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Analysis of Student Satisfaction with the Quality of Education Services and Lecturer Performance Using the Survey and Naive Bayes Methods

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Abstract: This research aims to evaluate the level of student satisfaction with the quality of educational services and the assessment of faculty performance at STMIK Tegal through a survey method and the application of Naive Bayes. The research sample consists of 100 active students from different study programs. Survey results were processed using the Naive Bayes method to assess the impact of variables related to the quality of educational services and faculty performance on the level of student satisfaction. The findings of the analysis indicate that the quality of educational services has a positive effect on student satisfaction, while faculty performance also contributes positively. This research has practical implications for improving the quality of educational services and faculty performance at STMIK Tegal. Infrastructure and facilities supporting the teaching and learning process can be enhanced, and faculty members can receive training and guidance to improve their teaching quality. In the long term, this can enhance the institution's reputation and overall student satisfaction. This study has limitations related to the limited sample size and the use of non-random sampling techniques. Therefore, future research can expand the sample size and use more representative sampling techniques to enhance the accuracy of research results.

Keywords: Educational Services; Naive Bayes; Student Satisfaction

Introduction

Universities are higher education institutions that have a significant role in forming individuals who have qualities and capabilities that enable them to compete in the professional arena. Therefore, the quality of educational services and lecturer performance are key factors in improving the quality of education and meeting student needs (Ali et al., 2020; Becket & Brookes, 2008; Budiharso & Tarman, 2020). STMIK Tegal, as one of the higher education institutions in Indonesia, also faces challenges in improving the quality of educational services and lecturer performance in order to provide a satisfying learning experience for students. The main problem faced by STMIK Tegal or other higher education institutions regarding the quality of educational services is how to increase the efficiency and effectiveness of the services provided to students. In the digital era like now, students have higher expectations for easy access to information and fast service. Therefore, higher education institutions need to ensure that the service systems and information access they offer are easy to reach and quickly adapt to student needs (Naim & Alahmari, 2020).

Apart from that, another challenge faced by STMIK Tegal is how to improve the quality of lecturers' teaching. Good lecturer performance greatly influences student learning experiences and the learning outcomes achieved. Lecturers need to have the ability to convey learning material well, provide relevant case examples, and provide constructive feedback to students (Carless, 2022; Homaidi & Lina, 2019). To overcome this problem, STMIK Tegal can conduct an analysis of student satisfaction with the quality of educational services and lecturer performance (Hwang & Choi, 2019). By analyzing student satisfaction, STMIK Tegal can

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determine the level of student satisfaction with the educational services provided and the level of student satisfaction with lecturer performance (Martono et al., 2020; Masserini et al., 2019). In this way, STMIK Tegal can identify areas that need to be improved in educational services and improve lecturer performance to improve the quality of education provided to students.

At STMIK Tegal, the quality of educational services and lecturer performance are very important. STMIK Tegal as a tertiary institution that has existed for more than two decades has the aim of becoming a superior educational institution and being the first choice of students. However, in order to maintain and improve the level of quality of educational services and lecturer performance, an assessment of student satisfaction is needed. The purpose of this evaluation is to identify positive and negative aspects in educational services and lecturer performance and determine the actions needed to improve service quality (Chandra et al., 2018).

Survey and analysis methods using the Naive Bayes method can be an effective tool to overcome this problem. By conducting a survey of STMIK Tegal students using a prepared questionnaire, data regarding student satisfaction can be collected properly (Rozaq et al., 2022). Then, Naive Bayes can be applied as a data analysis technique to identify factors that have the most significant impact on the level of student satisfaction with the quality of educational services and lecturer performance (Qomariah et al., 2020). The results of this evaluation can be a basis for providing concrete recommendations and corrective actions for STMIK Tegal in improving the quality of educational services and lecturer performance (Lubis et al., 2020).

