Application of Association Rule Mining Method Using Apriori Algorithm to Determine the Purchasing Pattern of Home Made Dimsum

Muhammad Ekki Pratama[1], Mahardika Abdi [2]

[12] Muhammadiyah University of North Sumatra, Indonesia
[12] Information Technology, Faculty of Computer Science and Information Technology, Muhammadiyah University of North Sumatra, Indonesia

[1] ekki06yonge11@gmail.com, [2] mahardikaabdiprawira@umsu.ac.id

Article Info

ABSTRACT

Dimsum Homemade's marketing strategy in the culinary field is one of them by increasing innovation in dimsum variants. However, some Homemade Dimsum business actors have shortcomings in understanding the purchasing patterns of dimsum products because there are too many variants of dimsum today. Dimsum Homemade business actors should know the most popular dimsum variants. This relates to the availability of which dim sum stock is the most so as not to experience large losses. So in this case technology is needed related to the dimsum variant purchase pattern algorithm so that sales data accumulates properly and it is easy to find out which dimsum variants are in great demand. One of the solutions needed is to apply the Association Rule Mining method using the a priori algorithm calculation. Application of Association Rule Mining (association rules), which is a data mining technique to find association rules for a combination of items. Based on the description of the problem above, the purpose and objectives of this study are to apply the Association Rule Mining method using the apriori algorithm to make it easier to analyze which dim sum variants have a high level of sales together. Thus the results obtained can be used to help make decisions in increasing accurate stock inventory and better product promotion. Association rules with apriori algorithm calculations can result in Homdemade dimsum purchase patterns, namely there are several association rule patterns that have a fairly high support and confidence value. For example, it is stated that the "Shrimp" dimsum menu has a tendency to buy the "Chicken" dimsum menu and vice versa. Then the "Chicken" dimsum menu becomes a menu associated with other dimsum menus, although the support and confidence values vary.

Corresponding Author:

Muhammad Ekki Pratama
Muhammadiyah University of North Sumatra
Email: ekki06yonge11@gmail.com

1.   INTRODUCTION

Dimsum is one of the most popular foods in Indonesia. This has become one of the high business opportunities in the present. No wonder many business actors, especially individuals, make the dimsum business a fairly guaranteed livelihood. Individual dimsum business actors are usually known as Home Dimsum Business (Homemade Dimsum). The number of Homemade Dimsum business actors is currently a concern among fellow sellers regarding intense competition. Therefore, every business actor carries out a marketing strategy in the field of technology. (Wulandari & Mursidah, 2019)

Dimsum Homemade marketing strategy in the culinary field, one of which is by increasing innovation in dimsum variants. However, some Dimsum Homemade business actors have shortcomings in understanding the purchasing patterns of dimsum products because there are too many variants of dimsum today. Dimsum Homemade business actors should know the most popular dimsum variants. This relates to the availability of which dim sum stock is the most so as not to experience large losses. So in this case technology is needed related to the algorithm for purchasing patterns of dimsum variants so that sales data accumulates properly and it is easy to find out which dimsum variants are in great demand. (Hutagalung et al., 2021).

One of the solutions needed is to apply the Association Rule Mining method using the a priori algorithm calculation. The application of Association Rule Mining (association rules), which is a data mining technique to find association rules for a combination of items. This can help to find association rules between a combination of dimsum variant items that sell the most together. (Maranatha, 2014)

Based on the description of the problem above, the purpose and objective of this research is to apply the Association Rule Mining method using the apriori algorithm to make it easier to analyze which dimsum variants have a high level of sales together. Thus the results obtained can be used to help make decisions in increasing accurate stock inventory and better product promotion. (Yanto & Khoiriah, 2015)

2.   METHOD

1)   Association Rule Mining and Apriori Algorithm

Some of the definitions of Association rules that the author managed to collect from several literatures are as follows:

   a.   Association rule is a method that aims to find patterns that often appear among many transactions, where each transaction consists of several items.
   b.   Association rule is one of the Data Mining techniques which is expected to be a very useful application.
   c.   According to amirudin et al (2007) Association analysis or association rule mining is a Data Mining technique for finding association rules between combinations of items.
   d.   According to Goldie, G & Dana, I.S (2012) Association analysis is a Data Mining technique for finding association rules between a combination of items.
   e.   Association rule is one form of pattern generated by Data Mining. Association rules can be used to find relationships or cause and effect. The importance of an association can be known by two benchmarks, namely support and confidence. Support is the percentage of the combination of items in the database, while confidance is the strength of the relationship between items in the association rule.

