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# Implementation Of The Naïve Bayes Method With Approach Holistic In Predicting Student Achievement (At One Of The Vocational High Schools In Bandung)

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***ABSTRACT***

*Within the realm of education, students frequently encounter many obstacles, including defiance, absence of drive, and other intricate factors that can impact the caliber of their learning. This issue can result in many students abstaining from attending class, withdrawing from school, or prematurely leaving before completing their education. This highlights the need for proactive and preventive measures taken by educational institutions to assist children in overcoming learning barriers from a young age. Professional educational and training institutions should promptly identify potential obstacles to students' learning and take proactive measures to assist them in overcoming these difficulties.*

*These endeavors encompass vigilant supervision, effective communication among educators, parents, and students, as well as impactful mentoring and counseling initiatives. By adopting this methodology, educational establishments can establish an all-encompassing and nurturing atmosphere that prioritizes the academic achievement of students. In this study, we employ the Naive Bayes algorithm and the Holistic Approach, two powerful tools in the field of data analysis, to forecast student academic performance at Otista Bandung Vocational School. The Naive Bayes algorithm allows us to make predictions based on the probability of an event occurring given certain conditions, while the Holistic Approach ensures that we consider all relevant factors in our analysis. This research aims to offer early forecasts for students who are susceptible to low academic performance, enabling schools to proactively intervene and avert a fall in student success. By implementing this approach, schools may offer targeted support to individuals requiring more help, while also fostering an inclusive environment that promotes academic success for all students, regardless of their circumstances.*

*Keywords: Education, Academic Achievement, Naïve Bayes Method, Holistic Approach*

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## INTRODUCTION

Education is typically a deliberate exertion of influence on others, be it individuals, groups, or society, to ensure compliance with the instructions provided by the instructor. Education aims to acquire knowledge, cultivate talents, and adhere to the divine authority, enhancing the rationality of all facets of existence.

Within education, students are the primary focal point of all educational institutions, which consistently prioritize the significance of scientific disciplines for the betterment of students and society. Nevertheless, students frequently encounter many issues during their educational journey, including failure to adhere to regulations and a lack of motivation for learning. The ramifications of this issue are multifaceted, resulting in numerous students needing to be present in class, discontinuing their education, or even prematurely departing from school without completing their studies. (Buraimoh, Ajoodha & Padayachee, 2021; Latif, XianWen & Wang, 2021; Kabathova & Drlik, 2021)

This phenomenon highlights the need for educational institutions to implement proactive and preventive measures to enhance the student learning process. Educational institutions must proactively detect potential obstacles to student learning, such as disobedience, lack of motivation, and other intricate factors. By acknowledging this potential, educational institutions can adopt proactive measures to assist students in overcoming these hurdles and attaining academic excellence. These endeavors include vigilant surveillance, effective communication among educators, parents, and students, and implementing impactful mentorship and counseling initiatives. By adopting a comprehensive strategy, educational institutions can establish an all-encompassing environment, encouraging and guaranteeing student achievement in acquiring knowledge. Nevertheless, educational institutions frequently need to anticipate or mitigate students' challenges during the learning process. Timely awareness of potential challenges prospective students face is crucial for educational institutions, as it enables them to implement proactive measures to address these hurdles promptly. (Saleh, Dharshinni, Perangin-Angin, Azmi & Sarif, 2023; Nahar, Shova, Ria, Rashid & Islam, 2021; Sathe & Adamuthe, 2021)

Due to the absence of timely interventions for students at risk of learning challenges or academic underperformance, many pupils exhibit poor attendance or face expulsion from school. These two issues are prevalent challenges that frequently occur in diverse educational

institutions. Various determinants that can impact the academic performance of vocational school students encompass their socio-economic status, the financial resources of students or their parents, the educational resources offered by the school, and the student attendance or absenteeism rate. (Nayak, Vaheed, Gupta & Mohan, 2023; Donnellan, Aslan, Fastrich & Murayama, 2022)