In the context of this research, researchers will apply the survey method together with the Naive Bayes approach to evaluate the level of student satisfaction with the quality of educational services and lecturer performance at STMIK Tegal. Naive Bayes is a classification method that is commonly used in data processing and is able to detect factors that have the most significant influence on student satisfaction (Sodikin et al., 2021). On the quality of educational services and lecturer performance. The survey method was used to collect data regarding student perceptions and levels of satisfaction with educational services and teacher performance at STMIK Tegal. Data obtained from the survey will be in the form of responses and assessments from students regarding various aspects of educational services and lecturer performance (Setiadi, 2021).

Then, the data that has been collected will be processed using the Naive Bayes approach. This method is based on a probability theorem which assumes that each attribute in the data is independent of each other. Despite these simplistic assumptions, Naive Bayes often provides good results in classification due to its computational efficiency and ability to address multi attribute problems. In the Naive Bayes method, class probability (i.e. student satisfaction) and attribute conditional probability (i.e. quality of educational services and lecturer performance) are calculated based on the data that has been collected. This process involves creating a probability model based on training data that is used to classify test data (Umar et al., 2022).

The results of the analysis from the Naive Bayes method will provide insight into the relationship between the quality of educational services and lecturer performance and student satisfaction. The factors that most influence student satisfaction will be identified through the conditional probability of significant attributes. This research is intended to provide a more comprehensive insight into what is most important for student satisfaction in the context of educational services and lecturer performance at STMIK Tegal.

Method

The approach applied in this research involves survey techniques and a data analysis process using the Naive Bayes method. The following are the stages of the research method that have been carried out.

Survey method

A survey approach was used to collect information regarding the level of student satisfaction with the quality of educational services and lecturer performance Mulyono et al. (2020), at STMIK Tegal. The process of distributing the questionnaire was carried out in several steps to ensure an accurate representation of the student population at STMIK Tegal (Simbolon et al., 2022).

First, researchers will determine a sample from the student population who are actively studying at STMIK Tegal. This sampling was carried out randomly to ensure fairness and better representation of the entire student population (Pace, 2021). Second, the questionnaire that has been prepared will be distributed to a sample of students. This questionnaire contains questions related to the quality of educational services and lecturer performance, as well as student satisfaction with both. The questions in the questionnaire are carefully designed to cover various relevant aspects and can provide comprehensive information about students' perceptions and expectations of lecturer services and performance.

Third, the data collection process is carried out by providing opportunities for students to fill out questionnaires independently and without pressure. Filling out the questionnaire can be done online via platforms such as Google Forms or via paper forms

provided by researchers. Filling out the questionnaire can be done within the specified time, and the researcher will give a reminder to respondents to fill out the questionnaire if necessary. Fourth, to ensure a good level of participation from the student sample, researchers will make effective communication efforts by clearly conveying the research objectives and underlining the importance of their participation in contributing valuable data to improve the quality of educational services and lecturer performance at STMIK Tegal. Fifth, during the data collection process, researchers will verify the completed questionnaires to ensure that the data obtained is complete and reliable. Researchers will also evaluate the potential for bias or error in filling out the questionnaire.

Next, the data that has been collected is used as input data for analysis using the Naive Bayes method. This approach will play a role in categorizing data and identifying elements that have the most significant impact on the level of student satisfaction with the quality of educational services and lecturer performance at STMIK Tegal. By carrying out the process of distributing questionnaires carefully and collecting data accurately, this research will obtain data that represents students' perceptions and views more broadly. Therefore, through the application of the Naive Bayes method, this analysis will produce more valid and reliable findings in identifying the main factors that have the potential to influence the level of student satisfaction in the STMIK Tegal academic context.

Naïve Bayes Method

The Naive Bayes method is a technique in the field of machine learning that is used for classification purposes (Saritas & Yasar, 2019). Naive Bayes utilizes the concept of probability to anticipate categories or classes of data based on its characteristics, by assuming that all characteristics operate separately, even though in reality, these characteristics may be related to each other. Within the scope of this research, the Naive Bayes approach was decided to evaluate data collected through a survey method regarding the level of student satisfaction with the quality of educational services and the performance of lecturers at STMIK Tegal. The decision to use the Naive Bayes method was based on several references and previous research that had applied this method in a similar research context.

