EVALUATION OF STUDENTS' CRITICAL THINKING ABILITIES THROUGH DATA MINING TECHNIQUES

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ABSTRACT:

Our objective in this project is to identify Key Performance Indicators that can define a student's level of understanding after completing specific classes, and to explore how we can utilize these Key Performance Indicators for classification or to calculate the success rate of skills in universities, as well as to place particular students in environments where they can thrive. Additionally, we will analyze which data mining algorithm yields the highest accuracy based on our dataset and address some of the challenges we may face along the way, drawing from existing research literature. The implementation of multi-phase analysis and cluster analysis is designed to be grounded in data that will ultimately inform the determination of Key Performance Indicators. Based on these identified Key Performance Indicators, we can access critical information and, if feasible, display it on a functional dashboard.

1. INTRODUCTION

At present, there is a notable progression in online education systems, where all activities related to academics are systematically monitored and recorded in various databases, log files, personal profiles, and more. Online learning consistently produces extensive amounts of data that illustrate the interactions among training, teaching, electrical systems, and students. Additionally, the growing volume of student information and behaviors incorporated into online learning platforms presents a challenge, as unmanaged data can result in misleading perceptions and opinions without delivering clear insights. Numerous research studies suggest different approaches for employing data mining algorithms and techniques within online education and learning systems. It is broadly recognized that data mining techniques can be utilized in online learning environments to analyze and understand students' academic profiles, improve the quality of their work, customize training to address their academic requirements, and, importantly, monitor and comprehend their critical thinking processes. This can be achieved by performing regular assessments and observing attendance patterns, which can yield insights into students' motivations and assist in identifying optimal placements for enhanced academic results.

The academic performance of students within an institution and its various departments presents challenges and is influenced by multiple factors, including a student’s academic achievements, communication abilities, skills, problem-solving capabilities, and any disabilities. Work Integrated Learning serves as a strategy to improve performance practices and the development of students' readiness skills, particularly among graduates. Utilizing data mining techniques to forecast student performance will aid prospective employers in effectively placing students in integrated learning careers. This research employs data mining methods to assess whether students are engaging in critical thinking appropriately and to predict their likelihood of passing or failing a course. In certain universities, Work Integrated Learning pertains to work-based learning experiences at approved industry sites, which combine theoretical knowledge with practical application. The implementation of data mining algorithms is beneficial for extracting

information that can inform educational decision-making. It is essential to predict whether a student will excel or struggle during the semester and to consider the relevant factors accordingly.

2.RELATED WORK

Towards Accurate and Fair Prediction of College Success, Evaluating Different Sources of Student Data: In the realm of higher education, predictive analysis can yield insights that are beneficial to various stakeholders, including administrators, educators, and students. Distinct sets of features are frequently employed for different prediction tasks, such as utilizing student activity prediction logs and registrar data to forecast long-term college success. Regarding fairness, the reliance on institutional data consistently diminishes the representation of students who have been previously disadvantaged compared to their peers, whereas LMS data often tends to overestimate the performance of some of these groups. The integration of both data sources does not entirely eradicate bias and continues to perpetuate significant stigma among disadvantaged populations. This analysis aims to guide the cost-effective and equitable application of student data in predictive analytics within the higher education sector.

Forecasting Academic Success in Higher Education Institutions Utilizing Video Learning Analytics and Data Mining Techniques: The incorporation of technology and innovation enables various higher education institutions to implement a range of academic programs - one such approach is video-based instruction and learning. An exploratory data analysis of the digital footprints generated within this online curriculum provides a thorough understanding of the program's effectiveness. Engagement through video-based online learning and transformative teaching methods can result in substantial improvements in a student's academic performance. Insights obtained from the academic information system, learning management system, and mobile applications were analyzed and assessed using classification algorithms. Moreover, data modification and preprocessing methods were employed to achieve more refined features. In addition, genetic research and partial analysis were performed to further reduce traits.

