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Favorite Lecturer Determination of UPI YPTK Padang using Apriori Algorithm

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Abstract

In this study, the authors used a priori algorithm to analyze the favorite lecturer indicators of UPI YPTK students in Padang. A priori algorithm was chosen because of its ability to analyze data that appears simultaneously and repeatedly and data that has accumulated a long time, so it is necessary to use data mining, to gain knowledge. The data that I use is a selection of favorite lecturer indicators UPI YPTK Padang randomly as many as 17. The research method that I use is to manually calculate data then a trial of the Weka data mining software is conducted. The results of this study found that the pattern of determining the favorite lecturers of upi yptk padang using a priori algorithm is 10 knowledge and the items that appear are smart (1), interesting (3) and humorous (6).). Therefore, the university leadership can give direction to the new lecturers that: if they are already smart (1) then it is suggested to be interesting (3) and / or humorous (6) and vice versa. This knowledge is very useful for improving the performance of lecturers and student interest in learning Upi Yptk Padang. This study produces 10 new rules that meet the minimum value of support (20%) and minimum confidence (55%).

Keywords: algorithm, a priori, data mining, favorites*.*

INTRODUCTION

Education is the need of every human being to be able to adapt to his environment. The higher the level of one's education, the wiser the person is in adapting to their environment. Conversely the lower the intake of one's education, the more difficult a person to adapt to their environment. Basically education is not only taken formally, but also informally. Formal education is usually managed or controlled by the government, while informal education is usually only managed by the community or foundation. True human education has been received since in the smallest environment, the family. So a person's character usually reflects the character of his family. Formal education can actually be divided into two categories, namely public and private education. Public education is managed and controlled directly by the state while the private sector is managed by community groups or foundations but is still controlled by the state. At present the government is gradually no longer distinguishing between public and private education. But in the midst of society today tends to choose state education. There are several reasons that arise for example costs and prestige. In terms of the cost of public education is lower than private education. This is understandable because state education operational costs are borne by the state while private education operational costs come from students, even if there is from the government only in the form of subsidies. In essence the quality of an education can be measured by how much the teacher's progress in the learning process. Not all students assume that public education is superior to private education. Of course there are other indicators that will influence the interests of prospective students in determining the destination of educational institutions. For example accreditation, achievements and even educators. In this study the writer will focus on the evaluation of favorite lecturers of UPI YPTK students in Padang. The number of students studied was 17, where they were asked to write down their favorite lecturer indicators. They are freed to write down how much and what these indicators are. From this indicator several item set will appear simultaneously. The item set will be processed using the A priori Algorithm to get the trend of indicators that appear simultaneously. While the software used to display the results is Weka.

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LITERATURE REVIEW

Data Mining

Data mining is a field of several scientific fields that unites techniques from machine learning, recognition of statistical patterns, databases, and visualizations for handling the problem of retrieving information from large databases [1]. Data mining is a series of processes to explore the added value of a data set in the form of knowledge that has not been known manually [2]. Data mining is defined as mining data or attempting to dig up valuable and useful information on a very large database. [3].

To determine the association rules to be chosen, it must be sorted by Support × Confidence. N rules are taken as many as the rules that have the greatest results. In addition, the integration of data mining techniques into the DBMS, specifically Object-Relation DBMS (ORDBMS) which is the latest DBMS technology, is also an active area of research. The main purpose of this integration is to "melt" the data mining algorithm to become a quality internal function of ORDBMS, so users can use it as needed. Because DBMS is a mature technology, widely used, can manage data in very large sizes, facilitates easy query tables with Structured Query Language (SQL) and has features that accommodate the needs of ORDBMS users, the development and integration of data mining algorithms to in a good ORDBMS is to take advantage of all this. Data mining is one of the activities in the field of software that can provide high ROI (return on investment). However, data mining is still only a tool that can help humans to see patterns, analyze trends in order to speed up decision making.

