



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 1, January 2016

Automatic Student Performance Analysis and Monitoring

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ABSTRACT: This paper presents the survey of work done in existing systems for student performance analysis and monitoring. As well as the survey to understand and analyze the existing system and the algorithms that are used in it and to propose a system that will analyze student performance and will guide them by displaying the areas where they need improvement, in order to contribute to a student's overall development by generating a score card for the same. This paper presents the analysis of student performance on the basis of academic performance, research and innovation, self-development and extra-curricular activities. – Performance Analyzer, Score Card, Student Development, Student Performance, Student, Classification, Association rules.

KEYWORDS: Performance Analyzer, Score Card, Student Development, Student Performance, Student, Classification, Association rules.

I. INTRODUCTION

For any school, college or other educational institute, students are an important asset in order to produce graduates of great quality who excel in academics, practical knowledge, self-development and innovative thinking. To achieve this it becomes essential for every college, school or any other educational institute to analyze the performance of students. Academic performance can be measured by conducting various examinations, assessments and other form of measurements. However academic performance may vary from student to student as each student has different level of performance.

The academic performance of student is usually stored in various formats like files, documents, records etc. The available data would be analyzed to extract useful information. It becomes difficult to analyze student data by applying statistical techniques or other traditional database management tools. Hence there is a need to develop an automated tool for student performance analysis that would analyze student performance and will guide them by displaying the areas where they need improvement, in order to contribute to a student's overall development by generating a score card for the same.

The proposed system will display results of student performance on a single click action by the user, thus inducing automation and reducing efforts of staff in analyzing student performance manually.

A. Overview

In this paper we are proposing a system that aims to display student performance in form of graphs and student score card on single click action by the user such that by typing name of student and his unique ID the result will be displayed.

Here is a list of objectives that are identified for development of the system:

- i. To develop a system for students' performance analysis.
- ii. To identify the factors that affects the students' performance.
- iii. To develop a student monitoring tool which will counsel students in order to provide them an insight regarding their academics & areas where improvement is required.
- iv. To assist faculty in keeping track of the students' progress throughout the semester and to generate score card for the same.



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B. Motivation

There was no automation in analyzing student performance in our college; instead student performance was analyzed manually which takes lots of time and efforts by the staff. This really motivated us to design and develop an automated system that would analyze student performance and display result on a single click action.

II. LITERATURE REVIEW

A. Study of Existing Systems Similar to proposed System:

In order to review similar works by existing author's, a background study is done to perform analysis of student performance. Here we have chosen three existing systems as study of these helped us to propose our system.

a) Student Performance Analysis System (SPAS) [1]

Chew Li Sa et.al [1] have proposed a framework named Student Performance Analysis System (SPAS) which is able to predict the students' performance in course "TMC1013 System Analysis and Design", which in turns assists the lecturers from Information System department to identify students that are predicted to have bad performance in course "TMC1013 System Analysis and Design". The proposed system offers student performance prediction through the rules generated via data mining technique. The data mining technique used in this project is classification, which classifies the students based on students' grade.

b) Extraction and Analysis of Faculty Performance of Management Discipline from Student Feedback Using Clustering and Association Rule Mining Techniques. [2]

Chandrani Singh, Dr. Arpita Gopal, Santosh Mishra have proposed a system that deals with the extraction and analysis of faculty performance of management discipline from student feedback using clustering and association rule mining techniques. The performance of a faculty of any school or an Institute has been found to be dependent on a number of parameters broadly ranging from the individual's qualifications, experience, level of commitment, research activities undertaken to institutional support, financial feasibility, top management's support etc. The parameters which are crucial for assessment of faculty performance range across various verticals, but the paper discusses and covers the performance of faculties based strictly on students feedback only. The other assessors of faculty performance being the Management Body which could be a private body or a Government unit, self and peer faculties of the organization or the University. The parameters act as performance indicators for an individual and group and subsequently can impact on the decision making of the individual and also the stakeholders. The idea proposed in this paper is to perform extraction and analysis of faculty performance using techniques of Data Mining.

Apriori algorithm has been used in this system to extract association rules as follows:

1. Communication and Presentation Skills, Punctuality And Regularity, Knowledge beyond Syllabus ==> Counseling Personal Guidance conf : (0.97)
2. Teaching Ability with use of new Teaching Aids ==> Subject Knowledge conf:(0.97)
3. Motivation Self Students, Communication Presentation Skills, Punctuality And Regularity ==> Counseling and Personal Guidance [conf:\(0.97\)](#)
4. Class Control, Punctuality And Regularity = 5968 ==> Counseling Personal Guidance = 5933 [conf:\(0.96\)](#)
5. Communication and Presentation Skills, ClassControl ==> Counseling and Personal Guidance conf:(0.96)
6. Class Control, Knowledge beyond Syllabus ==> Counseling and Personal Guidance conf :(0.96)
7. Communication and Presentation Skills, Knowledge beyond Syllabus ==> Counseling and Personal Guidance [conf:0.96](#)



