

Implementation Of Data Mining To Find Product Sales Patterns Using The Apriori Algorithm (Case Study: Warung Dini)

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Abstract: In the increasingly fierce business competition, utilizing sales transaction data is crucial to improve business performance, including at Warung Dini. This research aims to identify customer purchasing patterns at Warung Dini by applying the Apriori algorithm, which is one of the effective data mining methods in uncovering associations between items in large transaction data. Using the Apriori algorithm, this research successfully found 12 association rules consisting of 5 combinations of two itemsets and 2 combinations of three itemsets, with a minimum support value of 60%, confidence 100%, and lift ratio 1. These itemset combinations reveal products that are often purchased together, such as Rice and Soy Sauce, as well as combinations of three products such as Rice, Soy Sauce, and Instant Noodles. These findings provide important insights for Warung Dini to optimize marketing strategies, such as designing attractive promotional packages and arranging product placement more strategically to increase sales. In addition, the results of this analysis also help the store in predicting stock needs, thus improving operational efficiency. The implementation of the Apriori algorithm in this study not only provides insight into sales patterns, but also supports more precise and strategic business decision-making, so as to strengthen the competitiveness of Warung Dini in a competitive market.

Keywords: Data Mining, Sales Pattern, Apriori Algorithm

Introduction

In competition in the business world, especially small businesses, sellers need to find marketing strategies that can increase sales of goods or products. One way to increase the number of sales of goods by utilising assets in the form of data on sales transactions of goods or products. In today's digital era, data is an important asset for every organisation, including small businesses. Data can provide deep insights into customer behaviour patterns, sales trends, and product preferences. By utilising data effectively, business owners can make better decisions and more appropriate strategies to increase sales and customer satisfaction.

Warung Dini is a shop that sells various kinds of goods such as household supplies, household appliances, accessories, flowers, clothes, bags, shoes, cosmetics, and others.

Located at on Jalan Timor Timur, Putri Hijau District, North Bengkulu Regency. The building area is 8x25 M and a height of 2.5 M Every day, of course, there are transactions for the sale of goods, data on consumer purchase transactions if left unattended only becomes archive data even though this data can be utilised. Consumer transaction data can be processed into decision making as an analysis of customer behaviour in purchasing goods (Yu, 2024).

Without the right analytical tools, it is difficult for shop owners to understand sales patterns and make accurate predictions. Therefore, a method is needed that can identify sales patterns hidden in existing transaction data. One method that can be used is the Apriori algorithm, a data mining algorithm used to find associations or relationships between items in large datasets. This algorithm is very effective in finding *frequent itemsets* and *association rules* that can help businesses understand customer buying behaviour. By applying the a priori algorithm, Warung Dini can identify product combinations that are often bought together, which in turn can be used to devise better marketing, promotion and product structuring strategies.

Erma (2018) conducted research with the title, "Application of Data Mining for Shoe Sales Using the Apriori Algorithm Method", in the study using the apriori algorithm to determine the relationship between the frequency of shoe sales that are most in demand by consumers. Based on the results of this study, it shows that the apriori algorithm can assist in forming customer purchasing patterns that can be used to develop business strategies, this algorithm can be used as very valuable information in decision makers to prepare stocks of what types of shoes are needed in the future. So that the algorithm can be used to be applied in this research in helping to find patterns and increase the number of sales of Warung Dini later (Lu, 2024).

Based on this, this research will use the apriori algorithm as a method to find itemset relationship patterns that can be used to develop business strategies for Warung

Dini. Apriori algorithm as a method to find *itemset* relationship patterns that can be used to develop business strategies for Warung Dini. So a research is proposed with the title "*Implementation of Data Mining to Find Product Sales Patterns Using the Apriori Algorithm (Case Study: Warung Dini)*".