This research also compares various classification methods in predicting student academic performance. The results show that Naive Bayes provides good accuracy in classifying students based on academic attributes. Through these references, it can be concluded that the Naive Bayes method has been used in several studies that are similar to the context of this research. The use of this method has provided satisfactory results in analyzing student data, including in analyzing student satisfaction with educational services and lecturer performance. Therefore, the reasons for using the Naive Bayes method in this research make more sense and are supported by relevant empirical evidence.

Data Analysis

After the information obtained through the survey is collected, the next action is the data processing and analysis process using the Naive Bayes approach to predict the level of student satisfaction with educational services and lecturer performance at STMIK Tegal. First, the data from the survey will be preprocessed to clean and prepare it before being used in analysis. Preprocessing includes removing missing or invalid data, normalizing data, and adjusting data formats to suit analysis needs.

Once the data is ready, the next step is to create a Naive Bayes model based on the training data. This model will be used to study patterns and relationships between variables that influence student satisfaction in training data. The model will take into account the probability of satisfaction classes (satisfied, dissatisfied, neutral) and the conditional probability of attributes (for example, the probability of students being satisfied with educational services if they state they are satisfied with the lecturer's performance).

After the model is created, the next stage is training the model with training data. The model will learn from training data to understand existing patterns and improve its predictive capabilities. Training data will be split into learning data and validation data to ensure that the model has general ability to make predictions. After the model training process is complete, the next step is to test the model using test data. Test data refers to student data that is never used in the model formation stage. The model will use knowledge about classification probabilities obtained from training data to categorize test data and predict the level of student satisfaction with the quality of educational services and lecturer performance.

The analysis results from the Naive Bayes model are interpreted and presented in graph or table form to make it easier to understand the results. For example, the results of student satisfaction predictions can be presented in the form of a bar chart or pie chart to show the percentage of students who are satisfied, dissatisfied, or neutral with lecturer services and performance. In addition, tables or matrices can be used to show the level of accuracy, precision and success of the model in making predictions (Purba & Syahputra, 2021).

Validate Results

Results validation was carried out to ensure the accuracy of the data analysis results obtained using the

Naive Bayes method. Validation is carried out by comparing the prediction results obtained from the model with actual data obtained from the survey method. The validation results will be used to evaluate model performance and ensure that the model created is reliable (Annur, 2018).

The validation results will provide insight into the performance of the Naive Bayes model in predicting student satisfaction by comparing the predicted results with actual data from the survey. If the model has high accuracy and performance based on evaluation using metrics. This will form a solid basis for decision making at STMIK Tegal in improving the quality of educational services and lecturer performance based on relevant insights from data analysis.

Result and Discussion

Key data that describe the results of the study. The variables in this quantitative analysis consist of student satisfaction (Y), academic services (X1), and lecturer performance (X2) all collected through questionnaires with a score of 1 to 5 (Harahap et al., 2020). Meanwhile, the SPSS (Statistical Product and Service Solutions) program is used to analyze data (Rudini, 2016).

In qualitative research, data is collected in stages, including observations, in-depth interviews, and key debriefing sessions with students, lecturers, and faculty about each variable (Fadli, 2021).

Student Satisfaction (Y)
Description of quantitative data

The data used to measure student satisfaction (Y) was obtained from a questionnaire consisting of 35 statements and using an evaluation scale of 1-5. This evaluation scale has minimum and maximum values that are abstract or in the range 30-150. The Elasticity of Student Happiness is explained quantitatively in the next section (Y).

Referring to Table 1, the mean is 131.57 and the mode is 130, which is an insignificant difference. Comprehensive presentation of student satisfaction variable values in the form of.

Table 1. Student Satisfaction Variable (Y).

