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Teaching Performance Evaluation with Decision Support System

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Abstract: *The influencing factors of classroom teaching quality evaluation, including students, teachers, courses, teaching process and other factors, will produce a large amount of data in the process of teaching evaluation. In view of the fact that the commonly used evaluation methods can not make full use of the data, this study uses the classroom teaching quality evaluation system based on the decision tree method to effectively analyze the collected data and better carry out the teaching quality evaluation.*

Keywords: *decision tree, classroom teaching quality, evaluation data analysis*

1. Introduction

Classroom teaching quality evaluation is a complex and comprehensive process[1]. There are many factors affecting classroom teaching quality[2-4], which interact and influence each other. The current research focuses on three aspects: the first is the research on the evaluation subject[5], the second is the research on the content of the classroom teaching quality evaluation system, and the third is to determine the index of the system and design the teaching quality evaluation method. Factors affecting teaching quality are considered from different perspectives, and there are many [6], such as the reform of evaluation institutions, cooperation between different institutions, the requirements of social development environment for higher education, and so on [7-8].

A large amount of data contained in the overall data has not been developed and applied. These data are contained in the system. Appropriate methods must be used to mine and process data to effectively play the role of data.

2. Design of the system

About teachers' classroom teaching quality[9], the researcher adopt c4.0 in data mining technology decision tree algorithm to construct the evaluation decision tree model of classroom teaching quality of teachers.

2.1. Research Design

For the Descriptive Design, we utilized this method to gather data on the problems and issues encountered in the existing system.

2.2. System Development Procedures

The study adopted the Spiral Model [10]as a process model for the development of the Teaching Quality Evaluation with Decision Support System. The Spiral Model is a risk-driven software development process model.

Through the Spiral Methodology, the following tasks will be performed by the researcher: determine objectives, identity and resolve risks, develop, and test the product, plan the next iteration.

Spiral Methodology is unique as it incubates a working prototype at the end of each mini-spiral. Each spiral is composed of four stages: planning, risk analysis, engineering, and customer review. The entire process of development is divided into four different stages which keep on repeating until the entire

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project is completed.

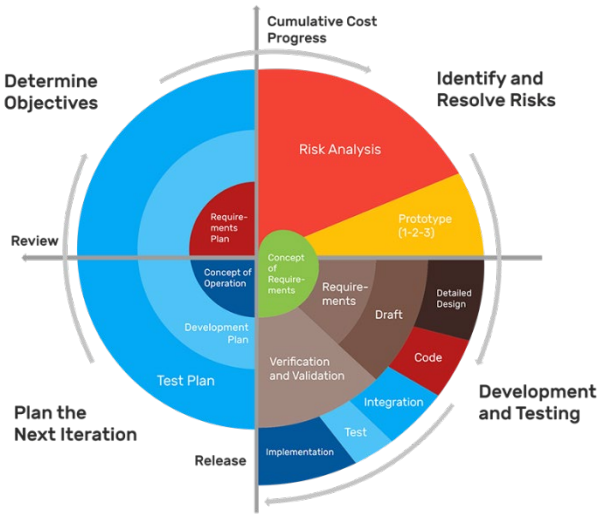

Figure 1: The Spiral Model

2.3. System Architecture

The Teaching Quality Evaluation with Decision Support System is composed of four modules that aim to automate the major functions which are as follows:

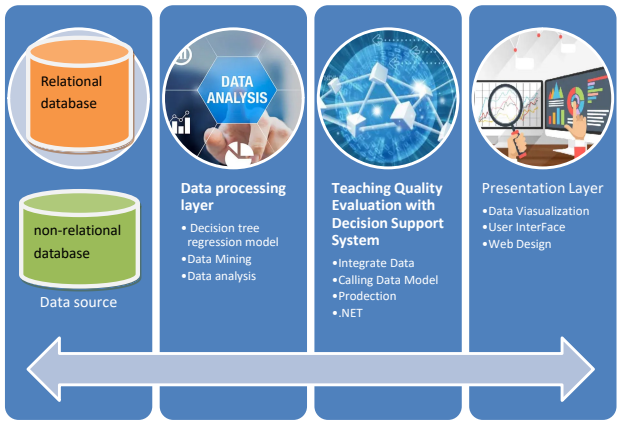

Figure 2: System Architecture

Figure 3 show the system Architecture composed of four layers. The system software architecture consists of four layers namely: data source, data processing layer, teaching quality evaluation with decision support system and presentation layer.

2.4. Decision Tree

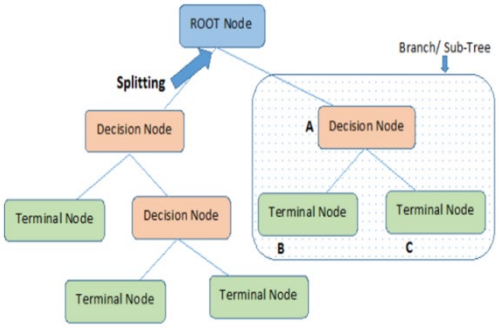

Figure 3: Node Relation Diagram of Decision Tree

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As can be seen from the Figure 4, the root node of the decision tree is at the top. In order to calculate entropy, we need to calculate the expected value of information contained in all possible values of all categories, which is obtained by the following formula:

$$H = -\Sigma_{i=1}^{n} p(x_i) log_2 p(x_i) \quad (1)$$

Where n is the number of classifications, and the greater the entropy, the greater the uncertainty of random variables.

