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Product Recommendation System Application Using Web-Based Equivalence Class Transformation (Eclat) algorithm

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Abstract: Sales transactions at Alfamidi can affect the continuity of product sales accuracy. The use of stored transaction data can provide a lot of useful knowledge for companies in making policies and finding strategies at Alfamidi. In implementing these objectives, namely using Market Business Analysis. One of the Data Mining techniques is the Association Rule, which is a Market Basket Analysis procedure to find customer buying patterns. This pattern can be one way of making business policies and strategies. One pattern is determined by two parameters, namely support (support value) and confidence (definite value). This analysis uses the Equivalence Class Transformation (ECLAT) algorithm. One of the patterns resulting from the analysis of 30 transaction data with 12 item categories. For example, if we buy strawberry jam, we buy bread essence with a confidence value = 1%. The results obtained can also be used to assist Alfamidi to assist in determining inventory decisions. So the conclusion that can be drawn is that if consumers can buy strawberry jam and then buy bread juice at the same time, Alfamidi must at least keep the stock availability of the two goods the same.
Keywords: Market Basket Analysis, Association Rule, ECLAT

INTRODUCTION

This outlet is larger than minimarkets in general (Wedy et al., 2016). In addition to selling fruits and vegetables, Alfamidi also sells various food products, beverages and other necessities of life. More than 5000 food products and other necessities of life are available at competitive prices to meet the needs of daily consumers (Siregar & Hasugian, 2020). Alfamidi branch is located in Purwakarta precisely on Jl. Raya Sadang - Subang, Campaka, Purwakarta Regency, West Java. Alfamidi always tries to provide the best service so that satisfaction for consumers can be realized by providing quality products, superior services, and friendly prices, as well as in a pleasant shopping atmosphere, but because there is competition with other supermarkets, strategies are needed to maintain the retail business. In this regard, a supermarket must be able to understand what its consumers really want to provide convenience in shopping at the supermarket(Muhammad Rashidi Wahab, 2013). Especially in providing convenience to choose the groceries desired by consumers easily. For example, in placing grocery items arranged on shelves, it should be adjusted to consumer shopping patterns to make it easier for consumers to find the desired goods(Aprizal et al., 2016). Every day Alfamidi serves a lot of sales transactions, and one of the problems that is often faced is the lack of stock of goods, namely the availability of goods is often inadequate for customer needs. For example, the number of stock items is large but the demand is small, this can cause customer disappointment because the desired goods are often used up and also losses for self-service managers because some unsold goods can accumulate more and more(Alma et al., 2020). Every day the sales transaction data in Alfamidi is increasing so that the data accumulates, but this data is often treated only as a record without further processing so that it does not have more use value to be used properly. Analysis of each data collection will produce knowledge or information, for example in the form of patterns and rules of association that occur in the data (FAHRUDIN, 2019).

LITERATURE REVIEW

Important things related to data mining are: Data mining is an automated process of existing data (Asriningtias & Mardhiyah, 2014). The data to be processed is in the form of very large data. The purpose of data mining is to obtain relationships or patterns that may provide useful indications (Sikumbang, 2018). A method that is often used to analyze consumer shopping behavior patterns is shopping cart analysis or Market Basket Analysis (MBA)(Elisa, 2018). This analysis is one of the methods in data mining that studies the behavior of consumer habits in buying goods in simultaneously at one time(Arnomo, 2021). The method of analyzing MBA shopping

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behavior patterns using the help of the ECLAT algorithm, the technique can be applied in very large data such as sales transaction data on Alfamidi. Managers want to know if a group of items is always purchased together (Yuli Mardi, 2019). These managers can use this information to create supermarket layouts, so that the arrangement of these items can be optimal for each other or for promotional purposes, buyer segmentation, product cataloging, or viewing shopping patterns. The rules of the association want to provide such information in the form of "if-then" or "if-then" relationships calculated from data of a probabilistic nature. The idea of the association rules is to examine all possible if-then relationships between items and select only the most likely ones as indicators of dependency relationships between items. It is commonly used the term antedecent to represent the "if" and consequent parts to represent the "then" part. In this analysis. Antedecent and consequent are a group of items that have no relationship together(Susanto & Sudiyatno, 2014).

