Current Trends in Technology and Science
ISSN : 2279-0535 Volume : Volume –II Issue : Issue-III

Student - Teacher Model for Higher Education System

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Abstract — In today's integrated world, the role of higher educational institutes is to offer quality education and to improve overall performance by taking qualitative managerial decisions. These organizations generate huge amount of educational database which contains valuable information. The analysis of this database using data mining techniques helps in decision making and finding meaningful patterns and knowledge. Data mining tools and techniques like association rule mining, clustering, classification helps to enrich education sector in various application areas. This paper focuses on capabilities of data mining in context of education by presenting a conceptual model for students as well as teachers.

Keyword - Higher education, data mining, knowledge extraction, applications.

INTRODUCTION

During past few years, there is explosive growth in the educational data which contains valuable information[10]. Usually, organizations generate data about student, staff, faculty, which contains information of management system, employees, lecturers, organizational personal and so on. These strategic resources are helpful for improving quality of higher educational institutes. Traditional statistical techniques are not much adequate for analysis of this datasets. The knowledge discovered by data mining techniques would enable the higher education systems in making better decisions, having more advanced planning. [8] Nowadays, these systems encounter many problems which keep them away from achieving their quality objectives. Some of these problems stem from knowledge gap. Knowledge gap is the lack of significant knowledge at the educational main processes such as counseling, planning, registration, evaluation. For example, many learning institutions do not have access to the necessary information to counsel students. Therefore they are not able to give suitable recommendation to the students. We also observe that there is no accurate grouping of courses to identify which type of course is most appropriate to be offered to which type of students. Our main idea is that the hidden patterns, associations, and anomalies that are discovered by data mining techniques can help bridge this knowledge gap in higher learning institutions. The knowledge discovered by data mining techniques would enable the higher learning institutions in making better decisions, having more advanced planning in directing students, predicting individual behaviors with higher accuracy, and enabling the institution to allocate resources and staff more effectively. It results in improving the effectiveness and efficiency of the processes. Data mining helps for analyzing students' behavior, to assist instructors, to improve teaching, to evaluate and improve teaching-learning systems, to improve curriculum and many other benefits also.

RELATED WORK

Data mining in higher education is a recent and promising research field and is well known because of its potentials to educational institutes. [1] A case study of using educational data mining in Moodle course management system which describes how different data mining techniques can be used in order to improve the course and the students' learning. [2] have a survey on educational data mining between1995 and 2005. Which compares the Traditional Classroom teaching with the Web based Educational System and also discuss the use of Web Mining techniques in education systems. [3] have described the use of k-means clustering algorithm to predict student's learning activities. The information generated after the implementation of data mining technique may be helpful for instructor as well as for students. [4] discusses how data mining can help to improve an education system by enabling better understanding of the students. The extra information can help the teachers to manage their classes better and to provide proactive feedback to the students. [5] have described the use of data mining techniques to predict the strongly related subject in a course curricula. This information can further be used to improve the syllabi of any course in any educational institute. [6] describes how data mining techniques can be used to determine the student learning result evaluation system is an essential tool and approach for monitoring and controlling the learning quality.

RESEARCH OBJECT

The object of this paper is to review the potential areas in which data mining techniques can be applied in the field of Higher education and to identify which data mining technique is suited for what kind of application in the form of a conceptual model for student and teacher improvement.

DATA MINING

Data mining is a powerful tool for academic intervention. Data mining uses explicit knowledge base, analytical skills, and domain knowledge to uncover hidden patterns.[13] These patterns form the basis of predictive models that enable analysts to produce new observations from existing data Data Mining refers to extracting meaningful knowledge from huge database. Data mining is a logical process which will search through large amount of data in order to find useful data and patterns which are previously unknown. Once these patterns are found they can further be used to make certain decisions for development of organization. Data Mining is considered as a most promising and challenging technology which can be used to discover knowledge from large warehouses use supervised or unsupervised data mining algorithms.

DATA MINING TECHNIQUE

Various techniques like Classification, Clustering, Regression, association rule mining etc., are used for knowledge discovery from databases. These techniques and methods in data mining need brief mention to have better understanding. [9]

Association: Association rules are if/then statements that help uncover relationships between seemingly unrelated data in a relational database or other information repository.[10] The association rule X → Y is interpreted as database tuple that satisfy the condition in X are also likely to satisfy the conditions in Y.