Association Rule

Association rule requires a variable size that is determined by the user to determine the extent to which or how much output the user wants. Support and Confidence is a measure of trust and usefulness of a pattern that has been found. The importance of an associative rule can be determined by two parameters, support (support value), namely the percentage of the combination of items in the database and confidence [4]. An example of an associative rule from the analysis of elective courses is knowing how likely a student is to take an Agribusiness Management course along with a Business Feasibility Study. With this knowledge, department managers can determine what electives are most often taken simultaneously by students.

Table 1. Sample Transactions for Association Rule Analysis

Trans	***Item set***
1	1.3.4
2	2
3	1.2.4
4	2.3.6
5	1.3.6
6	1.2.3.6
7	4
8	1.2.3.6
9	2
10	2.3
11	1.4
12	2.4
13	1.5
14	2.4
15	3.6
16	2.5
17	3.6

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Association Analysis

In association analysis an item set is a collection of zero or more items. In the example table above, the item set is the item purchased at the store, trans is the transaction code. In the table, it can be seen in transaction 1 that goods are purchased A, B and E. Transaction 2 purchased is B and D, and so on. Association analysis will conduct an analysis of relationships with certain rules often referred to as association rules. As an example of this table, buyers who usually buy goods A and B will buy goods C. This rule can be written {A, B} ◊ {C}. To get the quantification of the terminology support and confidence needs to be considered. Support and confidence can be calculated as follows:

$$\textit{Support} = \frac{\Sigma\,(X \cup Y)}{N} \times 100\%$$

Information:

S = $Support$

Σ (X **U** Y**)** = Number of transactions containing X and Y

N = Number of Transactions

$$\textit{Confidence} = \frac{\textit{Support}\,(X \cup Y)}{\textit{Support}\,X} \times 100\%$$

Where X and Y are the item set and σ is the support of the item set. With this formula, the support obtained from the relationship s (A, B ◊ C) is: 92 = 0, 22. Meanwhile the confidence value obtained is c (A, B ◊ C) is: 42 = 0, 5. The value of 2 in the support obtained from item set A, B, C is 2, namely in trans 8 and 9, the total number of trans is 9. Whereas 2 in the same confidence as in support, 4 is obtained from the amount of A, B, namely in trans 1, 4, 8 and 9. From this acquisition, we can make the desired percentage rules to determine the certainty of the association. It is best if the value of support and confidence is high.

Apriori Algorithm

Apriori is an algorithm for searching frequent item set to get association rules. As the name implies, this algorithm uses prior knowledge about frequent item set properties that have been previously known, to process further information. A priori uses an iterative approach which is also called level-wise search where k-item set is used to search (k + 1) –item set. Apriori algorithms use knowledge about frequent known item set, to process further information. High frequency patterns are patterns of items in a database that have frequencies or support above a certain threshold called the minimum support term. This high frequency pattern is used to develop associative rules and also some other data mining techniques.

The principle of a priori algorithm is:
1. Collect the number of single items, get large items
2. Get candidate pairs, count ◊ large pairs of items
3. Get candidate triplets, calculate ◊ large triplets of items and so on
4. As a guide: each subset of a frequent item set must be frequent

The two main processes in the a priori algorithm are the steps that will be taken to get frequent item set. Although the a priori algorithm is easier to understand and implement compared to

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other algorithms that are applied to the association rule process, the a priori algorithm also has the disadvantage of searching for frequent item set, the a priori algorithm must repeatedly scan the database for each combination of items. This causes the amount of time needed to scan the database. In addition it takes a large generate candidate to get a combination of items from the database

Prior Research

1. The application of a priori algorithms has been widely used before to get valuable information from a number of data frequencies. The following are a number of a priori algorithm applications: Basket Market Analysis with Apriori Algorithms and FP-Growth [6]. This paper will discuss the application of Apriori and FP-Growth in the process of finding frequent itemsets. The use of FP-Tree which is used in conjunction with the FP-growth algorithm to determine the frequent itemset of a database, is different from the Apriori paradigm which requires a candidate generation step, namely by scanning the database repeatedly to determine the frequent itemset. This paper also provides a discussion of the comparison of time complexity between the FP-growth algorithm and Apriori and the results of the comparison of the algorithm.

