



Analysis of the Effectiveness of Online Lectures Against Student Achievements Using the C4.5 Method (Case Study: Faculty of Communication and Information Technology National University)

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ABSTRACT

This research is aimed at studying the effectiveness of online lectures on student achievements at the Faculty of Technology and Communication and Information at the National University using the C4.5 Algorithm method. The factors that must be considered in measuring the level of effectiveness of online lectures, namely from the income of parents, attendance and GPA (Grade Point Average) to every student. In the third factor has not been measured with certainty so that the Faculty of Communication and Information and Technology found it difficult to determine what can be changed and improved in quality, which will use the C4.5 method, in the case the author tries to measure these three factors so that eventually a Decision Tree. After doing calculations using the application it will know the level of shortcomings. Educational quality is something that needs to be considered because it is very influential in the process of student learning, therefore it needs an effort to improve effectiveness in online lectures.

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1. Introduction

The development of technology in Indonesia now shows a very rapid increase in education. Some universities seem to make other plans to face competitive resistance by always being responsible for the improvement in various factors. These three factors can be done by universities to provide a way for students in terms of needs related to online lectures.

This lecture model is still less effective so the effectiveness in online lectures is not noticed. Some factors that are influenced by online lectures are the presence of students who start to decline, the GPA (Grade Point Average) also begins to decline in some students and the financial ability of parents also affects because it becomes a facility for online lectures. Research conducted using the C4.5 Algorithm method to measure the effectiveness of online lectures on student achievement. And is expected to be able to know the effectiveness of online lectures and find out the factors that affect effectiveness. In helping an analysis and evaluation so that it can be used as a model for decision tree making.

Customer interest in a company must be highly considered and increased, if the number of customers with a company needs to be maintained and also increased [1].

Improving the quality of national education is the spearhead of development in the field of education, a factor that can increase the foreign competitiveness of higher education is the quality of the graduation of its students. Therefore the development of lecturers and also performance measurement is very important [2].

C4.5 algorithm is a decision tree. Decision tree functions to find a data, find an invisible relationship between a number of input variables with a target variable and produce useful new information [3].

Customer satisfaction is predicted and evaluated by data mining using the C4.5 algorithm for predictions of customer satisfaction with data that has been obtained [4].

The rapid increase in the food business as well as drink is evidence of high growth in all parts of the world, from ordinary tastes to the upper classes. Lots of fast-food or instant reports that lead to competition, the belief of many consumers about what they buy if they buy something, the buyer feels satisfied and will share his satisfaction with producers or sellers [5].

Correspondence is not the only way to make long-distance communication, because for this modern age people will definitely prefer cell phones or what we can call mobile phones. Besides being able to be used to communicate



remotely, cellphones can also have many other uses. When these conditions, indirectly forcing companies to move in the telecommunications sector to carry out more effective strategies to maintain a product in the market [6].

The quality of service in the education of an agency is very important because it can help agencies in providing quality service according to students and can help provide solutions to the types of service that affect the level of student satisfaction [7].

Some cases of delinquent customers make a company's income decrease and unstable, with the company being forced to auction off customer collateral to pay for the company's losses. The price auctioned drastic can only replace half of the company's losses. Therefore, the company requested to be careful in selecting prospective customers so that the company suffered losses again and focused on the problem of classifying prospective financing customers accurately using the C4.5 algorithm [8].

2. Research methods

In this study the authors describe an explanation of data mining methods, including the following stages:



Figure 1. Research flowchart

At this stage of the research carried out by collecting data after that, dividing the data into training and testing data and then making the application, if the application is complete proceed to testing the application and evaluating the application.

A. C4.5 Algorithm

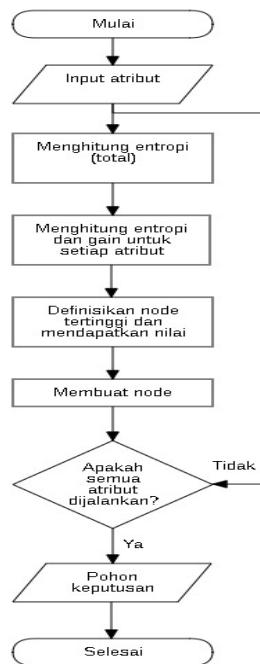


Fig 2. Flowchart method

With this stage learning from data mining, the C4.5 algorithm constructs a tree of interest from the test data, which is recorded in the database. There are three principles of the C4.5 Algorithm:

1. Formation of the tree of levitation
2. Trim the decision tree and evaluate
3. Make the rules of the decision tree

The formula in C4.5 Algorithm is:

$$Entropy (Y) = - \sum_{l=1}^j pl * \log_2 pl$$

Where :

- Y* : set of cases
- J* : number of partitions Y
- pl* : proportion of *Yl* towards Y

$$Gain (Y, X) = Entropy (Y) - \sum_{l=1}^j \frac{|Xl|}{|X|} * Entropy (Yl)$$

Information :

- Y* : set of cases
- X* : attribute
- j* : number of attributes X partition
- | Yl |* : total case in the l-partition
- | Y |* : number of cases in Y



B. System Flowchart

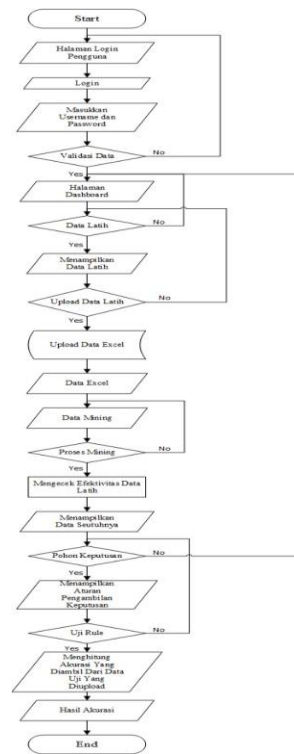


Fig 3. System flowchart

In Figure 3 explains that the flow of the application with the initial login appearance, here only the admin can log in and if valid data will continue to the dashboard page and continue to the training data uploaded from the excel file, then it will go into the mining process on the data mining page will display the effectiveness of the data and then go to the decision tree to display the decision tree and will be tested in the rule to calculate the level of accuracy and will display the results of accuracy.

3. Results and Discussion

A. Data Grouping

The results of grouping data using the C4.5 Algorithm are to determine each attribute and grouping of attributes, which attributes are used, namely parents' income, attendance and GPA (Grade Point Average).

B. Calculation

Table 1
Data

No	Parents' Earnings	Presence	GPA	Class
1	Able	Diligent	High	Effective
2	Very capable	Enough	Enough	Effective
3	Able	Less	Low	Not
4	Not capable	Less	Enough	Not
5	Not capable	Diligent	High	Effective
6	Very capable	Diligent	Enough	Effective
7	Able	Diligent	Enough	Effective
8	Very capable	Enough	High	Effective
9	Not capable	Enough	Enough	Effective
10	Able	Enough	Enough	Effective
11	Able	Diligent	Enough	Effective
12	Not capable	Less	Low	Not
13	Not capable	Enough	High	Effective
14	Able	Enough	Low	Not

In table 1. data are used for each attribute, namely parent's income, attendance and GPA (Grade Point Average) which these attributes have value. While the class column is "Effective" and "No" classes.

$$Entropy (Y) = \left(-\left(\frac{10}{14}\right) \times \log_2 \left(\frac{10}{14}\right)\right) + \left(-\left(\frac{4}{14}\right) \times \log_2 \left(\frac{4}{14}\right)\right) = 0,863121$$

Table 2
Total Entropy

Total cases	Effective	Not	Total Entropy
14	10	4	0.863121

Calculates the total entropy of all cases and the values for each attribute will be calculated.

Node	Atribut	Nilai	Total	Efektif	Tidak	Entropi	Gain
1	Penghasilan Orang Tua	Sangat Mampu	3	3	0	0	0,122797
		Mampu	6	4	2	0,918296	
		Tidak Mampu	5	3	2	0,970951	
	Kehadiran	Rajin	5	5	0	0	0,058454
		Cukup	6	5	1	0,650022	
		Kurang	3	0	3	0	
	IPEK	Tinggi	7	6	1	0,591673	0,567284
		Cukup	3	0	3	0	
		Rendah	4	4	0	0	

Fig 4. Calculate entropy and gain for each attribute

So to calculate the gain from family income, namely:

$$Gain (X) = 0,863121 - \left(\left(\frac{3}{14}\right) \times 0 + \left(\frac{6}{14}\right) \times 0,918296 + \left(\frac{5}{14}\right) \times 0,970951\right) = 0,122797$$

Calculate the gain of attendance:

$$Gain (X) = 0,863121 - \left(\left(\frac{5}{14}\right) \times 0 + \left(\frac{6}{14}\right) \times 0,650022 + \left(\frac{3}{14}\right) \times 0\right) = 0,058454$$

Calculate Gain from GPA:

$$Gain (X) = 0,863121 - \left(\left(\frac{7}{14}\right) \times 0,591673 + \left(\frac{3}{14}\right) \times 0 + \left(\frac{4}{14}\right) \times 0\right) = 0,567284$$

Calculating the parents' income gain, attendance and GPA, the results can be seen in Figure 4. The largest gain value is the parent's income gain.