Methodology

1. Problem Analysis

Warung Dini, a shop selling a wide range of goods on Jalan Timor Timur, Kecamatan Putri Hijau, Kabupaten Bengkulu Utara, faces challenges in increasing sales and understanding customer behaviour. Despite having valuable daily sales transaction data, the data currently only serves as an archive without providing meaningful insights. Without the right analytical tools, it is difficult for the owner of Warung Dini to identify sales patterns, understand customer preferences, and make accurate predictions. To solve this problem, Warung Dini needs to implement an effective data analysis method. The Apriori algorithm, which is known in the data mining field for finding associations or relationships between items in large datasets, can be used to identify product combinations that are often purchased together. By applying the Apriori algorithm, Warung Dini can leverage transaction data to devise more precise marketing strategies, improve product structuring,

and optimise promotions, thereby increasing sales and overall customer satisfaction (Kurniawan, 2019).

The research method carried out in this study using the *data mining* technique method. *The stages in the research method are as follows:*

1. Planning

At this stage, research-related planning will be carried out with several processes, namely as follows:

a. Direct Observation

At this stage, a direct observation process will be carried out to the research site, namely Warung Dini, to find out the condition of the research site to be carried out and observe the process related to processing product sales transaction data carried out by the research site.

b. Interview

At this stage, interviews will be conducted with the Warung Dini to the shop owner who archives product sales transaction data carried out by the shop.

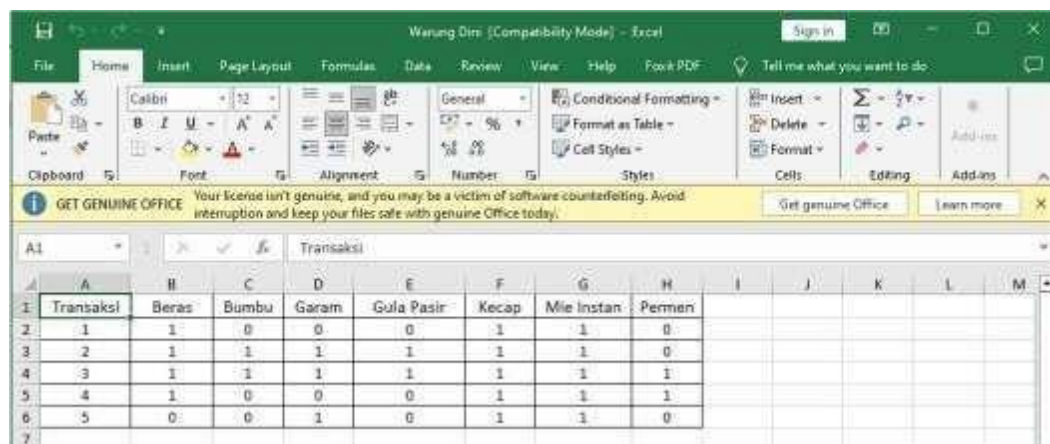
c. Study Literature

At this stage, information collection is carried out to obtain supporting theories in research and related to the problems raised in the research. This is studied in the literature study, among others, regarding research related to the research being carried out, sales patterns, data mining, association rules and the apriori algorithm.

Result and Discussion

Implementation

This part of the research will explain the operation of Tanagra 1.4 software as a system used to determine sales patterns at Warung Dini. The stages can be explained as follows



Transaksi	Beras	Bumbu	Garam	Gula Pasir	Kecap	Mie Instan	Permen
1	1	0	0	0	1	1	0
2	1	1	1	1	1	1	0
3	1	1	1	1	1	1	1
4	1	0	0	0	1	1	1
5	0	0	1	0	1	1	0

Figure 1. Sales Transaction Data

First, prepare an excel file in the form of sales transaction data that will be processed by the Tanagra 1.4 application where the data is the result of the process of the data mining stage from 162 data obtained 7 product items namely rice, seasonings, salt, sugar, soy sauce, instant noodles and candy from 5 transactions which are then formed in a tabular table as shown in Figure 1.