Creating a classifier to forecast students' academic performance through data mining classification methods: Data mining is utilized in educational institutions to anticipate a student's engagement with the curriculum by employing classification techniques. These methods analyze student characteristics to uncover logical patterns that can serve as a foundation for predictions. The high accessibility of digital student information, combined with the significant advancements in computer processing capabilities, has made this entire process feasible. Extensive research has been conducted in this area to mitigate the risk of significant student failures. Student attributes gathered from diverse sources were previously examined, which were subsequently introduced to Put for feature selection and ultimately analyzed and tested.

3.PROBLEM DEFINITION

Identifying the areas where both students and instructors can excel is a challenging task, especially within the realm of online education. Understanding the learner's complete thought process after completing an assignment or a series of tasks will yield further insights into the student's weaknesses or whether there is a lack of skills, particularly if numerous students appear to need a tailored approach. To create a more structured experience for learners, we can classify ourselves according to academic performance or overall activities, and uncover a system that will provide insights into an individual student's performance in a specific subject, as well as a group of students who excel in certain subjects. The implementation of multi-phase analysis and cluster

analysis is intended to be grounded in data from which key performance indicators (KPIs) will be defined at the end. Utilizing these established KPIs, we can obtain valuable information and, if possible, present it on a functional dashboard.

4.METHODOLOGIES INVOLVED

Finding appropriate procedures for the pre-existing parameters, filling in any gaps in the previous research, and finding new material to facilitate the formation of tangible insights and conclusions are the only rationalizing steps involved in conducting an organized preview based on relational systems. In the current literature, a structured preview serves only to support any questionable claims that may be made throughout the procedure. The methods and processes that advance our research and assist us in moving closer to findings and outcomes will then be defined. In addition to helping us identify any potential constraints in the research, we hope that this will also assist us define some boundaries.

Factors that are likely to be taken into account include: Descriptive and quantitative questions that are applicable to the current literary study that aids in analyzing and forecasting students' academic success.

The two most commonly used metrics are cumulative grade point average and any internal evaluations carried out throughout the semester. The main reason why the majority of academics use cumulative grade point average is because it makes a significant contribution to any institution that deals with work or higher education. This measure must also be qualified as a determinant of an institution's academic potential.

Then, external and population testing are the most commonly used parameters. The focus of academic demographics is on age, gender, disability, and family history. The reason why academics frequently use demographics like gender is because male and female techniques for teaching and learning are frequently very different. While female academics are known to complete their methods with diligence and are rarely found to be slagging, they are known to work through the night on a number of occasions. Male academics are known to have very effective and optimized methods of gaining knowledge and having a better understanding of some of the topics.

Scholars have taken a variety of approaches that incorporate a number of academic staff psychometric characteristics. Any interest an academic has in a subject, their eagerness to learn, how much time they spend studying alone, and their family's support are the psychometric criteria that are used. These factors have been used to create an organized system that is easy to adopt, effective, and optimal. Although this aids in evaluating a scholar's patterns of behavior or even their decisions and the potential justifications for them, they are not used as frequently as we would want because they can only provide qualitative insights, whereas quantitative insights are desired in the research community.

5.FUTURE SCOPE

The use of meta-analysis in predicting students' academic success should make sense and motivate more research in the specific topic. It will improve the organization of online learning by enabling systematic student performance monitoring. Any other available data, such as instructor or parental data, may be included in the analysis even though the reported conclusions are based on current literature, i.e., data directly linked to students alone. This could lead to the discovery of new features in the study.

CONCLUSION

It is a challenging endeavor for both the student and their instructor to identify the areas in which they can excel, particularly within the web-based educational framework. Gaining insight into the learner's comprehensive thought process following an assignment or a series of assignments will provide us with additional information regarding the pupil's deficiencies or whether the skills are lacking, especially if many students seem to require a specific approach. To facilitate a more organized experience for students, we can categorize ourselves based on academic performance or overall activities, and discover a system that will offer us insights into an individual student's performance in a specific subject and ultimately, a group of students who excel in particular subjects. The application of multi-phase analysis and cluster analysis is designed to be based on data from which key performance indicators (KPIs) will be established at the conclusion. Based on these established KPIs, we can access valuable information and, if feasible, display it on a functional dashboard.

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