may lose some global frequent item sets [5]. To reduce this possibility, you can use less than the minimum support to find support local frequent item sets (denoted as Ls) in S, and then the rest of the database used for the actual support count for each item set Ls.

Conformance test. Judge the eigenvector W of the matrix A corresponding to the maximum eigenvalue λ_{max} , after normalization, obtain the order weight value of relative importance between several corresponding factors of the same layer and some factor of the upper layer.

$$CI = \frac{\lambda_{max} - n}{m-1} \quad (1)$$

ID3 ALGORITHM PROCESS DESCRIPTION

ID3 algorithm is to find information about the process gain the greatest attribute in the attribute set A, as root, root attribute values according to the sample set into several subsets, concentrated to remove this property from the property, focus gain select the maximum value of each sub-attribute information, as the root node of the current subset, the upper set of child nodes of the root node, this cycle recursion, if the resulting subset of all the samples belong to one category, recursion stops.

Algorithm: Generate_decision_tree

Input: Training sample samples; candidate attribute collection attribute list

Output: Decision tree

Steps:

(1) Create a node N;

(2) if samples are in the same class C then Return N as a leaf node labeled with the class C;

(3) if attribute_list empty then Return N as a leaf node labeled samPles the most common class;

(4) Select attribute_list with the highest information gain property test_ttribute;

(5) Mark the node N is test_ttribute:

(6) for each test attribute of a known value ai Grow as a condition by the node N test_attribute = ai branches;

(7) Let si is samples of test_attribute = ai collection of samples:

(8) if si is empty then

A leaf with a labeled sample is the most common classes;

else

plus node consisting Generate_decision_tree (si, sttribute_list-test_attribute) returned.

ID3 algorithm flow chart is shown in Figure 2.

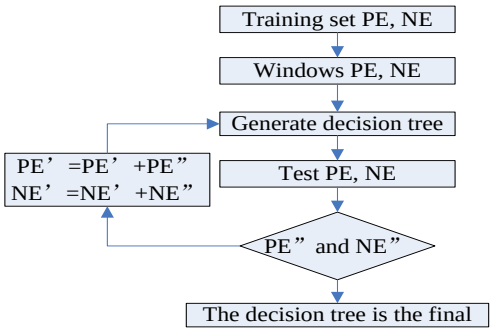

Figure 1 ID3 algorithm flowchart

TEACHING RESOURCE SHARING ARCHITECTURE BASED ON GAE PLATFORM

The teaching resource sharing architecture based on cloud platform contains the consumer end and cloud end Google App Engine (GAE).

1) Consumer end. The architecture’s consumer end is not only the PC machine, but also any terminal which can search the Internet. As long as there is the network resource, the consumer can use own Internet terminal browser to visit the cloud teaching resource sharing system.

2) Cloud end. The cloud end is Google App Engine cloud platform. The platform can be seen as a big virtual machine. Within the platform, the traditional infrastructure and setted operation environment exist, the developer only needs to upload the application to the platform, thus saving the development cost. Developing own system teaching resource sharing system in the platform, the system can visit the interface provided by Google App Engine and interact with Bigtable database. Through Google file system,GFS can save and visit the file.

The currently applied information system architecture mainly includes C/S architecture and B/S architecture. The cloud-service educational resource platform is built on the cloud computing platform. B/S (browser/server) mode is adopted as the platform’s overall technical architecture, including consumer end browser, server Web server, App application server and database these four technical architectures. Wherein, the browser is deployed on the consumer end and interacted with the server through the Internet, and other three layers are deployed on the server.

Concerning an application, the business execution function is to carry out the daily application activity. The detailed function of educational resource cloud platform based on cloud service is as follows: 1) After user logging on to the platform, the platform can provide the corresponding function interface for the users with different rights. 2) The platform allows the user with administrative privilege to maintain and manage the platform user and educational resource and other basic information, issue the platform notification and maintain the exchange platform, wherein, the latest published related information will

be updated to the platform homepage. In the functional architecture, the system design is as shown in Figure 2.

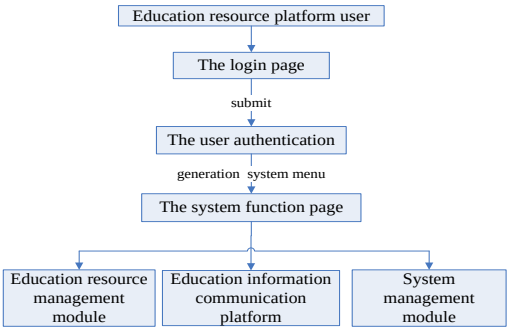

Figure 2 The system architecture of the platform

FUZZY COMPREHENSIVE EVALUATION

Fuzzy comprehensive evaluation method is a scientific evaluation methods proposed by American cybernetics expert Zadeh, who uses the basic theories and methods of fuzzy mathematics to quantify the fuzzy and uncertain things in the real world widespread, so as to make a relatively objective, accurate and realistic evaluation to solve practical problems [6]. The basic principle is to gather information of preparing teaching evaluation projects and to determine the evaluation factors and evaluation rating in the first phase. In the second phase, construct FUZZY mathematical model according to the weight ratio of evaluation index educed with the method of AHP. If the weight ratio educed with AHP method is $\omega_i (i = 1,2,\Lambda\ ,m)$, assuming that the evaluation equivalence domain is $A = (a_1, a_2, \Lambda\ , a_n)$, then construct fuzzy matrix R with grade domain and fuzzy relationship that takes influence on the factors.

$$R = \begin{bmatrix} r_{11} & r_{12} & \Lambda & r_{1m} \\ r_{21} & r_{22} & \Lambda & r_{2m} \\ \mathrm{M} & \mathrm{M} & \Lambda & \mathrm{M} \\ r_{m1} & r_{m2} & \Lambda & r_{mm} \end{bmatrix} \quad (2)$$

Then take the fuzzy evaluation matrix and evaluation index weight ratio $\omega_i (i = 1,2,\Lambda\ ,m)$ into $B = \omega \circ R$ for calculation, conduct the normalization process for the results and finally obtain the evaluation result according to the maximum membership principle or downgrade accumulation over half principle.

