An Adaptive Model to Enhance Student Performance Analysis

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Abstract— There is a management system in every college to manage the student's records. These days very few system evaluates the performance of the student based on their yearly performance in academics. Nowadays the Student failure and dropout rate is increasing drastically and is the biggest problem. Data mining plays a vital role in predicting and identifying these dropout rate. The proposed system is capable of predicting the performance of student which in turn could help the professor to identify the students who are about to have a bad performance and are going likely to fail in future. The proposed system assess the evaluation of student performance through data mining techniques such as Decision tree, Fuzzy logic, C means clustering.

Keywords— Student Performance, Decision Tree, Evaluation, Fuzzy logic, Data mining.

I. INTRODUCTION

The data in educational institute is growing significantly. Presently the need to represent data in an integrated and consistent format is also increasing. So we propose a model on which data mining techniques can be applied to predict and enhance student academic performance. Data mining is a technique to find a relationship between variables or factors in the large amount of database. Here we implement the data mining techniques through classification approach to analyze student data. The information from a system can be rapidly assessed to find the performance of students. The data and information gained from the learning system can be used as a substantial indicator for monitoring of the potential student failure. Furthermore alerts can be sent to the parent and academic staff to intimate them about the performance of the student. The data in educational institute is growing significantly. Presently the need to represent data in an integrated and consistent format is also increasing. So we propose a model on which data mining techniques can be applied to predict and enhance student academic performance. Data mining is a technique to find a relationship between variables or factors in the large amount of database.

II. LITERATURE SURVEY

[1] Proposed a New Fuzzy Expert System for students' academic performance evaluation based on fuzzy logic techniques. When the results are evaluated from fuzzy expert system, a difference in outcomes is seen between the classical and proposed fuzzy logic based expert systems methods. While the classical method adheres to a constant mathematical rule, evaluation with fuzzy logic has great flexibility and reliability.

[2] Apply computer based Fuzzy System Approach in plane of time consuming conventional method. However, in some cases, the variations in results from fuzzy system have been observed for some students who have same result through conventional method. It was due the difference in their attendance which shows that expert system incorporates input attendance effectively.

On the contrary in the conventional system, for a regular course, a student must have mandatory attendance failing to which the student may not be allowed to appear in exams. This shows that the expert system provides flexibility to the inflexible conventional system which is greatly required in present age of technology.

[3] Proposed Gaussian MF's to represent the fuzzy sets (i.e., levels) representing the importance, the complexity and the difficulty of the questions given to students. Results show that using Gaussian MFs with a width value (i.e., standard deviation) of 0.4 and higher provide a more reliable evaluation system which is able to provide new ranking orders without changing students' total scores. Gaussian MFs provide smooth transition between levels and provides a way to fire the maximum number of rules in the rule base and hence a more accurate representation of the input– output relationship is achieved.

[4] Explores the potency of machine learning algorithms in deciding the influence of result, parental education, gender, economy and the locality within the study and analyze of school students'performance. It is discovered that Random Forest performance is best than that of different algorithms employed in the study.

[5] Presents a fuzzy set approach to assess the outcomes of student-centered learning. The proposed method uses a fuzzy set method for determining the assessment criteria and their corresponding weights. The commonly agreed criteria are then used to evaluate the students' learning outcomes.

[6] Proposes a new performance evaluation method based on the Fuzzy Logic System (FLS). The study proposes a new evaluation method to find a performance of students results based on FLS and

also compared with the Classical Method (CL). Students' performance based on organizing technique at Manonmaniam Sundaranar University in the Department of Statistics was carried out using FLT and it was compared with the CL. Twenty students took part for the statistical course were considered as study samples. Several approaches using FLT have been proposed a practical method for evaluating student academic performance and compared with existing statistical method. In this paper, evaluation of the results showed variations between the CL and FLMs.

[7] Proposed rule based Fuzzy Expert system for students' academic performance evaluation based Fuzzy C-Means Clustering Algorithm, Fuzzy Logic and Regression analysis model. The proposed rule based Fuzzy Expert System automatically converted the crisp data into fuzzy set and also calculate the total marks of a student appeared in semsetr-1 and semester-2 examination.