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8. Communication and Presentation Skills, Counseling and Personal Guidance, Knowledge beyond Syllabus ==> Punctuality And Regularity [conf:\(0.96\)](#)
9. Motivation Self and Students, Punctuality And Regularity, Knowledge beyond Syllabus ==> Counseling and Personal Guidance [conf:\(0.96\)](#)
10. Communication Presentation Skills, Punctuality And Regularity ==> Counseling and Personal Guidance [conf:\(0.95\)](#)
11. Teaching Ability with use of new Teaching Aids ==> Subject Knowledge [conf:\(1.00\)](#)

c) Graduate Students Dataset and Recruitment Preprocessing [3]:

Umamaheswari. K* S. Niraimathi have written a paper that categorizes the students into grade order in all their education studies and it helps in interview situation. This study explores the socio-demographic variables (age,gender, name, lower class grade, higher class grade, degree proficiency and extra knowledge or skill, etc). It examines to what extent these factors helps to categorize students in rank order to arrange for the recruitment process. Due to this, all students get benefitted and it also reduces the short listings. Here, clustering, association rules, classification and outlier detection has been used to evaluate the students' performance.

The data mining techniques to the data are:

i) Association Rule

Association rule learning is a popular and well researched method for discovering interesting relations between variables in large databases. Association rules are usually required to satisfy a user-specified minimum support and a user-specified minimum confidence at the same time. Association rule generation is usually split up into two separate steps:

First, minimum support is applied to find all frequent item sets in a database. Second, these frequent item sets and the minimum confidence constraint are used to form rules. Finding all frequent item sets in a database is difficult since it involves searching all possible item sets (item combinations). The set of possible item sets is the power set over I and has size $2^n - 1$ (excluding the empty set which is not a valid item set).

[Lower_class_grade=Poor, Higher_class_grade=Good] → [Grade=Average] (Support: 0.19, Confidence:0.757)
[Lower_class_grade=Good, Higher_class_grade=Poor] → [Grade=Average] (Support: 0.19, Confidence:0.757)
[Lower_class_grade=Good, Higher_class_grade=Poor] → [Grade=Average] (Support: 0.105, Confidence: 0.731)

ii) Classification

Classification is the process of finding a model that describes and distinguishes data classes or concepts, for the purpose of being able to use the model to predict the class of objects whose class label is unknown. The derived model is based on the analysis of a set of training data. It is important to know that classification rules are different than rules generated from association. Association rules are characteristic rules, but classification rules are prediction rules [5].
If lower_class_grade=good and Higher_class_grade=good then Topper, If Lower_class_grade=poor and Higher_class_grade=good then Average, If Lower_class_grade=poor Higher_class_grade=poor then Below Average.

B. Discussion with Top Management of our College:

In order to gather requirements for our system we presented our idea to the top management of our college to seek their views and suggestions for our system. We designed our system according to the requirements we gathered from top management and the suggestions they gave us.

III. PROPOSED SYSTEM

The features of the existing system that we studied are employed in the design of the proposed system. These features include an user profile creator to provide user interface, user login, student performance analyzer, score card

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generator, student performance credit card, student development card, achieved credit, passing criteria card and sem wise student performance attribute card.

The block diagram for proposed system is as shown in figure 2.

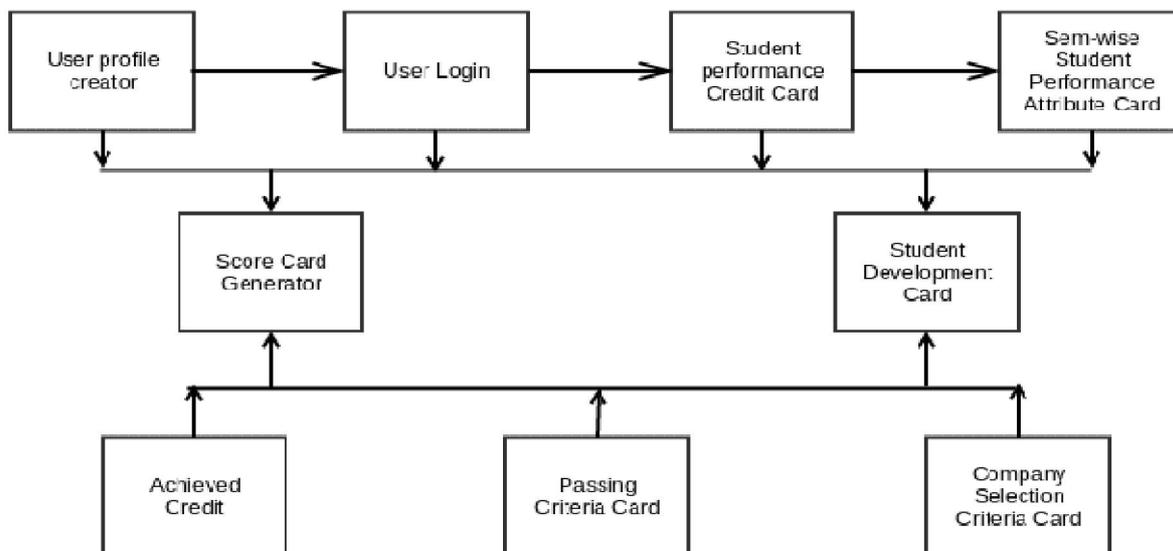


Fig.2 Block Diagram for Proposed System

Rules for passing criteria were decided after discussion with top management. Students will be grouped into categories like distinction, first class, higher second class, second class and pass class based on passing criteria.