Apriori algorithm is a basic algorithm proposed by Agrawal & Srikant in 1994 for determining frequent itemsets for boolean association rules. Apriori algorithm is a type of association rule in data mining. Rules that express associations between several attributes are often called affinity analysis or market basket analysis. Association analysis or association rule mining is a data mining technique to find rules for a combination of items. One of the stages of association analysis that attracts the attention of many researchers to produce efficient algorithms is frequent pattern mining. The importance of an association can be known by two benchmarks, namely support and confidence. Support is the percentage of combinations of these items in the database, while confidence is the strength of the relationship between items in the association rules. (Purnia & Warnilah, 2017).

## 2)   Application Stage of Apriori Algorithm and Association Rule Mining

The explanation of the application stage of the Apriori algorithm and Association Rule Mining, namely:

   a.   Collect sales data of homemade dim sum products
   b.   display homemade dimsum product sales data based on the specified date
   c.   determine the minimum support and minimum confidence values of homemade dimsum items
   d.   Formation of the number of each itemset

    e.   Determining candidates or items that pass the minimum support value, and pruning items that do not meet the minimum support value.

    f.   Formation of associative rules from each homemade dimsum itemset that meets the minimum support value.

    g.   Determining the confidence value of each frequency of homemade dimsum itemset

    h.   Pruning itemsets that do not meet the support and confidence values

    i.   The final result of the homemade dimsum association is an itemset that meets the support and confidence values.

3) Research Flow

The research conducted uses a quantitative approach with data analysis using a numerical calculation process. To achieve the research objectives, the procedure used is to create a flowchart or workflow as follows:
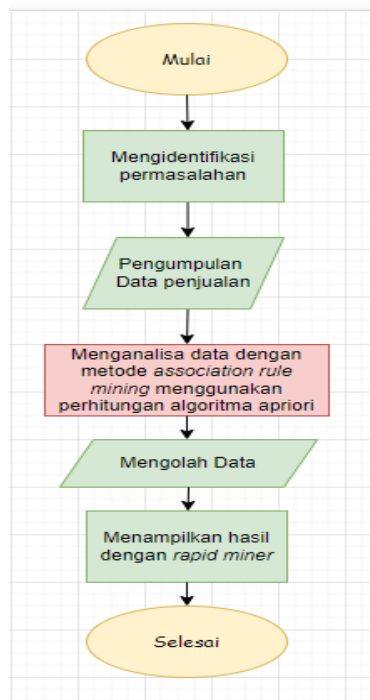
3.   RESULTS AND DISCUSSION

3.1. Frequent Itemset

The frequent itemset search is performed by reading the dataset that has been obtained from the sales results of homemade dimsum in June 2024, which is 26 transaction ids. This search also serves to identify the items (for example, dimsum variants) that appear most frequently in transactions, as follows:

Transaction number	Dimsum Menu	Date
1.	Ayam, udang, kepiting, hakaw	01/06/2024
2.	Udang, kepiting, lumpia ayam, bakpao ayam	03/06/2024
3.	Kepiting, ayam, nori, lumpia ayam	04/06/2024
4.	Ayam, Kepiting	05/06/2024
5.	Ayam, nori, kepiting	06/06/2024

6.	Ayam, udang, hakaw	07/06/2024
7.	Kepiting, udang, hakaw, ayam, bakpao ayam, lumpia ayam	08/06/2024
8.	Ayam, kepiting	10/06/2024
9.	Ayam, kepiting	11/06/2024
10.	Bakpao ayam, hakaw	12/06/2024
11.	Udang, kepiting, Ayam	13/06/2024
12.	Ayam, udang, Kepiting	14/06/2024
13.	Ayam, hakaw	15/06/2024
14.	Bakpao ayam, hakaw, nori	17/06/2024
15.	Ayam, kepiting, nori, udang	18/06/2024
16.	Udang, ayam, kepiting	19/06/2024
17.	Ayam, bakpao ayam	20/06/2024
18.	Ayam, lumpia ayam, udang	21/06/2024
19.	Nori, kepiting, bakpao ayam	22/06/2024
20.	Ayam, nori, lumpia ayam, hakaw	24/06/2024
21.	Ayam, Udang, kepiting	25/06/2024
22.	Ayam, Bakapo ayam, hakaw, nori	26/06/2024
23.	Ayam, lumpia ayam, kepiting	27/06/2024
24.	Ayam, Kepiting, hakaw, nori	28/06/2024
25.	Ayam, udang	29/06/2024
26.	Kepiting, udang, hakaw, lumpia ayam, bakpao ayam	30/06/2024

3.2. Minimum Support Testing

Support is a parameter that measures the extent to which an item appears alongside other items in a transaction.