Otista Bandung Vocational School is a dedicated vocational secondary school that strongly emphasizes its pupils' academic accomplishments. However, to attain the highest level of academic performance, one must gain a more profound comprehension of the aspects that impact this achievement. Hence, accurately forecasting the academic performance of pupils at Otista Bandung Vocational School holds significant importance. (Yakubu & Abubakar, 2022; Nawang, Makhtar & Hamzah, 2021; Pramoedyo, Ariyanto & Aini, 2022)

This study utilizes the Naive Bayes method and a Holistic Approach to predict student learning achievement at Otista Bandung Vocational School by implementing a classification method. This approach has been extensively utilized in diverse domains, predicting students' academic performance. However, the Naive Bayes technique frequently needs to consider the interdependencies among components, focusing solely on individual factors.

Thus, employing the Naive Bayes method as a holistic strategy can effectively address these limitations. This research aims to facilitate early identification of kids with a propensity for underperformance, allowing schools to proactively intervene and avert a fall in academic performance or expulsion. Schools can offer targeted support to kids who are at risk of experiencing a decline in academic performance. It is intended that students from diverse backgrounds actively participate in student accomplishment to the fullest extent possible.

Naive Bayes is a straightforward probabilistic classifier that computes a collection of probabilities by aggregating the frequencies and combinations of values from a provided dataset. The Naive Bayes algorithm, alongside other algorithms, is a widely used data mining approach among the top 10 most common data mining classifications. The Naive Bayes approach is highly regarded for its strong potential in accurately classifying documents, surpassing other classification methods in accuracy and computing efficiency. (Wickramasinghe & Kalutarage, 2021; Abu El-Magd, 2022; Awujoola, Odion, Irhebhude & Aminu, 2021)

The Naïve Bayes method, developed by the British scientist Thomas Bayes, is a straightforward and efficient classification approach. It operates on the assumption of attribute independence, making it easy to implement and understand. Identifying the

attribute with the highest probability and likelihood values for each class provides a practical and efficient solution to data classification tasks. (Amin, Adnan & Anwar, 2023; Ramaswami, Susnjak & Mathrani, 2022; Fadhil, 2021)

The term "holistic" is derived from the term "holism." The term was coined by Jan Christiaan Smuts, a South African leader, in his book Holism and Evolution. "holism" originates from the Greek word "holos," which signifies the concept of entirety or completeness. According to Smuts, holism is the inherent inclination to create a unified entity that is more than the sum of its components, which arises from evolution.

## METHOD

This study aims to apply the Naive Bayes technique using a comprehensive strategy to forecast the academic performance of students at Otista Bandung Vocational School. The data collection involved many methods, including observation, interviews, questionnaires, and secondary data. Observations and interviews are conducted with teachers, students, and parents to get insight into the various aspects that impact student progress, such as motivation and familial support. Questionnaires are distributed to students in order to gather data on psychological, social, and environmental factors. Schools gather academic data, including report cards, attendance, and disciplinary records. The gathered data will undergo cleansing and analysis to guarantee uniformity. The Naive Bayes approach is employed to categorize student data by computing the likelihood of each element that has been detected in order to identify the student achievement category. A comprehensive approach is employed by considering the interconnectedness of several components, aiding in detecting patterns that may be overlooked if the factors were examined individually. The cross-validation technique is employed to assess the dependability of the prediction model by evaluating its accuracy by utilizing a confusion matrix, precision, recall, and F1-score. The model will be fine-tuned according to the validation results to enhance the predictions' accuracy. The research findings will offer schools ideas for proactive and preventive measures to assist pupils at risk of experiencing low academic performance. Suggested measures involve:

a. The implementation of targeted mentoring initiatives that prioritize the enhancement of learning motivation and provision of psychological assistance,
b. Enhancing the communication channels among educators, learners, and parents, and
c. Continuous monitoring of students' academic progress.