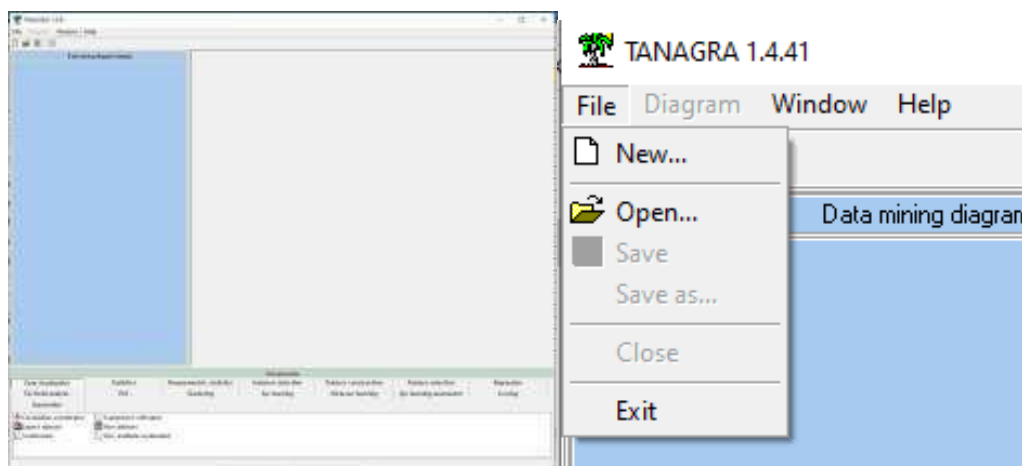


Figure 2. Tanagra 1.4 Application and New Project Creation

Next, open the Tanagra 1.4 application on a computer or laptop and the work page of the application appears. Then create a new project to start the application user in processing the data that has been owned to be processed with the apriori algorithm by clicking FILE then NEW (Xie, 2022).



Figure 3. New Project

A *dialogue box* will appear to create a new project consisting of a *diagram title* or diagram name, namely the name of the project being created. In this process, it is named "Early Warung Sales", *data mining diagram file name*, namely the location of the project with the extension .tdm which is stored on the local C computer and the *dataset* location of the excel file of sales transaction data that has been made before then click OK (H. Chen, 2024).

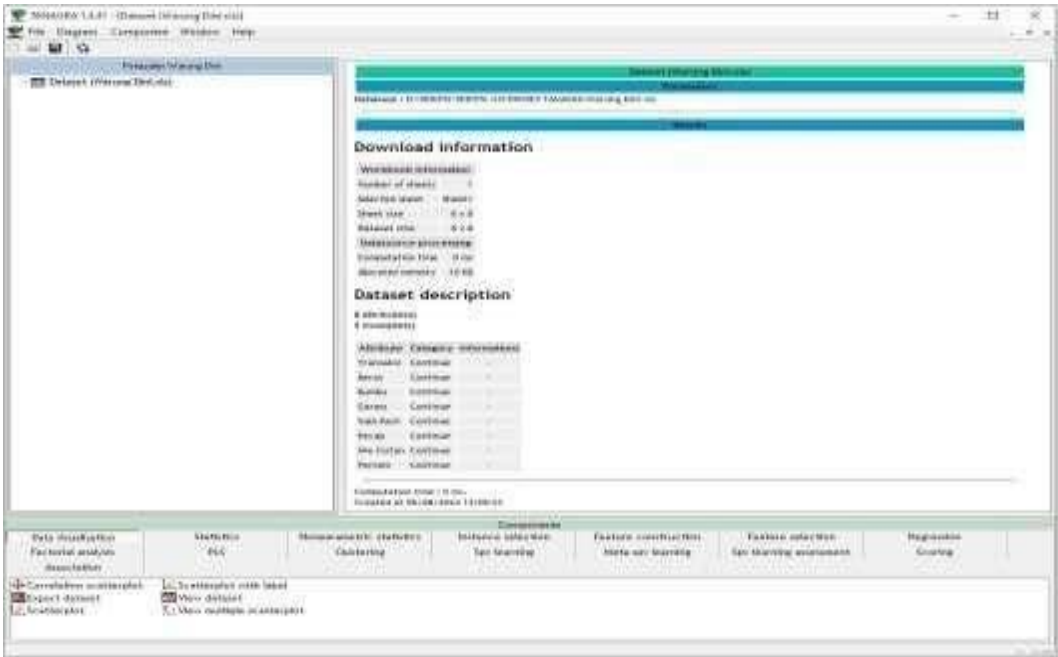


Figure 4. Early Stall Sales Dataset

After the excel file of Warung Dini sales transaction data is entered, the page in Figure 4. will appear in the form of a dataset that will be processed.