[8] Presents how teachers' expertise and students' logfiles have been used in implementing, training, testing and evaluating the neural network-based fuzzy diagnostic model, which is a general diagnostic model, in diagnosing aspects of students' learning style in the Intelligent Learning Environment ''Vectors in Physics and Mathematics''.

[9] The classification task is used in employee database to predict the employee performance on the basis of trained dataset. As there are many approaches that are used for data classification, the decision tree method is used for measuring the performance of an employee in an organization. Information like attendance, paper presented, seminars attended were collected from the employee's previous record, to predict the performance at the end of the year. This study helps to predict whether to give yearly increment, promotion and career advancement for an employee in an educational institution.

[10] On the basis of the published empirical comparisons of classification tree algorithms, GUIDE appears to have, on average, the highest prediction accuracy and RPART the lowest, although the differences are not substantial for univariate splits.

III. CORE METHODOLOGY

Figure 3 presents core methodology implemented in student performance evaluation and elaborated in below section. System has been implemented in five phase approach.
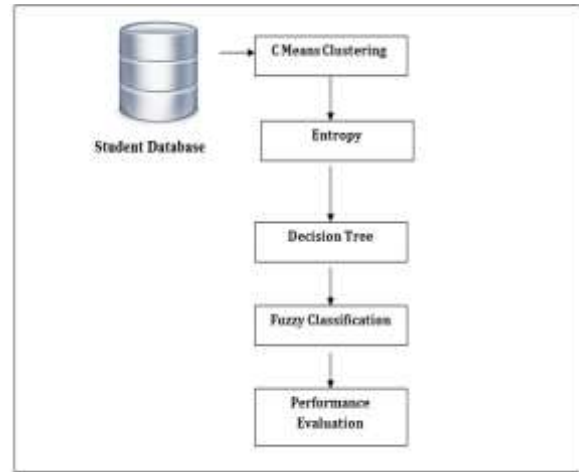

Figure 3: Student Performance Evaluation System

Phase 1: C-Means Clustering

Student Information with features like marks, attendance is been retrieved from web Application database. This Information consists of student name, roll_no, subject, marks, Attendance and class. Relevant attributes are been selected for data mining. In C-means clustering initially unique Users are been extracted, subsequently unique marks are been fetched. Based on This Two Attributes membership Matrix is Been generated. C-means Clustering range is been Generated based on min_max values of marks Clustering process is been initiated to form clusters and Five different clusters are been generated.

Phase 2: Shannon Information Gain Evaluation

Based on this clusters Shannon Information gain is been evolved for each student and Applied on all clusters.

$$J_m = \sum_{i-1}^{N} \sum_{j-1}^{C} \mu_{ij}^m \left\| X_i - C_j \right\|^2 \quad 1 \leq m < \infty \quad \text{----------------------(1)}$$

Here

m = real number whose value should be greater than 1

u_{ij} = degree of membership of x_i in the cluster j

$x_i = i^{th}$ of d-dimensional measured data

c_j = d-dimension center of the cluster.

Then the advancement of the groups is done by the reality of fuzzy partitioning which yields fine grained bunches which thus shows the dynamic examples of the information gain for Student with marks

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ALGORITHM 1: FCM

Let P = {p₁, p₂, p₃ ..., pₙ} be set of data points and c = {c₁, c₂, c₃ ..., c_c} be the set of centers.

Step 0: Start

Step 1: Randomly select *'c'* centers.

Step 3: Calculate fuzzy membership $'\mu_{ij}'$ using:

$\mu_{ij} = 1/\sum_{k=1}^{c}(c_{ij}/c_{ik})^{(2/m-1)}$

Step 4: Compute fuzzy centers $'v_j'$ using:

$V_j = (\sum_{i=1}^{n}(\mu_{ij})^m X_i) / (\sum_{i=1}^{n}(\mu_{ij})^m)$,

for all j=1,2,…c

Step 5: Repeat step 2) and 3) until minimum $'J'$ value is achieved or $//U^{(k+1)} - U^{(k)}// < \beta$.

where, $'k'$ is iteration step. $'\beta'$ termination criterion between [0, 1]. $'U = (\mu_{ij})_{n*c}'$ is the fuzzy membership matrix. $'J'$ is the objective function.