2. Development of a Book Search Recommendation System by Extracting Rule Associations Using Apriori Algorithms (Case Study of the Library and Archive Agency of East Java Province) [7] In this study the method used in identifying the pattern in question is the association rule with a priori algorithm. This method and algorithm generates book lending transactions with strong associations between books in the transaction which are used as book lending recommendations that help users get recommendations for other books when users see details of the selected book or want to borrow. From the results of trials in this study, it was found that the greater the minimum support (minsup) and minimum confidence (minconf), the less time needed to produce recommendations and the fewer recommendations given, but the recommendations given came from frequent transactions.

3. A priori Algorithm Use for a Consumer Behavior in the Purchase of Goods [8]. In this study the data used are consumer purchase data at the Andika Muara Bulian minimarket. By using a priori algorithm obtained a combination of consumer purchases at the convenience store.

4. Implementation of Data Mining with Apriori Algorithm Method in Determining Drug Purchase Patterns [9]. The results of testing with a priori algorithm and the system built show the results that have met the needs in determining the pattern of drug purchase based on the tendency of drug purchases by customers. Compared with the ongoing system, the performance is shown in the effectiveness of information from the system about determining the purchase pattern of drugs for the availability of drugs and the layout of the drugs to make it easier to find out the presence of drugs seen from 2 drugset items.

The research focuses on analyzing the favorite lecturer data selected by UPI YPTK students in Padang. The criteria data is free and random. Students are free to determine what criteria and how many of their favorite lecturers. The data is processed and analyzed using a priori algorithm. Until finally conducted trials using Weka data mining software.

METHODOLOGY

In conducting a research, of course it must be based on the correct research method so that it can facilitate the course of the research. The research method is a framework for conducting research. By following the framework, the research conducted will run systematically and give good results. In this section the research framework will be described, this framework is

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the steps that will be taken in solving the problem that will be discussed. The steps are described as shown below:

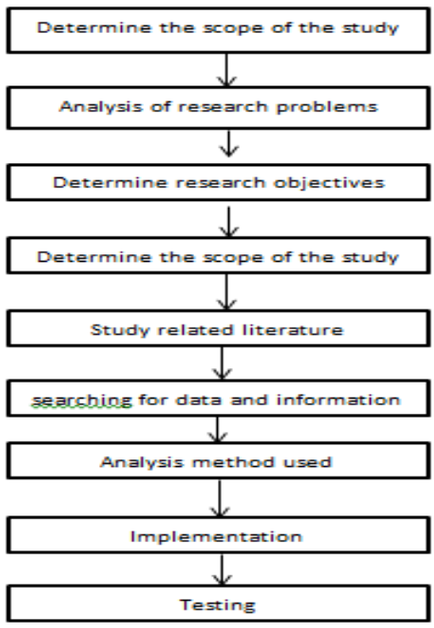

Figure 1. Research Framework

RESULTS AND DISCUSSION

Association Analysis with Apriori Algorithms

In this study, the authors analyzed 17 students who determined their favorite lecturer indicators at UPI YPTK Padang. The author analyzes the incoming data from students based on their choice of favorite lecturer indicators according to each of them. Each student is given freedom to the number of indicators they want. Based on the data the author analyzes, the smallest number of indicators is 1 and the highest indicator is 4. The total number of favorite lecturer indicators that the author gets is 6 indicators namely Smart, Neat, Attractive, Discipline, Quiet and Humorous.

Association rules are usually stated in the form of: {Smart, Neat} ◊ {Be diligent} {support = 20%, confidence = 55%} This means that 55% of the favorite smart and neat favorite lecturer indicators must also be diligent. While 20% of all favorite lecturer indicators are available containing these three items. Defining Variables. The data to be processed in determining this favorite lecturer indicator is based on student choice indicators. The favorite lecturer indicator variables to be processed are:

1. Students
2. Indicator 1
3. Indicator 2
4. Indicator n

From the variables above, each indicator will be divided into groups based on the same type of indicator, this is done so that the data analysis process can be done easily using a priori algorithm.