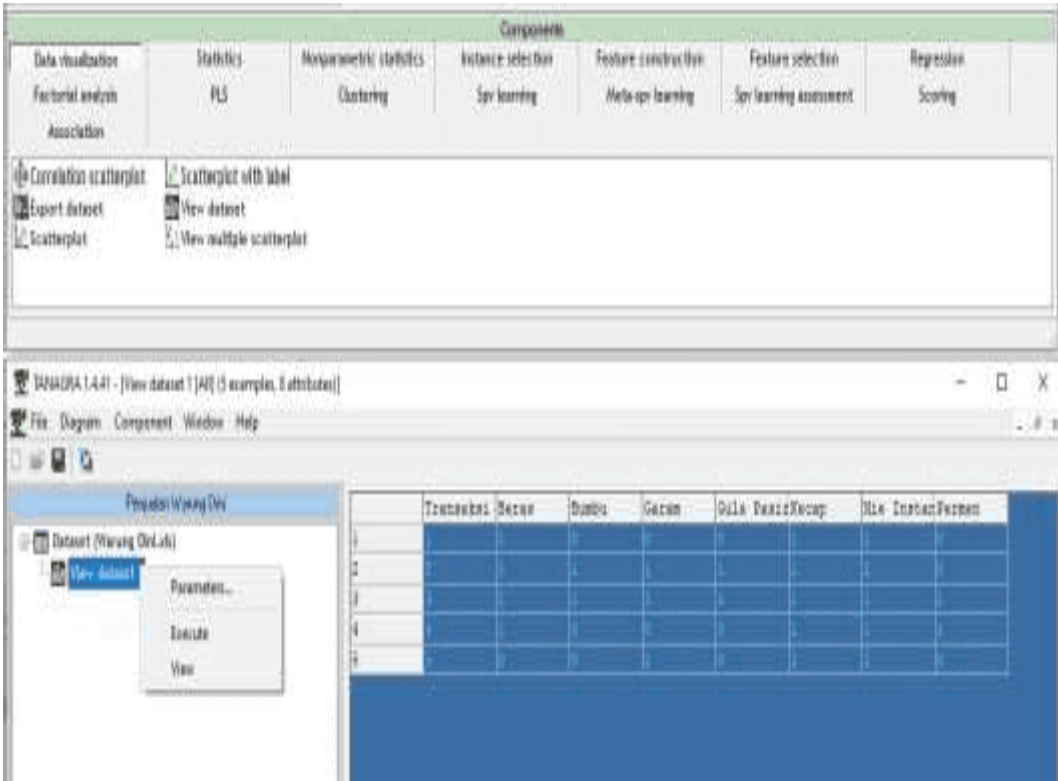


Figure 5. View Dataset

The next step is in the *componets* column click *data visualisation* and select *view dataset*. Then pull towards the Warung Dini *dataset* right-click then select EXECUTE and VIEW, a sales transaction data table will appear.