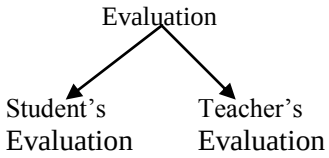
Classification and prediction: Classification is the process of discovering set of functions which describe and differentiate data classes which can be used to predict the class of object whose label is unknown. The derived functions can be used as classification rules, decision trees, and neural networks. In many applications it is required to find missing values rather than class labels. In such cases prediction is used.

The proposed model for higher education system named **'Student-Teacher Model for Enhancement of higher Education'** is as shown in table 1.

This model represents the superior advantages of data mining in higher educational system. It can be used as a guideline for the applications of data mining in higher educational system. This model mainly focuses on the improvement of students and teachers by extracting explicit knowledge using various data mining techniques.

The proposed model contains five main processes which are related to any higher educational system like counseling, admission, evaluation and performance. Each main process can be classified into some sub processes.

For example :



The main idea in this model is to identify how each of these commonly used processes can be improved through data mining techniques. Therefore, the forth column, 'Explicit Knowledge' represents enhanced processes achieved by applying data mining techniques mentioned in fifth column of this model.

In this model, Evaluation process contains evaluation of student and teacher. By making use of classification technique like decision tree, pattern of previous students successful or unsuccessful in a specific course can be determined. Therefore, with this knowledge, we can concentrate on the unsuccessful students to improve their performance academically. Similarly, how the previous student's attendance and their health information is associated with marks can be determined using association technique like apriori. In teacher's evaluation, we can associate teacher's training with students marks. With the help of this explicit knowledge, an institute can arrange more training programs for teachers and improve student's performance accordingly. Also, the characteristic patterns of previous teachers which were more effective than others can be predicted. This knowledge of patterns can be used to improve other teacher's performance.

CONCLUSION:

Today, higher educational systems are more prone towards their educational goals and objectives. In this paper, we discussed that data mining techniques are helpful to extract meaningful knowledge from huge educational data. The Student - Teacher Model for Enhancement of higher education System is used as a guideline for the application of data mining in higher educational system. With the help of this model we can increase ratio of admissions by counseling students for better selection of courses. Also, it helps to enhance the evaluation and performance of students as well teachers.

In future, we will implement this model in real higher education system to enhance quality of education and improve decision making procedures using data mining.

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Table 1 : Student Teacher Model for Enhancement of Higher Education System

Main Process	Sub-Process	Implicit Knowledge	Explicit Knowledge	Data Mining Method
Counseling	Student's Course Selection	Association of student and most appropriate course	associating student to most appropriate course	Association
		Patterns of previous students choosing various subjects	Predicting what type of students are most likely to particular type of subjects	Prediction
		Classification of student to the existing courses	Classifying student to the most appropriate available course in the university	Classification
	Student Behavioral Counseling	Patterns of previous student behavior	Predicting student problem behavior pattern	Prediction
Admission	Student Course Selection	Association of student to most appropriate subject	associate student to different subjects	Association
		Classification of student to most appropriate subject	classify student to different subjects	Classification
		Patterns of students choosing different subjects	Predicting what type of students are most likely to choose a subject	Prediction
Evaluation	Student's Evaluation	Patterns of previous student's learning outcome	predicting student's learning outcome	Prediction

		Patterns of previous student's successful and unsuccessful in a course	Classifying students into groups of and unsuccessful in a course	Classification
		Patterns of previous student's attendance corresponding to marks	Associating attendance with students marks	Association
		Associating student health with their marks	Associating health information with their marks	Association
	Teacher's Evaluation	Classifying characteristics of previous teachers with effective teaching than others	predicting more effective teachers	Prediction / Classification
		Association of teacher's training with student's marks	Associating teacher's training with student's marks	Association
Performance	Student's Performance	Association of student performance with their learning attitude	Associating student performance with their learning attitude	Association
		Association of student attendance with their class situation	Associating student attendance with their class situation	Association
		Success pattern of students with good performance but low teacher's satisfaction	Predicting possibility of students with good performance but low teacher's satisfaction	Prediction
		Classifying student to time and place of classes	Classifying student to most appropriate time and place for different classes	Classification
	Teacher's Performance	Association of teachers with poor teaching with students marks	Associating teachers with poor teaching with students marks	Association
		Association of teachers with their attitude or personal information	Associating teachers with their attitude or personal information	Association