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A REVIEW ON USE OF DATA MINING TECHNIQUES FOR STUDENTS ACADEMIC PERFORMANCE PREDICTION

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Abstract — In spite of furnishing high quality of education, demand on prognosticating pupil academic performance become more critical to ameliorate the quality and aiding scholars to achieve a great performance in their studies. The lack of having an effective and accurate vaticination model is one of the major issues today. The aim of this paper is to review current exploration conditioning related to academic analytics fastening on prognosticating pupil academic performance using various data mining techniques. Various data mining solutions have been proposed by former experimenters to develop the performance model using variety of scholar's data, ways, algorithms and tools. Classification, regression, and clustering are just a few of the learning tasks that are related to the predictive modeling used to forecast student performance. Numerous variables have been picked and evaluated to determine the most important characteristics to do prediction in order to create the best prediction model. The ability to forecast performance accurately will be useful in guiding students' learning and helping them to avoid receiving low grades. Good input data and variables, a suitable predictive method, and a strong and reliable prediction model are all necessary in order to produce an effective predictive model.

Keywords — academic performance, data mining, vaticination model**, performance model, data mining, prediction model.**

1. Introduction

Currently, every educational institution manages a significant amount of student data, which can be useful for a variety of reasons. Predicting students' performance is a significant application of such data. Teachers and mentors, as well as pupils, may find utility in such a forecast. Students who are close to failing can receive extra help from mentors [1]. This study's primary goal is to analyse existing academic analytics research projects that are primarily concerned with forecasting student academic success. Academic performance of students gives educational authorities with important

data that offers a variety of chances for decision-making and helps the students achieve a great performance in their studies. [2].

1.1 Concept of Academic Performance

The main characteristic and one of the main objectives of education is the academic performance of students, which can be characterised as the knowledge acquired by the student that is evaluated by a teacher through marks and/or educational goals set by students and teachers to be attained over a specific period of time [3].

The importance of students' academic achievement is enormous since strong academic performance is thought to be a prerequisite for obtaining good jobs, a better career, and ultimately a quality of life. The academic achievement of students is of utmost importance since it influences both the social and economic development of any nation.

1.2 Educational Data Mining (EDM)

A new trend and intriguing technique called educational data mining offers a variety of predictions at all educational levels [4]. The study of data in educational contexts using various Data Mining (DM) methodologies and tools is known as Educational Data Mining (EDM). Stakeholders in education, DM methods-tools and techniques, educational data, educational tasks, and outcomes that satisfy educational objectives are the essential elements of EDM [5].

1.2 Predictive Analysis

According to Gartner, who described Business Intelligence as a software platform offering 14 capabilities divided into three functional groups, including integration, information delivery, and analysis functionality, which includes data mining and predictive modelling, data mining is one of the business intelligence functionalities[6]. Data mining is a process that gathers, filters, prepares, analyses, and stores data that will be used to assist data analytics and predictive modelling and produce meaningful knowledge [7].

Moreover, predictive analytics is the process of making predictions about the future by examining

Figure 1: Some of the significant Factors that affect Students Academic Performance [22].

historical data and past performance in order to identify links and patterns [8]. Predictive modelling is mostly utilised in educational data mining to forecast students' academic achievement [9].

1.3 Education Analytics

Education analytics is one of the areas of educational technology that has gained more attention in the last ten years from educational scholars and practitioners [10]. In order to comprehend and improve learning and the environments in which it takes place, education analytics entails measuring, gathering, analysing, and reporting data about students and their circumstances. It is anticipated that education analytics can improve knowledge of learning habits, provide helpful recommendations for policymakers, instructors, and students, and assist educational practitioners to increase the effectiveness of teaching and learning.

Academic analytics is clearly gaining ground and a terrific way to forecast student performance, make it easier to intervene with specific students, and increase student achievement [11].

1.5 Factors Affecting Academic Performance of Students

The academic achievement of pupils in secondary schools is influenced by a wide range of internal and external influences. The main areas that have been considered are their basic demographics, motivation, interests, learning styles, and prior academic characteristics and environmental attributes such as the school environment, the environment at home, peer relationships, and other factors contribute to low academic achievement [12].