3. Predictive Analytics

When predictive analysis is applied to classroom teaching quality evaluation, it can predict the next step with the help of methods including historical data, statistical modeling, and data mining, make judgments to improve teaching quality, and extract information from the contained data.

Data collection is a prerequisite to ensure the success of data mining. Data collection is to extract a group of data from the collected original database according to the needs of project construction.

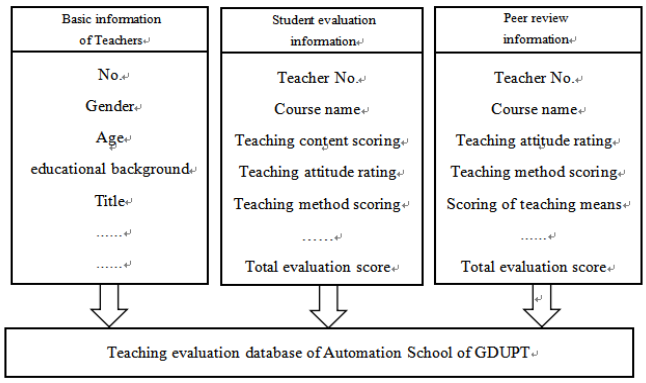

Figure 4: Teaching Quality Evaluation Database

Figure 5 shows the teaching quality evaluation database. It contains the student evaluation and peer evaluation data of each teacher. When the decision tree is created, due to the noise and outliers in the data, many branches reflect the anomalies in the training. Decision tree pruning can solve this problem.

Figure 6 shows the classification decision tree of whether the evaluation results are excellent after pruning.

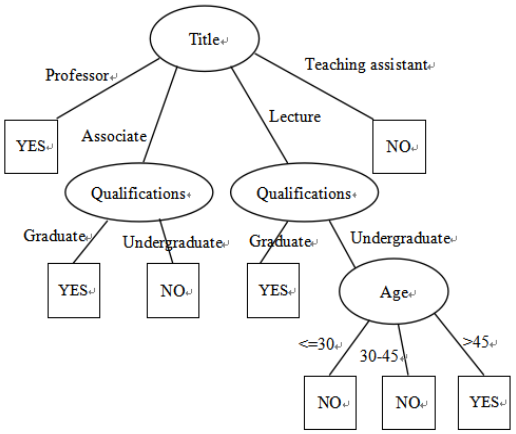

Figure 5: Decision Tree after Pruning

4. Application and Analysis

According to the proposed implementation scheme, taking the analysis of teachers' teaching evaluation information as an example, the whole process of data mining is completely realized.

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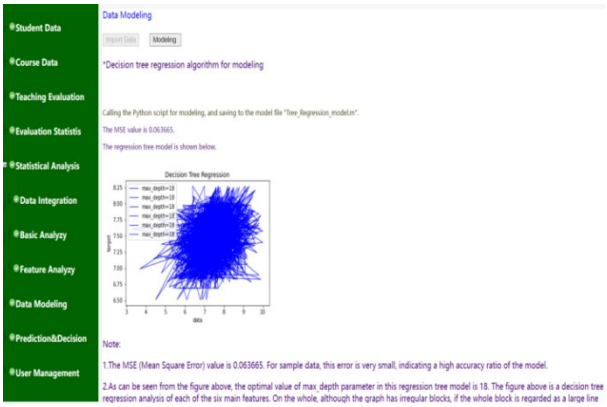

Figure 6: Display of Mining Results

The MSE (Mean Square Error) value is 0.063665. For sample data, this error is very small, indicating a high accuracy ratio of the model.

After the model is built, the feature importance is analyzed and visually displayed in the decision system. The results are as follows:

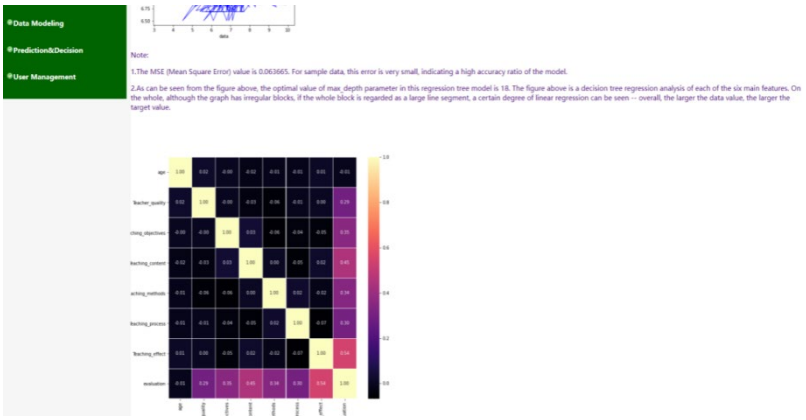

Figure 7: Feature importance analysis

Note: Figure 7 above is the correlation analysis diagram of each feature and target variable evaluation. It can be seen from the figure that the correlation coefficient between target variable evaluation and teaching effect feature variable is the largest, reaching 0.54, indicating that the better the teaching effect, the higher the teaching quality.

This study used the data mining technology based on decision tree to design the classroom teaching quality evaluation system of Petrochemical Technology. The developed system for classroom teaching evaluation system processed by information intelligent technology makes the classroom teaching quality evaluation more reasonable, more adaptive, and guiding value.

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