C. Implementation

The results of this implementation process the grouping with C4.5 Algorithm using data:

1. amount of data: 501
2. number of attributes: 3

Making the system using PHP, so as to produce a website-based information system. The picture below is an implementation of the system.

1. Login Display

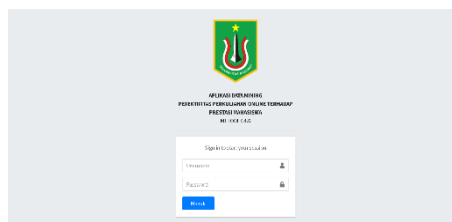


Fig 5. Login display

Figure 5. is the initial display for login where only the admin can login.



2. Main page display

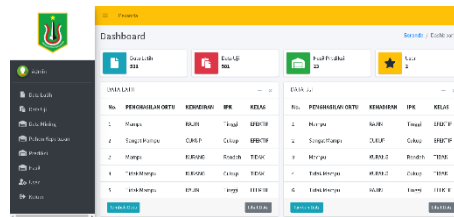


Fig 6. Main page display

In Figure 6. displays the main page after successfully logging in, which is where data has been processed before.

3. Data Display

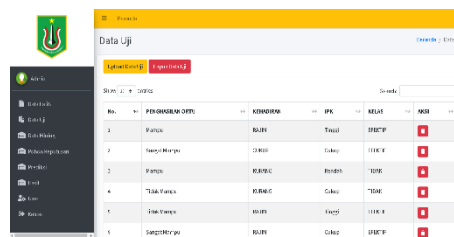


Fig 7. Data Display

Figure 7 is a display of data that will be used and displayed from an Excel file where the file is uploaded on the data page.

4. Display data mining process

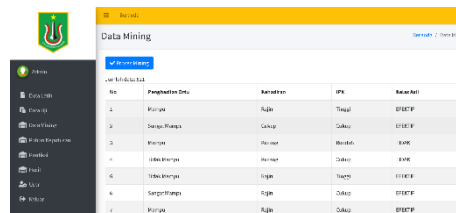


Fig 8. Display data mining process

Figure 8. is a display to do mining process that if we go to the mining process page already displays the data to be processed.

5. Display the results of the mining process

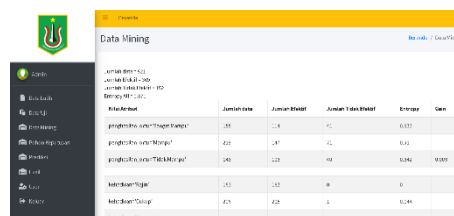


Fig 9. Display mining process

Figure 9. shows the results of the mining process which determines entropy and gain.

6. Decision tree view

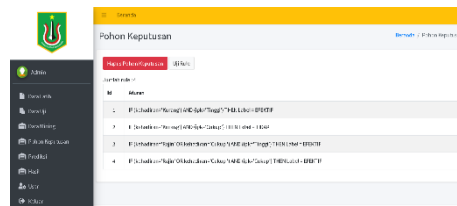


Fig 10. Decision tree view

Figure 10. is a decision tree display where if the mining process is complete and will display a decision tree.

7. Display accuracy results



Fig 11. Display accuracy results

Figure 11. displays the accuracy results if we already know the decision tree and will test the rule to see the accuracy results

4. Conclusion

According to the results of research on data and fact analysis, it can be concluded that:

- a) Research results on the value of accuracy C4.5 algorithm worth 71.06% classification will produce rules as a determination of the effectiveness of online lectures on student achievement and the accuracy results obtained from the rule test after knowing the decision tree.
- b) Rules that have been obtained tree decisions, can help and facilitate decision making on the effectiveness of online lectures on student achievement.
- c) With the application of C4.5 Algorithm in order to be able to provide solutions for improvements in the effectiveness of online lectures so that students are comfortable in participating in campus and other activities.

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