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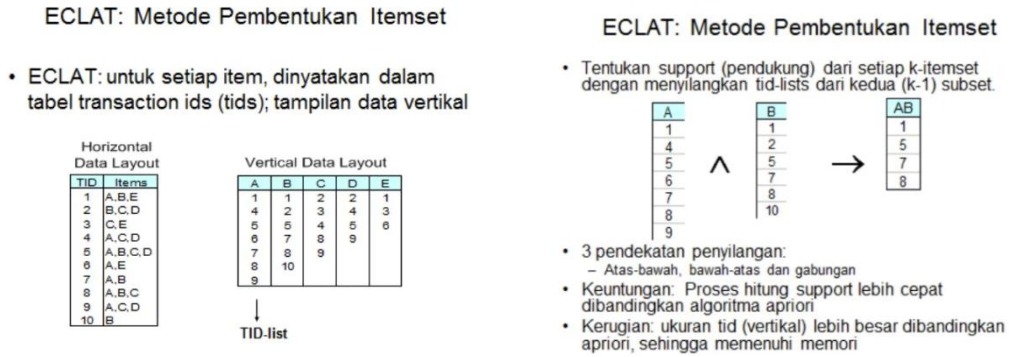
METHOD

The Equivalence Class Transformation (ECLAT) algorithm is a very simple algorithm to find the most frequently appearing items, basically the Equivalence Class Transformation (ECLAT) algorithm performs a depth-first search on a database with a vertical layout, if the database is horizontal, it must be converted to a vertical form first(Widyan & Rozi, 2021).

According to , the process of forming an itemset in the Equivalence Class Transformation (ECLAT) algorithm begins with changing the form of the transaction, if the item on the transaction is horizontal, it is converted into a vertical form by combining the TID List on the transaction that has the same item(Arinda, 2017). Equivalence Class Algorithm Transformation (ECLAT) is very simple algorithm for find the most frequent itemset appears, basically the ECLAT algorithm perform a depth-first search search on database with layout vertical, if the database is horizontal then it must be converted to the form first vertical (Lisnawita & Devega, 2018)

RESULT



The picture above is the stage of the dataset processing process using the ECLAT method. Data processing in the data mining application of the ECLAT algorithm method requires several stages. In this module, a minimum support value of 5% and a minimum confidence value of 14% are included.

The results of the dataset processing that have been carried out in the results of dataset processing using the ECLAT algorithm there are 5 stages consisting of Horizontal Itemset figure 1, Vertical Itemset figure 2, Itemset Crossing figure 3, Itemset Support figure 4, Assosiation Rule figure 5. For the results of the ECLAT algorithm analysis, it can be seen in the figure 1 Itemset Horizontal, itemset vertical , crossing itemset, support itemset, Result of Association Rule

Itemset Horizontal

TRANSAKSI	AM17	AM96	AM57	AM03	AM43	AM09	AM13	AM05	AM31	AM33	AM19	AM44
000023							✔	✔	✔			✔
000024							✔	✔	✔			
000025					✔		✔	✔		✔		
000026	✔			✔				✔		✔	✔	
000027	✔						✔	✔	✔			

Figure 1 Itemset Horizontal

*name of corresponding author

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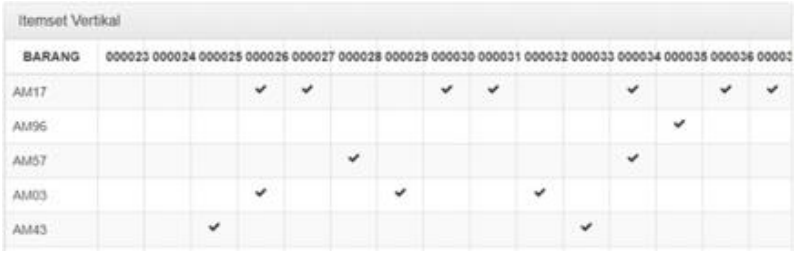
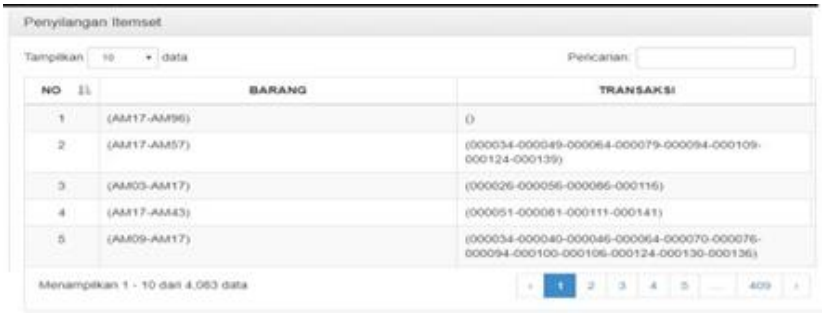