Data Aspect	Y
mean	131.56
Average deviation	0.915
Median value	132.50
Mode	129
Standard deviation (Std. Deviation)	8.186
Variation average	67.009
Range	42
Lowest score	103
Highest score	145
Total	10525

Table 2. Distribution of Student Satisfaction (Y).

Class Interval	Median	Frequency (Fi)	Frequency Percentage (%)	Frequency Commulative Percentage (%)
103-108	105.5	1	1.25	1.25
109-114	111.5	2	2.50	3.75
115-120	117.5	5	6.25	10
121-126	123.5	8	10	20
127-132	129.5	24	30	50
133-138	135.5	22	27.50	77.50
139-144	141.5	17	21.25	98.75
145-150	147.5	1	1.25	100
Total		80		

From this data, it can be seen that the highest frequency is in class 5 with a percentage of 30%, namely in the value range 127-132. A total of 24 students (30%) obtained good/high frequency scores, with an average of 131.56, meaning above average. Meanwhile, 40 individuals (around 50%) achieved scores above the average, while 17 individuals (around 20%) achieved scores below the standard.

Only a few students, less than 20 percent, expressed satisfaction. Meanwhile, around 70 percent of students had grades that reached average or higher than average, indicating a fairly high level of satisfaction in this area.

Academic Services (X1)
Description of quantitative data

Data for the academic variable (X1) was obtained through a questionnaire containing 40 statements, with measurements using a scale of 1 to 5. The minimum score obtained was 30, while the maximum score was 150. The research results display quantitative descriptive data for the academic performance variable (X1) as follows which is seen in Table 3.

Referring to Table 3. the mean is 126.66 and the mode is 122, which is an insignificant difference. The frequency distribution table and histogram chart below provide an overview of the ranking of academic achievement characteristics.

Table 3. Descriptive Data for Academic Service Variables (X1)

Data Aspect	X_1
Average (mean)	126.66
Average deviation	1.445
Median value	123.00
Numbers that appear most frequently (Mode)	122
Standard deviation	12.921
Variation average	166.961
Hose (Range)	47
Lowest score	103
Highest score	150
Total	10133

Table 4. Academic Services Distribution (X1)

Class Interval	Median	Frequency (Fi)	Frequency Percentage (%)	Frequency Commulative Percentage (%)
103-108	105.5	4	5.00	5.00
109-114	111.5	8	10.00	15.00
115-120	117.5	17	21.25	36.25
121-126	123.5	19	23.75	60.00
127-132	129.5	6	7.50	67.50
133-138	135.5	5	6.25	73.75
139-144	141.5	11	13.75	87.50
145-150	147.5	10	12.50	100
Total		80		

Based on table 4, the highest frequency value is 23.75% in Class IV, namely. in the assessment range of 121-126, with 19 students (23.75%) having an average academic service frequency score of 126.66. Meanwhile, 32 individuals (40%) managed to achieve average scores while 29 people (36.26%) had scores below the standard. In other words, the proportion of administrative staff providing scientific services with a medium or higher rating, i.e. 63.75%, indicating high status. Thus, administrative services to students are good/quality.

Lecturer Performance (X2)

Description of quantitative data

Basic information on the lecturer performance variable (X2) was collected using a questionnaire consisting of thirty statements with an assessment scale of one to five, and a theoretical assessment range of between thirty and one hundred and fifty. This data is descriptive and quantitative regarding the lecturer performance variables (X2) obtained, namely:

Referring to Table 5 the average value is 135.31 and the mode is 150, indicating an insignificant difference. The accompanying frequency distribution table and histogram chart provide a detailed overview of the scores for the lecturer performance impact variables.