1.6 Techniques for Predicting Student Performance

Classification, regression, and grouping are a few of the activities utilized to develop the predictive modeling. The techniques utilized include Naive Bayes (NB), K-Nearest Neighbor (KNN), Support Vector Machine (SVM), Artificial Neural Networks (ANN), Decision Tree (DT), and Bayesian Network (BN).

Several researchers used various data mining techniques to predict student academic performance from the reviewed literature.

Table 1:- Related work of few researchers for students performance prediction

Sr.No	Authors	Technique Used	Accuracy
1	Mubarak Albarka Umar [13].	Multilayer Perceptron Neural Network (MLP-NN) model	It correctly predicts 73.68% of the students' performance and particularly, 66.67% of the poor performing students.
2	M.Lauria et.Al. (2012) [14].	Logistic regression, support vector machines and C4.5 decision trees	Support vector machines and the logistic regression gave out higher.
3	Fahad et al.	Naive Bayes	The work achieved the accuracy of 98.8%

	(2018) [15].	technique and Kmeans clustering	
4.	Sumitha and Vinothkumar (2016) [16].	J48	97% accuracy
5.	Eashwar and Venkatesan (2017) develop [17].	Support Vector Machine	96.7% accuracy was achieved
6	Gilbert Nshimyumuremyi (2016) [18]	Fuzzy Logic	Evaluating students' performance using Fuzzy Inference System showed to be more effective than classic method
7	Tripti Mishra 2014 [19]	Decision Tree 2.5.	Accuracy achieved was 94.47%
8	Mayilvaganan, and his colleagues (2014) [20]	Support Vector Machine	Accuracy achieved was 83%
9	Jishan and his colleagues (2015) [21]	Neural Network	Accuracy achieved was 75%
10	Karishma and Swati (2016) [4]	ID3 and C4.5 algorithm	The Accuracy of the classifiers was calculated to be 98.5 %

1.7 Challenges and Limitations

A number of characteristics are required to comprehend the process based on the level of student understanding in order to provide better education. Many researchers practice, researchers need to uncover useful indicators and parameters. The selection of the proper factor and pertinent characteristics with a proper prediction approach presents additional hurdles in forecasting student academic achievement. However, the availability of student data input for the model to do the calculation for an accurate forecast also affects the choice of a strategy. The researchers must have access to more thorough data that will provide more convincing results in the future since another problem is the small size of data due to incomplete and missing values. However, the availability of student data input for the model to do the calculation for an accurate forecast also affects the choice of a strategy. The researchers must have access to more thorough data that will provide more convincing results in the future since another problem is the small size of data due to incomplete and missing values.

1.8 Future Scope

A gist of the applications of data mining in educational systems is provided. The key areas of study and trends are noted. It will aid the educational system in effectively tracking student performance. Future study should examine student performance at the earliest stages, in real time, and develop

strategies for dealing with changing environments. We can ensure that every student succeeds and that no student fails if every educational institution uses predictive models to frequently evaluate its students.

1.9 Conclusion

This research paper examined current studies on academic achievement prediction models for students. Early prediction is an effective strategy to help teachers and students both enhance their learning process and ensure that students achieve high score in stipulated period. To create the best predictive model, previous employed tools and predictive techniques to find hidden Characteristics that might reduce the failure rate of students. For the advice to include analyzing analytics results in studies have explored a variety of techniques for pre. Various factors have been identified and evaluated in order to make predictions. The majority of researchers have utilized factors including academic score, attendance, gender, family background, school environment and economical background. A select few characteristics have the most influence on whether a student will fulfill the academic criteria or not. One of the crucial elements for evaluating student performance is the prediction methods. The majority of researchers employ. Most of the researchers have used the techniques like KNN, BN, DT, ANN, SVM, Fuzzy Logic, MLP-NN, J48 etc. or blend of methods to provide a model with better accuracy.

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