IV. METHODOLOGY

Several phases that will be followed during development of proposed system are:

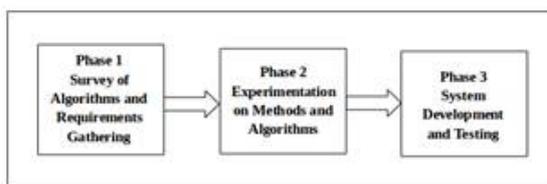


Fig.1 Phases for system Design and Development

A. Problem and Data Understanding

For the success of Student Performance Analysis system the problem and data understanding plays a very crucial role. In order to define the project goals and objectives, problems and data understanding is identified. The problems of existing system are analyzed for its effectiveness and efficiency in terms of functionality. After identifying the problem statement the solution to solve it is identified by studying various papers and deciding which possible algorithm or method suits best for our system that we are proposing.

Moreover an interview with top management of our college made our ideas clear in designing the system. Besides other similar systems are studied and analyzed for its features, strengths and weaknesses. This helps to identify needs and opportunities for proposed system.

Other than that the student data is collected on the basis of various attributes as listed in table 1, table 2, table 3, table 4.

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TABLE 1. ATTRIBUTES OF DATASET FOR ACADEMICS OF DATASET FOR PROJECT PERFORMANCE AND RESEARCH

Sr. No.	Academic Performance
I	In Semester Assessment (Term Work)
(a)	Attendance
(b)	Assignments
(c)	Unit Test
(d)	Course Related Activities
II	End Semester Assessment

TABLE 2. ATTRIBUTES

Sr. No.	Project and Research
I	Project/model making/poster development/competition
(a)	Major project
(b)	Mini project
(c)	Technical exhibition or competition(External) such as SAE, BAHA, SUPRA, ROBOTICS
(d)	Technical exhibition(At University level, College level) such as Techlight, spectrum.
II	Patent /IPR/Revenue Generation
III	Research Publication
(a)	Presentation in International conference or journal
(b)	Presentation in National conference or journal.
(c)	Presentation in State or University level

TABLE 3. ATTRIBUTES OF DATASET FOR STUDENT SELF OF DATASET FOR EXTRA SELF DEVELOPMENT CURRICULAR ACTIVITIES

Sr.No.	Student Self Development
I	Training Programs(Professional skill development)
(a)	Communication skill development(duration/score/achievements)
(b)	Aptitude Training (duration/score/achievements/Certification)
(c)	Technical Skill Development (duration/score/achievements/Certification)
(d)	Preparation for Higher study (duration/score/achievements/Certification)
(e)	Entrepreneurship Development program/Activities (duration/score/achievements/Certification)
(f)	Language Training
(g)	Finishing School (duration/score/achievements/Certification)
(h)	Spiritual and Holistic Development Program
(i)	Internship or Summer Training

TABLE 4. ATTRIBUTES

Sr. No.	Extra-Curricular Activities
I	Performing Art
(a)	National / International Level /Special Achievement in anything.
(b)	University/State level
(c)	College level(Gathering /Gadkari)
II	Visual and Library Art
(a)	National / International Level /Special Achievement in anything.
(b)	University/State level
(c)	College level(Gathering /Gadkari)
III	Sports
(a)	National / International Level /Special Achievement in anything.
(b)	University/State level
(c)	College level(Gathering /Gadkari)
IV	Social Service(NSS etc..)
(a)	Special Achievement
(b)	Participation
II	Leadership Development Activities(Contribution in Student bodies and cells)



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B. System Analysis and Design

Overall flow of system is planned, analyzed and designed in this phase. The requirements gathered are analyzed. In order to understand the input, processes and output of system, the data flow diagram is used. All levels of data flow diagram are drawn. Class diagram is drawn for better understanding of the methods that will be used during implementation of modules of the proposed system.

V. CONCLUSION AND FUTURE WORK

In future the system can be extended to analyze and predict the performance of the student to guide them for recruitment and higher studies.

The survey of existing systems, analytical algorithms and requirements gathered by discussion with top management have been done. Thus after surveying existing systems and algorithms we have proposed a system that focuses on student performance analysis and student monitoring. This system aims to guide students in the areas where they are lacking and where improvement is required. The proposed system will display results of student performance on a single click action by the user, thus inducing automation and reducing efforts of staff in analyzing student performance manually

ACKNOWLEDGEMENT

We would like to express our special appreciation and thanks to our Principal Prof. Dr. A.M. Fulambarkar, Dean Academics Prof. Dr. J.S. Umale, Dean for student development Prof. Dr. S. U. Bhandari, and project guides Mrs. S. R. Vispute, Mrs. N. Gawande.

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BIOGRAPHY

Snehal Kekane, Dipika Khairnar and Rohini Patil are the students of Pimpri Chinchwad College of Engineering, pursuing BE Computer Engineering and currently studying their VIIIth semester.