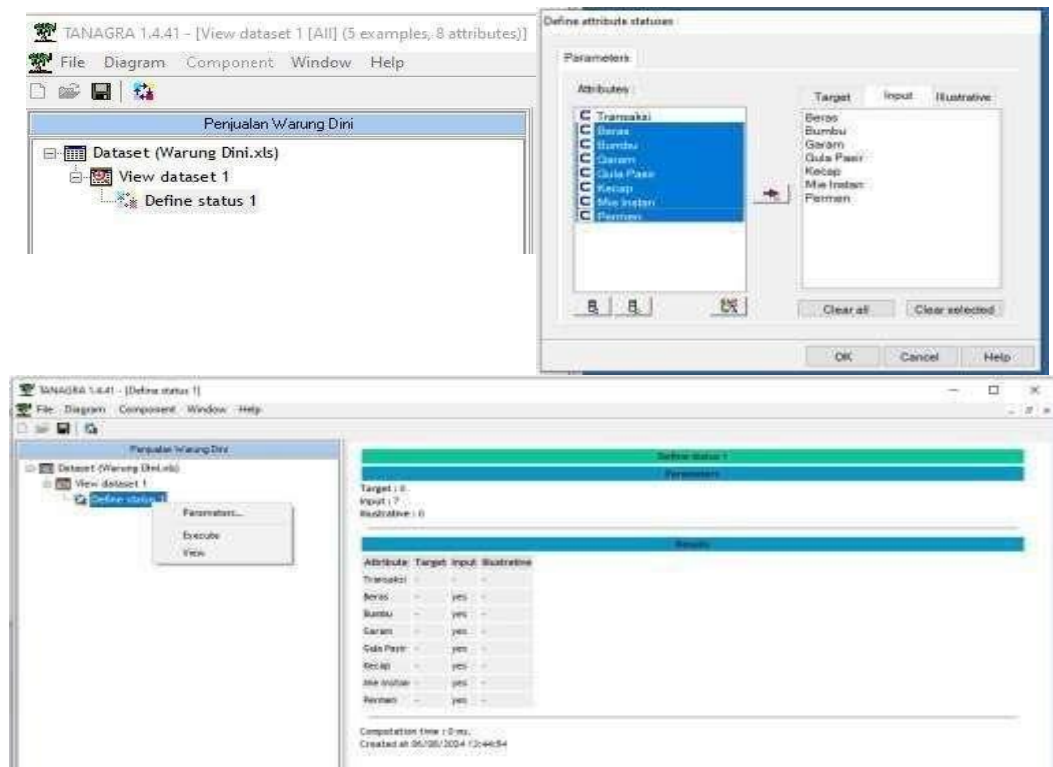
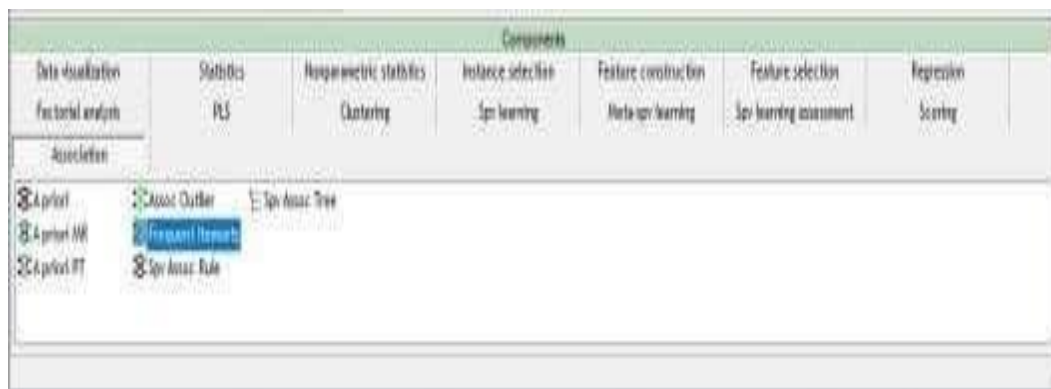


Figure 6. Define Status

Next, click the blue, yellow, red and purple icons to display the *define status*. The *define attributes statutes dialogue box* will appear then in the *attributes* section select the rice to candy items to be processed and move them to the *input* then click OK. Then right-click select EXECUTE and click VIEW, then *define status 1* will appear then *parameters* and *results* are the results of the attributes that have been entered previously (Dasgupta, 2024).