Table 1 Favorite Lecturer Indicator

COLLEGE STUDENT	SMART (1)	NEAT(2)	INTERESTING(3)	DISCIPLINE (4)	SHUTTERS (5)	HUMORICAL(6)
1	V		V	V		V

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2		V				
3	V	V		V		
4		V	V			V
5	V		V			V
6	V	V	V			V
7				V		
8	V	V	V			V
9		V				
10		V	V			
11	V			V		
12		V		V		
13	V				V	
14		V		V		
15			V			V
16		V			V	
17			V			V

After the data is obtained, the next step is to group students based on the selected indicators as the following table.

Itemset Formation

The process of forming C1 or known as 1-Itemset with a minimum amount of support = 20%, in this process an accumulative calculation of the number of training conducted by village midwives will be carried out for every 1 training item conducted by 17 village midwives, with the help of formulations. formula as follows:

$$Support\ A = \frac{\sum \text{Transactions contain A}}{\sum \text{Number of Transactions}} \times 100\ \%$$

Then after that the results of Suport A are obtained as a training item which looks like in the following table:

Table 2. 1-Itemset Support

NO	INDICATOR	FREQUENCY	SUPPORT
1	1 (SMART)	7	7/17 x 100 = 41,18 %
2	2 (NEAT)	10	10/17 x 100 = 58,82 %
3	3 (INTERESTING)	8	8/17 x 100 = 47,06 %
4	4 (DISCIPLINE)	6	6/17 x 100 = 35,29 %
5	5 (SHUTTERS)	2	2/17 x 100 = 11,77 %
6	6 (HUMORICAL)	7	7/17 x 100 = 41,18 %

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From the previous search results, the frequent values are: (1,2,3,4,6). This value is the result of support ≥ minimum support, namely 20%.

Combination of 2 Itemset

The process of forming C2 or what is called the 2-Itemset with a minimum amount of support = 20% produces 6 combination groups with the results shown in the following table:

Table 3. 2-Itemset Combination

NO	INDICATOR	FREQUENCY	SUPPORT
1	1 (SMART), 2 (NEAT)	3	3/17 x 100 = 17,65 %
2	1 (SMART), 3 (INTERESTING)	4	4/17 x 100 = 23,53 %
3	1 (SMART), 4 (DISCIPLINE)	3	3/17 x 100 = 17,65 %
4	1 (SMART), 6 (HUMORICAL)	4	4/17 x 100 = 23,53 %
5	2 (NEAT), 3 (INTERESTING)	4	4/17 x 100 = 23,53 %
6	2 (NEAT), 4 (DISCIPLINE)	3	3/17 x 100 = 17,65 %
7	2 (NEAT), 6 (HUMORICAL)	3	3/17 x 100 = 17,65 %
8	3 (INTERESTING), 4 (DISCIPLINE)	1	1/17 x 100 = 5,88 %
9	3 (INTERESTING), 6 (HUMORICAL)	7	7/17 x 100 = 41,18 %
10	4 (DISCIPLINE), 6 (HUMORICAL)	1	1/17 x 100 = 5,88 %

From the search results above, the frequent values are obtained, namely:

(1,3), (1,6), (2,3), (3,6) => (1,2,3,6)

The next analysis is to look at the 3-Itemset combination. The results are as in the table with the 4 combination groups as follows:

Table 4. 3-Itemset Combinations

NO	INDICATOR	FREQUENCY	SUPPORT
1	1 (SMART), 2 (NEAT), 3 (INTERESTING)	2	2/17 x 100 = 11,77 %
2	1 (SMART), 2 (NEAT), 6 (HUMORICAL)	2	2/17 x 100 = 11,77 %
3	1 (SMART), 3 (INTERESTING), 6 (HUMORICAL)	4	4/17 x 100 = 23,53 %
4	2 (NEAT), 3 (INTERESTING), 6 (HUMORICAL)	3	3/17 x 100 = 17,65 %

Received frequent score: (1,3,6) (SMART, INTERESTING, HUMORICAL).