Table 5. Lecturer Performance Variable (X2)

Data Aspect	X_1
Average (mean)	134.30
Average deviation	1.454
Median value	135.50
Numbers that appear most frequently (Mode)	150
Standard deviation	13.008
Variation average	169.200
Hose (Range)	47
Lowest score	103
Highest score	150
Total	10744

Table 6. Frequency Distribution of Lecturer Performance Scores (X2)

Class Interval	Median	Frequency (Fi)	Frequency Percentage (%)	Frequency Commulative Percentage (%)
103-109	105.5	1	1.25	1.25
109-114	111.5	2	2.50	3.75
115-120	117.5	16	20.00	23.75
121-126	123.5	9	11.25	35.00
127-132	129.5	8	10.00	45.00
133-138	135.5	9	11.25	56.25
139-144	141.5	6	7.50	63.75
145-150	147.5	29	36.25	100
Total		80		

Based on the data above, the highest frequency score is in Class VIII at 36.25%, namely in the range 145-150, with 9 instructors (11.25%) having an average instructor effectiveness frequency score of 134.30, while those with an average score of 35 people on average (43.75%) and 36 people below average (45%). From these results it can be concluded that 55% of lecturers have performance above average or in the average range. Therefore, this region has a number of lecturers who have high/good achievements.

Naïve Bayes method

Analysis and Design

Data Selection

The dataset used was obtained from distributing questionnaires using questionnaires, tests and question and answer sessions held on February 20-April 3 2023.

Data analysis

To determine the level of student satisfaction and dissatisfaction, calculations were carried out using Likert scale information with 5 answer options.

Figure 1. Student satisfaction data

Data Mining

Naive Bayes is a technique in the field of data exploration that is used to carry out classification, which directs data into certain categories or classes based on information obtained from available data (Jalota & Agrawal, 2019). Naive Bayes is based on Bayes' probability theorem, which describes the relationship

between the probability of an event based on the probability of previous events (Kumar et al., 2019; Rawal & Lal, 2023).

The basic principle of the Naive Bayes algorithm is to calculate the probability of the target class (output) based on the attributes (input) in the data (Gerhana et al., 2019; Lagman et al., 2019). These attributes can be categorical or numerical data. Naive Bayes works with the assumption that the attributes included in the model are independent, or unrelated to each other.

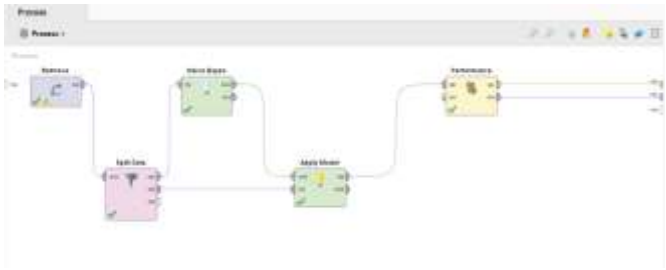

Figure 2. Data collection process for the Naive Bayes method

Classification calculation results with Rapid Miner

Rapid Miner is software used in data exploration and data mining to carry out various tasks, one of which is classification. The results of classification calculations with Rapid Miner can involve several stages, as seen in the illustration in Figure 2.

Conclusion

The quality of educational services at STMIK Tegal is considered quite good by students with an average satisfaction score of 3.81 on a scale of 5. This indicates that STMIK Tegal is able to provide educational services that meet student expectations. The performance of lecturers at STMIK Tegal is considered quite good by students with an average satisfaction score of 3.77 on a scale of 5. This shows that lecturers at STMIK Tegal are able to provide good learning and meet student expectations. The factors that most influence student satisfaction with educational services at STMIK Tegal are ease of access to information, quality of facilities and quality of teaching. Meanwhile, the factors that have the most significant impact on student satisfaction with lecturer performance are the ability to explain material well, the ability to provide relevant case examples, and the ability to provide constructive feedback. The results of the Naive Bayes classification model show a high level of accuracy, namely around 60.87%. This shows that the Naive Bayes classification model can be used to anticipate student attitudes towards the quality of educational services and lecturer performance at STMIK Tegal quite accurately.

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This article was prepared by three authors, namely S, H, and A.I. All members completed article ii by collaborating at each stage.

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Conflicts of Interest

The authors declare no conflict of interest.

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