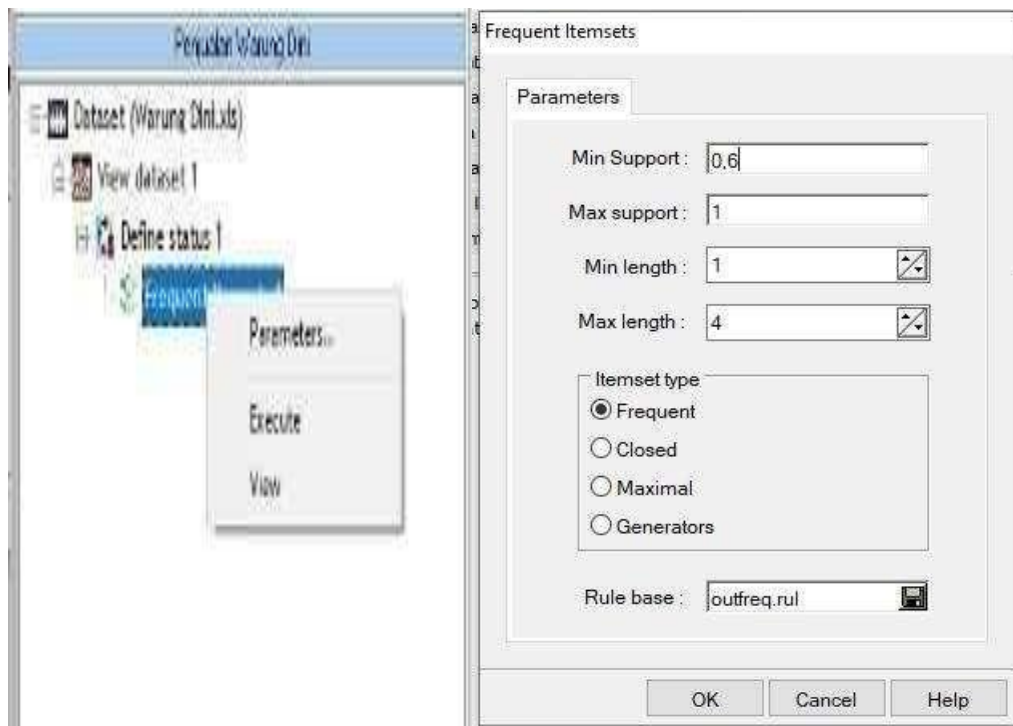


Figure 7. Fragments Itemset

At this stage, the a priori algorithm process is carried out to determine the combination of itemsets by finding the *support* value. First, select *association* in the *components* section then select *fragments itemsets* and drag it to the *defined status* so that it will appear in the section below. Then right-click and select *parameters* and a *frequent itemsets* *dialogue box* will appear. In that section fill in the *min support* 0.6 or 60%, then *max support* 1 or 100%, *min length* 1 and *max length* 4 which is the number of itemset processes from 1 itemset to 4 itemsets then click OK (S. Chen, 2024).