Establishment of Association Rules

At this stage, look for the confidence value in the results of the last combination that has met the minimum requirements for support values, namely in stage 2 combinations and 3 combinations. So that it can be continued to the next stage of the process by determining the value of confidence using the following formula:

$$Confidence\ A \rightarrow B = \frac{Support\ (AUB)}{Support\ A} \times 100\ \%$$

Table 5. Support and Confidence Results

NO	ITEM SET	SUPPORT	CONFIDENCE
1	1 (SMART) --> 3 (INTERESTING)	23,53%	57,14%
2	3 (INTERESTING) --> 1 (SMART)	23,53%	50%

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3	1 (SMART) --> 6 (HUMORICAL)	23,53%	57,14%
4	6 (HUMORICAL) --> 1 (SMART)	23,53%	57,14%
5	3 (INTERESTING) --> 6 (HUMORICAL)	41, 18%	87,50%
6	6 (HUMORICAL) --> 3 (INTERESTING)	41, 18%	100%
7	1 (SMART) --> 3 (INTERESTING), 6 (HUMORICAL)	23,53%	57,14%
8	3 (INTERESTING) --> 6 (HUMORICAL), 1 (SMART)	23,53%	57,14%
9	3 (INTERESTING) --> 1 (SMART), 6 (HUMORICAL)	23,53%	50%
10	1 (SMART) --> 6 (HUMORICAL), 3 (INTERESTING)	23,53%	100%
11	6 (HUMORICAL) --> 1 (SMART), 3 (INTERESTING)	23,53%	57,14%
12	1 (SMART) --> 3 (INTERESTING), 6 (HUMORICAL)	23,53%	100%

The value above has a value confidence ≤ minimum confidence value, namely = 55%.

The results are (1 →3) , (1→6), (6→1), (3→6), (6→3), (1→3,6)

(3,6→1), (1,6→3), (6→1,3), (1,3→6)

(Knowledge Persentation)

From the search process using a priori algorithm and the minimum support value of support = 20% and minimum confidence = 55%, the results of the association rule that appear are as many as II rules, namely:

1. 1 → 3 {S=23,53% ; C=57,14%}
   This means: if the student when filling out the questionnaire for the favorite lecturer chooses (SMART) 1 then the student will also choose (INTERESTING) 3 as much as 23.53%.

   The level of truth of students choosing (SMART) 1 and (INTERESTING) 3 simultaneously is 57.14% meaning that not all who choose (SMART) 1 will choose (INTERESTING) 3.

2. 1 → 6 {S=23,53% ; C=57,14%}
   This means: if the student when filling out the questionnaire for the favorite lecturer chooses (SMART) 1 then the student will also vote (HUMORICAL) 6 as much as 23.53%.

   The degree of correctness of students choosing (SMART) 1 and (HUMORICAL) 6 simultaneously is 57.14% meaning that not all who choose (SMART) 1 will choose (HUMORICAL) 6.

3. 6 → 1 {S=23,53% ; C=57,14%}
   This means: if the student when filling out the questionnaire for the choice of favorite lecturer chooses (HUMORICAL) 6 then the student will also vote (SMART) 1 as much as 23.53%.

   The degree of correctness of students choosing (HUMORICAL) 6 and (SMART) 1 simultaneously is 57.14% meaning that not all who choose (HUMORICAL) 6 will choose (SMART) 1.

4. 3 → 6 {S=41,18% ; C=87,5%}

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This means: if the student when filling out the questionnaire for the choice of favorite lecturer chooses (WITHDRAW) 3 then the student will also choose (HUMORIS) 6 as much as 41.18 %%.

The level of truth of students choosing (INTERESTING) 3 and (HUMORIS) 6 simultaneously is 87.5% meaning that not all who choose (INTERESTING) 3 will vote (HUMORICAL) 6.

5. 6 → 3 {S=41,18% ; C=100%}
   This means: if the student when filling out the favorite lecturer selection questionnaire chooses (HUMORICAL) 6 then the student will also choose (INTERESTING) 3 as much as 41.18 %.

   The level of truth of the student choosing (HUMORICAL) 6 and (INTERESTING) 3 simultaneously is 100% meaning that all who choose (HUMORICAL) 6 will choose (INTERESTING) 3.