Itemset Vertikal

BARANG	000023	000024	000025	000026	000027	000028	000029	000030	000031	000032	000033	000034	000035	000036	00003
AM17				✔	✔			✔	✔			✔		✔	✔
AM96													✔		
AM57						✔						✔			
AM03				✔			✔			✔					
AM43			✔								✔				

Figure 2 Itemset Vertikal

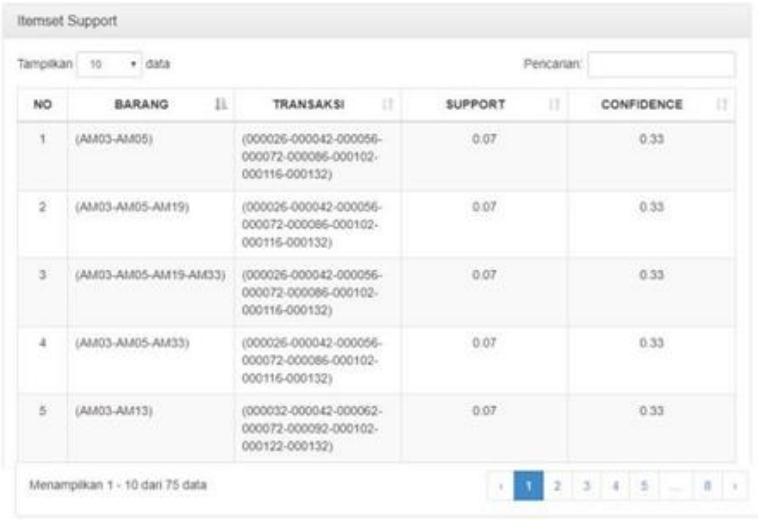

Penyilangan Itemset

Tampilkan 10 data Pencarian:

NO	BARANG	TRANSAKSI
1	(AM17-AM96)	()
2	(AM17-AM57)	(000034-000049-000064-000079-000094-000109-000124-000139)
3	(AM03-AM17)	(000026-000056-000086-000116)
4	(AM17-AM43)	(000051-000081-000111-000141)
5	(AM09-AM17)	(000034-000040-000046-000064-000070-000076-000094-000100-000106-000124-000130-000136)

Menampilkan 1 - 10 dari 4.053 data ‹ 1 2 3 4 5 ... 409 ›

Figure 3 Crossing Itemset

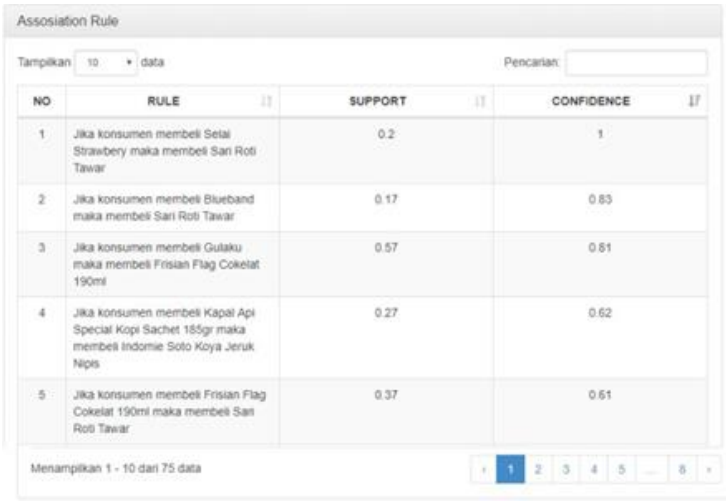

Itemset Support

Tampilkan 10 data Pencarian:

NO	BARANG	TRANSAKSI	SUPPORT	CONFIDENCE
1	(AM03-AM05)	(000026-000042-000056-000072-000086-000102-000116-000132)	0.07	0.33
2	(AM03-AM05-AM19)	(000026-000042-000056-000072-000086-000102-000116-000132)	0.07	0.33
3	(AM03-AM05-AM19-AM33)	(000026-000042-000056-000072-000086-000102-000116-000132)	0.07	0.33
4	(AM03-AM05-AM33)	(000026-000042-000056-000072-000086-000102-000116-000132)	0.07	0.33
5	(AM03-AM13)	(000032-000042-000062-000072-000092-000102-000122-000132)	0.07	0.33

Menampilkan 1 - 10 dari 75 data ‹ 1 2 3 4 5 ... 8 ›

Figure 4 Itemset Support


Assosiation Rule

Tampilkan 10 data Pencarian:

NO	RULE	SUPPORT	CONFIDENCE
1	Jika konsumen membeli Selai Strawbery maka membeli Sari Roti Tawar	0.2	1
2	Jika konsumen membeli Blueband maka membeli Sari Roti Tawar	0.17	0.83
3	Jika konsumen membeli Gulaku maka membeli Frisian Flag Cokelat 190ml	0.57	0.81
4	Jika konsumen membeli Kapal Api Special Kopi Sachet 165gr maka membeli Indomie Soto Koya Jeruk Nipis	0.27	0.62
5	Jika konsumen membeli Frisian Flag Cokelat 190ml maka membeli Sari Roti Tawar	0.37	0.61

Menampilkan 1 - 10 dari 75 data ‹ 1 2 3 4 5 ... 8 ›

Figure 5 Result of Association Rule

*name of corresponding author

Figure 5 above is the result of the Association Rules that have been formed based on the minimum support and minimum confidence values that have been determined. In the results of the Association Rules, there is an attachment of one item to another item.
If consumers buy Strawbery Jam then buy Sari Roti Tawar (confidence: 1)
If consumers buy Blueband then buy Sari Roti Tawar (confidence: 0.83)
If consumers buy Gulaku then buy Frisian Flag Chocolate 190ml (confidence: 0.81)
If consumers buy Kapal Api Special Kopi Sachet 185gr then buy Indomie Soto Koya Lime (confidence: 0.62)
If the consumer buys Frisian Flag Chocolate 190ml then buy Sari Roti Tawar (confidence: 0.61) If the consumer buys Gulaku then buy Indomie Soto Koya Lime (confidence: 0.57) If the consumer buys Gulaku then buy Sari Roti Tawar (confidence: 0.57)
If consumers buy Gulaku then buy Kapal Api Special Kopi Sachet 185gr (confidence: 0.52)
If consumers buy Blueband then buy Strawbery Jam (confidence: 0.5)
If consumers buy Cheese Snack then buy Indomie Soto Koya Lime (confidence: 0.5)
If consumers buy Frisian Flag Chocolate 190ml then buy Indomie Soto Koya Lime (confidence: 0.5)
If consumers buy Blueband and Strawbery Jam then buy Sari Roti Tawar (confidence: 0.5)
If consumers buy Gulaku and Frisian Flag Chocolate 190ml then buy Sari Roti Tawar (confidence: 0.48)
If consumers buy Gulaku and Frisian Flag Chocolate 190ml then buy Indomie Soto Koya Lime (confidence: 0.43)

DISCUSSIONS

Transaction data that is processed into the application of data mining algorithmic methods Web-based Equivalence Class Transformation (ECLAT), resulting in a knowledge in the form of consumer buying patterns. The patterns obtained can be used as a reference to be used as a guide in formulating policies and strategies such as determining the layout of items that make it easier for consumers to get it together, recognize consumer behavior, read market trends. The results of processing 30 transaction data, 12 items through the data application mining Equivalence Class Transformation (ECLAT) algorithm method with the minimum limit of support value is 5% and confidence is 14% resulted in 75 transaction patterns, it can be seen that transactions that have The highest support and confidence value of the association rule is if the consumer buying strawberry jam, then buying plain bread juice is known that the value of support or transaction value containing strawberry jam and bread juice items bargaining value of the total transaction is 0.2%, while the confidence value or the value of the proposition of all transactions containing strawberry jam and white bread juice of all transactions containing strawberry jam from association rules is 1% These results also explain that, the more types of item criteria investigated, the smaller the support value. This application can later be applied for other sales transaction data that have the same data structure and You can manipulate the type of criteria you want to research as you wish.

CONCLUSION

ECLAT application algorithm in this study is to find the most combination of items based on transaction data and then form an association pattern from the combination of these items. The association pattern formed with a minimum support value of 5% and a minimum confidence value of 14% produces 75 association rules. And it can be seen that the transaction that has the highest value of support and trust from the rules is if the consumer buys strawberry jam then buys white bread juice, it is known that the support value or transaction value containing strawberry jam and white bread juice items from the total transaction is 0.2%, while the confidence value or proposition value of all transactions containing strawberry jam and white bread juice from all transactions containing strawberry jam from the association rules is 1%. The transaction data that has been obtained is used as a benchmark to provide discount packages for purchasing items that have a high confidence value. This is useful for attracting consumers who often buy items on Alfamidi's product shelves to increase them. The results obtained can also be used to assist Alfamidi to assist in determining inventory decisions. So, it can be concluded that if consumers buy blueband, they buy fresh bread juice at the same time, so Alfamidi must at least keep the stock availability of the two items the same. Preferably, the research results from the Data Mining Application of the Equivalence Class Transformation (ECLAT) Algorithm Method can be applied to make it easier for the Alfamidi Store Head to understand the Market Basket Analysis.

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