3.2.1. Support Value

No	Itemset	Number of Itemsets	Support (%)
1	Ayam	23	88.55 %
2	Udang	12	46.24 %
3	Kepiting	17	65.47 %
4	Nori	8	30.76 %
5	Bakpao ayam	8	30.76 %
6	Lumpia ayam	7	26.92 %

| 7 | Hakaw | 10 | 38.46 % |

The highest per-item support value is {Chicken} at 88%. Which in this study, a minimum support of 20% has been determined, meaning that all itemsets meet the minimum support. Then we will combine 2 items

3.2.2. Support Value of 2 Item Combination

2 itemset	Number of Itemsets	Support (%)
Ayam, Udang	12	46.24 %
Ayam, Kepiting	16	61.54 %
Ayam, Nori	6	23.16 %
Ayam, Bakpao ayam	5	19.23 %
Ayam, Lumpia ayam	7	26.92 %
Ayam, Hakaw	8	30.76 %
Udang, Kepiting	9	34.62 %
Udang, Nori	1	3.85 %
Udang, Bakpao ayam	3	11.54 %
Udang, Lumpia ayam	4	15.47 %
Udang, Hakaw	4	15.47 %
Kepiting, Nori	5	19.23 %
Kepiting, Bakpao ayam	4	15.47 %
Kepiting, Lumpia ayam	5	19.23 %
Kepiting, Hakaw	4	15.47 %
Nori, Bakpao ayam	3	11.54 %
Nori, Lumpia ayam	2	7.69 %
Nori, Hakaw	4	15.47 %
Bakpao ayam, Lumpia ayam	3	11.54 %
Bakpao ayam, Hakaw	5	19.23 %
Lumpia ayam, Hakaw	3	11.54 %

There are 6 transactions that meet the minimum support value based on a combination of 2 itemsets. Then the next search is done for a count of 3 Itemset combinations.

3.2.3. Support Value of 3 Item Combination

3 itemset	Number of Itemsets	Support (%)
Ayam, Udang, Kepiting	9	34.62 %
Ayam, Kepiting, Nori	4	15.47 %
Ayam, Nori, Lumpia ayam	2	7.69 %
Ayam, Lumpia ayam, Hakaw	3	11.54 %
Hakaw, Udang, Kepiting	3	11.54 %

only 1 that meets the support value. Then the last step is to test the confidence value. In this step we will produce the Association Rule value.

3.2. Minimum Confidence Testing

Determining the Confidence value can be adjusted as needed. The Confidence value is set at 70% or 0.7. Because the highest confidence value will be taken, which is 1 or equal to 100%, and low values will be removed from the rule.

itemset	Support	Confidence
Ayam, Udang	46.15 %	0.52 %
Udang, Ayam	46.15 %	1
Ayam, Kepiting	61.54 %	0.69 %
Kepiting, Ayam	61.54 %	0.94 %
Ayam, Lumpia ayam	26.92 %	0.30 %
Lumpia ayam, Ayam	26.92 %	1
Udang, Kepiting => Ayam	34.62 %	1
Ayam, Hakaw	30.77 %	0.35 %
Hakaw, Ayam	30.77 %	0.8

There are 9 association rules as shown in Table 4.6, based on the calculation process the number of itemsets that meet Confidence 70% or equal to 0.7 is as many as 5 itemsets. In the formation of the association rule, the entire rule has the highest value in its confidence, which is 100% or 1. This shows that when the itemset (Shrimp) appears, the value of the itemset (Chicken) will also appear and vice versa. Likewise with other itemset combinations that have values above the minimum confidence of 70%, which can be concluded that the itemset has a strong relationship.

4.   CONCLUSION

Association rules with apriori algorithm calculations can result in Homdemade dimsum purchase patterns, namely there are several association rule patterns that have a fairly high support and confidence value. For example, it is stated that the "Shrimp" dimsum menu has a tendency to buy the "Chicken" dimsum menu and vice versa. Then the "Chicken" dimsum menu becomes a menu associated with other dimsum menus, although the support and confidence values are different.

The implication is that if someone buys a dimsum menu with a percentage of 46.15% "Shrimp", then there is a 100% chance that they will also buy a dimsum menu "Chicken". If someone buys a dimsum menu with a percentage of 34.62% "Crab and Shrimp", then there is a 100% chance that they will also buy a dimsum menu "Chicken". If someone buys a dimsum menu with a percentage of 26.92% "Chicken spring rolls", then there is a 100% chance that they will also buy a dimsum menu "Chicken". If someone buys a dimsum menu with a percentage of 61.54% "Crab", then there is a 94% chance that they will also buy a dimsum menu "Chicken". If someone buys a dimsum menu with a percentage of 30.77% "Hakaw", then there is an 80% chance that they will also buy a "Chicken" dimsum menu.

The implication above shows that the shop owner must provide more stock of the "Chicken" dimsum menu than the other dimsum menus.

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