6. 1 → 3.6 {S=23,53% ; C=57,14%}
   This means: if the student when filling out the questionnaire for favorite lecturer chooses (SMART) 1 then the student will also vote (INTERESTING) 3 and (HUMORICAL) 6 as much as 23.53%.

   The level of correctness of students choosing (SMART) 1 and (INTERESTING) 3 and (HUMORICAL) 6 simultaneously is 57.14% meaning that not all who choose (SMART) 1 will choose (INTERESTING) 3 and (HUMORICAL) 6.

7. 3.6 → 1{S=23,53% ; C=57,14%}
   This means: if students when filling out the questionnaire for favorite lecturers choose (RAPI) 3 and (HUMORICAL) 6 then the student will also vote (SMART) 1 as much as 23.53%.

   The level of correctness of students choosing (INTERESTING) 3 and (HUMORICAL) 6 and (SMART) 1 simultaneously is 57.14% meaning that not all who choose (SMART) 1 will choose (INTERESTING) 3 and (HUMORICAL) 6.

8. 1.6 → 3 {S=23,53% ; C=100%}
   This means: if students when filling out the questionnaire for favorite lecturers choose (SMART) 1 and (HUMORICAL) 6 then the student will also vote (INTERESTING) 3 as much as 23.53%.

   The level of correctness of students choosing (SMART) 1 and (HUMORICAL) 6 and (RAPI) 3 simultaneously is 100% meaning that all who choose (SMART) 1 and (HUMORICAL) 6 will choose (INTERESTING) 3.

9. 6 → 1.3 {S=23,53% ; C=57,14%}
   This means: if the student when filling out the questionnaire for favorite lecturer chooses (HUMORICAL) 6 then the student will also choose (SMART) 1 and (INTERESTING) 3 as much as 23.53%.

   The level of correctness of students choosing (HUMORICAL) 6 and (SMART) 1 and (INTERESTING) 3 simultaneously is 57.14% meaning that not all who choose (HUMORICAL) 6 and (SMART) 1 will choose (INTERESTING) 3.

10. 1.3→ 6 {S=23,53% ; C=100%}

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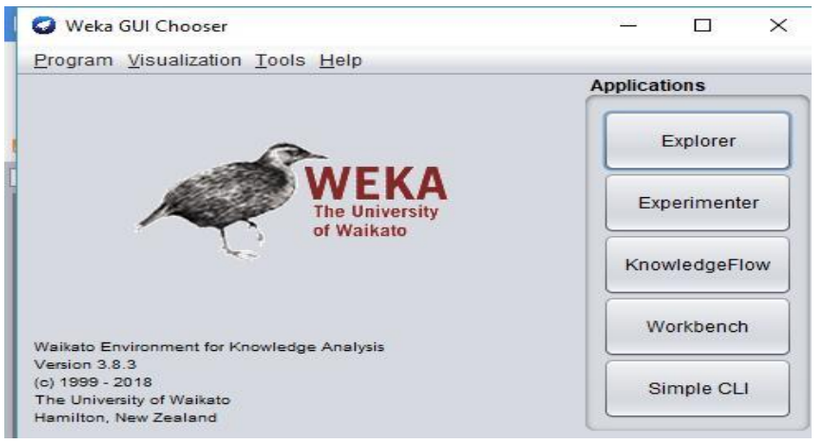
This means: if students when filling out the questionnaire for favorite lecturers choose (SMART) 1 and (INTERESTING) 3, then the student will also vote (HUMORICAL) 6 by 23.53%.

The level of correctness of students choosing (SMART) 1 and (INTERESTING) 3 and (HUMORICAL) 6 simultaneously is 100% meaning that all those who choose (SMART) 1 and (INTERESTING) 3 will choose (HUMORICAL) 6.