FUZZY COMPREHENSIVE EVALUATION STEPS

1) Establish the factor set of evaluation objects, U, and divide the evaluation factors into several levels.

2) Establish the comment set of evaluation factors.

3) Determine the weight ratio of each evaluation factor. Because of the different importance of each factor in the comprehensive evaluation, it is necessary to give each factor an appropriate weight coefficient. Assume that the weight of evaluation factors are respectively $a_1, a_2, \Lambda\ , a_m$ obtain the fuzzy set $A = (a_1, a_2, \Lambda\ , a_m)$, and $\sum_{i=1}^{m} a_i = 1$.

4) Establish the comprehensive evaluation matrix R. For each evaluation object, there is need to establish a comprehensive evaluation matrix R. And $R_i = (r_{i1}, r_{i2}, \Lambda\ , r_{in})$ is the single factor that the i-th factor u_i is in the comment set V. The r_{ij} represents the membership that the i-th factor obtains j-th comment v_j, which must meet $\sum r_{ij} = 1$ after the normalization generally.

5) Fuzzy comprehensive evaluation. According to the comprehensive evaluation matrix and weight set, the comprehensive evaluation result of the object is fuzzy set: $B = \omega \circ R = (b_1, b_2, \Lambda\ , b_n)$. And conduct normalization process for B.

6) Calculate comprehensive evaluation scores . In order to obtain visual score presentation of the evaluation result, it is allowed to conduct assignment to the comment level and the assignment matrix is $G = (G_1, G_2, \Lambda\ , G_n)$, so the evaluation result presented in the form of score value is $Y = B \cdot G^T = (b_1, b_2, \Lambda\ , b_n) \cdot (G_1, G_2, \Lambda\ , G_n)^T$. And Y is just the comprehensive evaluation score of the object.

VOCATIONAL GRADUATION DESIGN EVALUATION INDEX SYSTEM

Vocational graduation design is an important part of evaluating the student skills, the evaluation of graduation project is divided into three indicators, the first-level indicator includes the design topics, design organization and guidance, thesis plea, and design effects.

According to the general practice of teacher evaluation, the evaluation classification of each index includes four levels, namely "excellent", "good", "pass" and "fail", and each level corresponds to the set score: 95, 85, 65 and 45. Therefore comment set V={"excellent", "good", "pass", "fail"}, which corresponds to comment score set G = (95,85,65,45).

Construct the first-level index judgment matrix, as shown in Table 1.

Table 1: The First-level Index Judgment Matrix

	Design topics	organization and guidance	Thesis plea	Design effectiveness
Design topics	1	1/2	1/3	1

organization and guidance	2	1	1/2	2
Thesis plea	3	2	1	3
Design effectiveness	1	1/2	1/3	1

Conduct normalization and summation of each row sum. After renormalization, an eigenvector is obtained, namely $W=(0.14, 0.26, 0.46, 0.14)$, calculate the maximum eigenvalue $\lambda_{\max}=4.004$, according to $CI=\frac{\lambda_{\max}-n}{m-1}$ and $CR=\frac{CI}{RI}$, it could be calculated that CR=0.0018<0.10, which is believed that the comparison matrix has satisfactory consistency, so the weight coefficient of the first-level indicator is shown in Table 2.

Table 2: The First-level Index Weight Table of Vocational Graduation Design Evaluation Index

The first level indicator	Design topics	organization and guidance	Thesis plea	Design effectiveness
Weight	0.14	0.26	0.46	0.14

FUZZY DECISION STRATEGIES

1) Summarize the questionnaire data.

2) Calculate the comprehensive evaluation matrix of each sub-factor, $R_i(i=1,2,3,4)$, that R_1 represents the comprehensive evaluation matrix of sub-factors of "Design Topics", R_2 represents the comprehensive evaluation matrix of sub-factors of "Design Organization and Guidance", R_3 represents the comprehensive evaluation matrix of sub-factors of "Thesis Plea", R_4 represents the comprehensive evaluation matrix of "Design Effectiveness".

3) According to the weight distribution in the comparison matrix A, obtain the first-level fuzzy evaluation result vector of various sub-factors, $B_i(i=1,2,3,4)$, wherein 中 $B_i=A_i\times R_i$, and conduct the normalization process to $B_i(i=1,2,3,4)$. Use $B_i(i=1,2,3)$ to construct the second-level evaluation matrix R, obtain the evaluation result matrix according to $B=A\times R$.

4) Determine the evaluation level of the teacher's practical teaching [7].

CONCLUSION

The vocational practical teaching evaluation is a very complex issue and it will meet much more difficulties when operating under the university-enterprise cooperation mode, the evaluation is one of the problems that vocational colleges are researching jointly. The author in the paper has constructed the practical teaching evaluation index system under the university-enterprise cooperation mode, calculated the weights of each index with AHP and applied the comprehensive fuzzy theory to conclude decision. The cases showed that the system and the calculation process have the effectiveness and feasibility.

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