This method aims to enable schools to establish an inclusive and supportive learning

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environment that prioritizes comprehensive and equitable academic achievement for all students.

## RESULTS and DISCUSSION

Otista Vocational School must create a system that can accurately and comprehensively forecast student performance. Currently, a system does not exist that can offer schools, including principals, administrative officials, and instructors, full information about student success progress and forecasts.

The Naive Bayes approach will utilize this data to forecast student achievement. The prediction results will be the foundation for delivering recommendations and information to diverse stakeholders, such as school principals, to enhance student performance.

This system will provide the school with enhanced access to statistics and information regarding student accomplishment, enabling it to take proactive measures to enhance the quality of education at Otista Vocational School.

In the previous discussion, the author outlined the necessary requirements for a system that can accurately forecast student performance based on both academic and non-academic factors. Additionally, it is crucial to ensure that sufficient software and hardware are provided to support the development of this system. The presence of ample data is also a crucial element in optimizing the efficiency of system operations.

a. Proposed New System

1. Use case diagrams

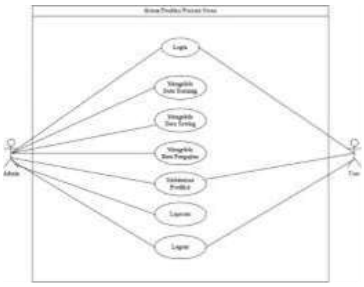


Figure 1. Use case diagram

2. Activity diagrams

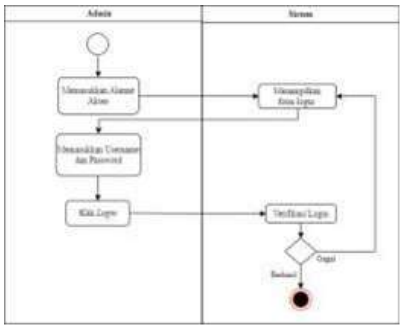
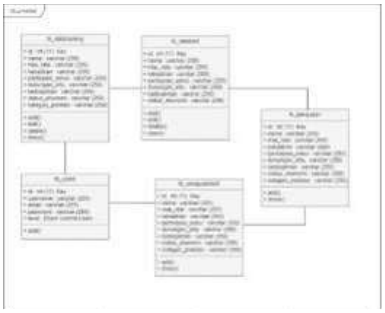


Figure 2. Activity diagram

b. System planning

1. Database Design



| Value | Type data | Size | Keterangan |
|---|---|---|---|
| Id | Int | 11 | Key |
| Username | Varchar | 255 | |
| Password | Varchar | 255 | |
| Level | Enum | Admin User | |

Figure 3. Database Design

2. Interface Design

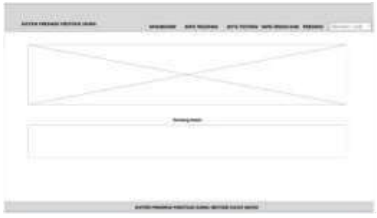


Figure 4. Interface Design

The system implementation step involves describing an application system in a manner that prepares it for operation.

a. Login Page Display

Figure 5. Login page display

b. Home Page/Dashboard Display

Figure 6. Home Page/Dashboard Display

c. Prediction Page Views

Figure 7. Prediction page display

## CONCLUSION

The research findings indicate that the Naïve Bayes method is viable for predicting student accomplishment at OTISTA Bandung Vocational School. This condition may be achieved by considering both academic and non-academic characteristics. This research identifies students at risk of facing challenges by considering holistic aspects such as extracurricular activities, family history, personal interests, and individual characteristics. The findings of this study demonstrate that this approach holds promise in enabling educators and educational establishments to offer enhanced support or aid to students requiring assistance.

Other recommendations can serve as input and be taken into account by future researchers. It is imperative to seek more suitable factors that are correlated with forecasting student performance. The primary menu display could be more efficient due to excessive redundant data records. The system is categorized as having lower security.

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