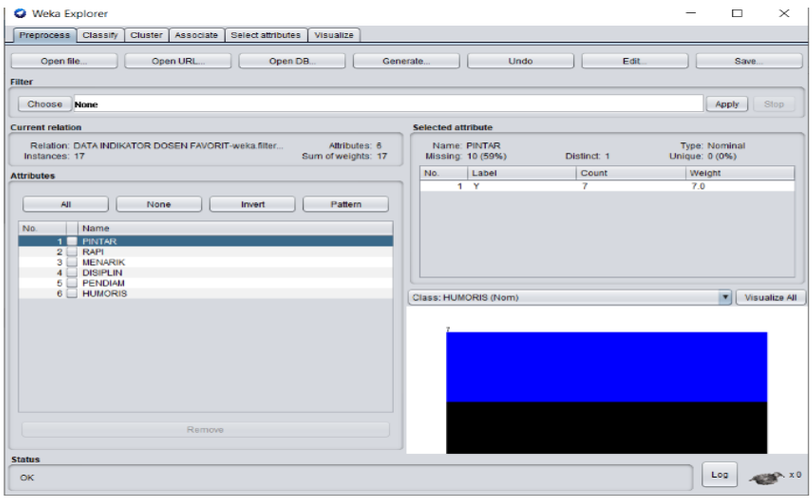
Software Testing Results

Testing the results of the analysis, it is very important to determine and determine whether the results of the analysis are correct or not. The software that I use in this test is Weka. The steps in testing on Weka are as follows:

a. Activate Weka software so that the following picture appears.



b. After the Weka window opens, click the Explorer menu, click the Preprocess menu, Open File, search for a database like the following image.



c. The next step is to click the Associate menu, select Apriori and then click Start to bring up the rules that are formed, as shown below;

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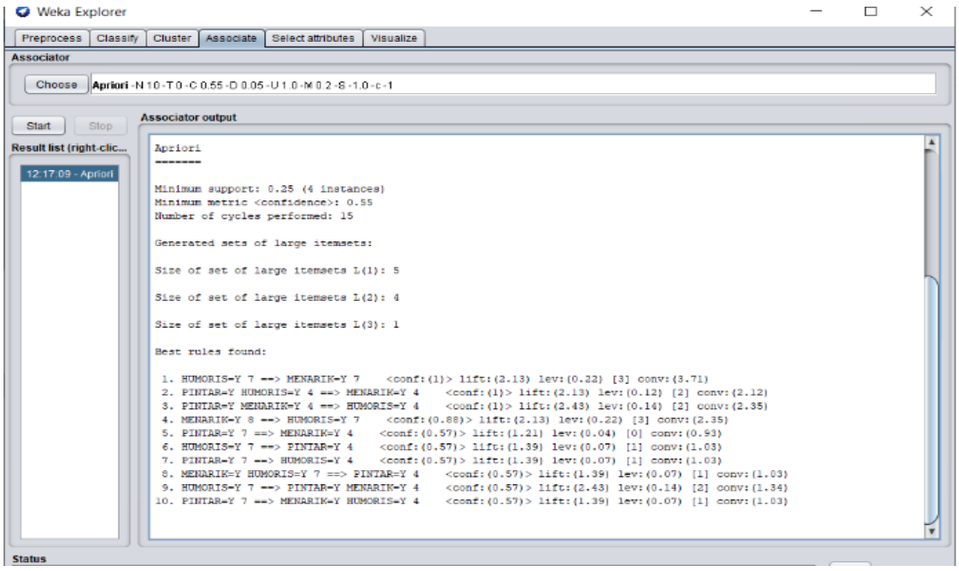
Figure 4. Formed Rule



CONCLUSIONS

Based on data processing carried out both manually and using the WEKA 3.8 application, it can be concluded that: the pattern of determining the favorite lecturers of upi yptk padang using a priori algorithm is 10 knowledge and the items that appear are smart (1), interesting (3) and humorous (6).). Therefore, the university leadership can give direction to the new lecturers that: if they are already smart (1) then it is suggested to be interesting (3) and / or humorous (6) and vice versa. This knowledge is very useful for improving the performance of lecturers and student interest in learning Upi Yptk Padang. This study produces 10 new rules that meet the minimum value of support (20%) and minimum confidence (55%).

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