Step 6: Stop

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Phase 3: Decision Tree Application:

Based on Shannon information gain evaluated in phase 2 decision tree is been generated for generated cluster-gain values. Equation 2 is been used in decision tree application.

IGR(C) = -$\sum$ (| C_i | / | C |) log (| C_i | / | C |) ....(2)

Where C_i is the frequency of the marks add *in* Cluster C.

Phase 4: Fuzzy Classification

This phase fuzzy classification has been done based on cluster and IF-Then Rules are been applied for data partition.

The complete clustered data is been divided in 5 Different parts based on Five Rules of Classification

For Example

Rule 1: Very Low Range -0-0.2

Rule 2 Low Range- 0.2-0.4

Rule 3 Medium Range 0.4-0.6

Rule 4 High Range 0.6-0.8

Rule 5 High 0.8-1.0

Phase 5: Student performance Evaluation

Based on this Complete Data classified above rank based evaluation of every student is been done and Grade are been allocated for every student. This performance evaluation has been sent to Student mail id

IV RESULTS AND DISCUSSIONS

System is a Web appliaction and Deployed using Tomcat and used Mysql Database.
System is been test for various valiadations and evaluated for perfomance as shown below . numerous test have been conduct for perfomance evaluation. The parameter used in evaluation is Mean reciprocal

Ratio. Student are been evaluated as per their classification value in rank to 0 -6 . Every rank reciprocal fraction valkue is been computed and Stored using factor RR as [1,0.2,0.33……..]

In case system has put ranks as 3 for student the RR factor is equal to 0.33 based on total value of 6 .

MMr stands for overall average ratio results for all students

$$MRR = \frac{\sum_{i=1}^{N} 1/Rank_i}{N}$$

…………(3)

Equation3 has been used in computing MRR

Rank = student rank in evaluated performance
N= total number of students
Number of test have been conducted for number of students and total five test where run

No of Students	MRR
10	0.80
15	0.83
20	0.76
30	0.72

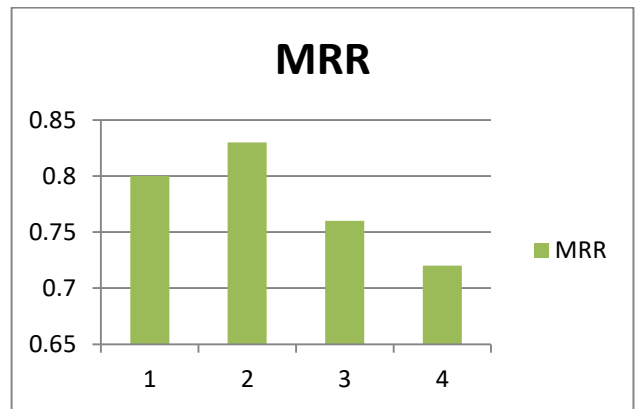Table 1: MRR for different Runs

Figure 3: MRR based performance evaluation

On plotting graph for the values tabled in table 1 we can observe that proposed model yields average MRR of 0.822that is 82.2 % and this shows the good sign of any translation system in hueristic approach. On graph generation for table I data. Proposed system has MRR of 0.78 and has 78% and is better system as in terms of scalability and shows accurately evaluates student based on student marks and attendance.

V. CONCLUSION AND FUTURE SCOPE

Most of performance evaluation system either work on one of attribute to evaluate entity .proposed system integrates combined approach to evaluate system. System has found to be best in terms of performance and scalable. Future scope system could be extended to all department and comparative overall evaluation of college students could be done with system. Proposed work is small protocol implementation and needs design modification with better Architectural style, these are scope of work.

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