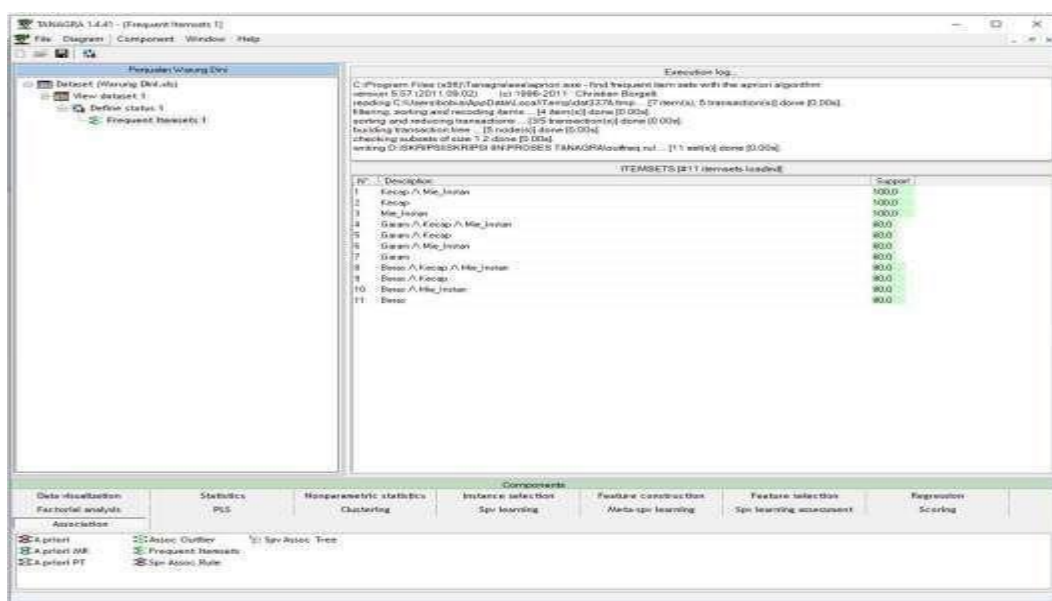


Figure 8. Results of Frequent Itemsets

After filling in the data in the previous form, the display in the picture above will appear by the system. The display brings up the combination process of the data that was previously entered. The combination is based on the rules given in the previous stage, namely the minimum *support* of the itemset is 0.6 or 60%. On the display there is a number, combination of itemset and *support* value.

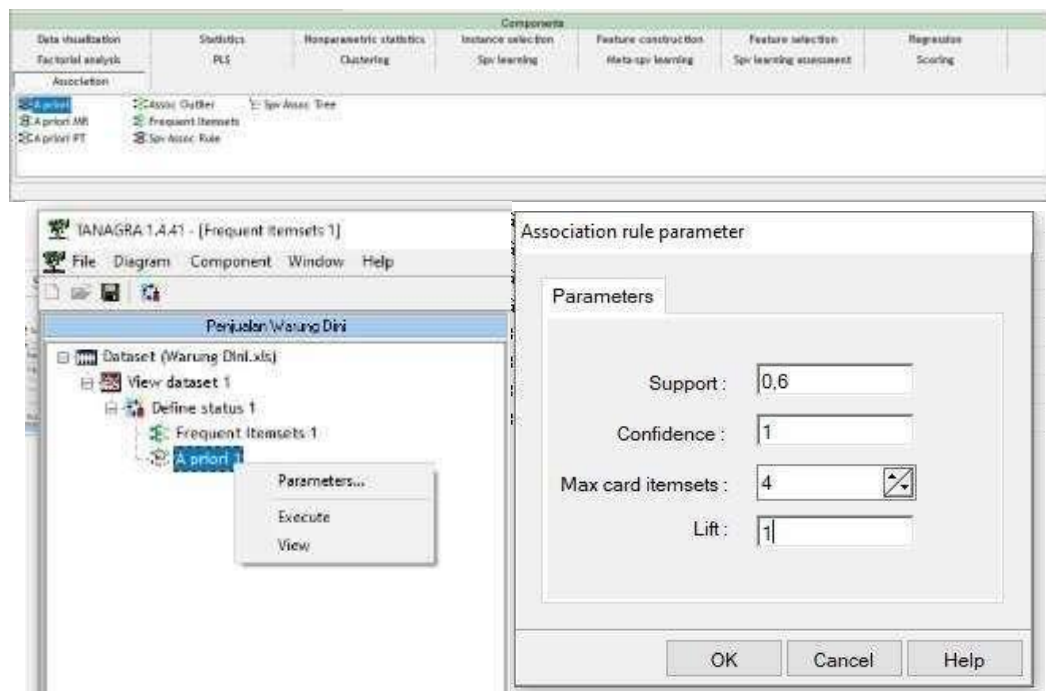


Figure 9. Association Rule

At this stage, the a priori algorithm process is carried out to determine the association rules by looking for the value of *support*, *confidence* and *lift*. First, select *association* in the *components* section then select *A Priori* and drag it to the *defined status* so that it will appear in the section below. Then right-click and select *parameters* and an *association rule parameter* dialogue box will appear. In that section fill in *min support* 0.6 or 60%, *confidance* 1 or 100%, *max card itemsets* 4 and *lift* 1 then click OK.

ITEMS	ITEMSET	ANT	CON	LIFT	SUPPORT	CONFIDENCE
1	{Rice, Soy Sauce}	{Rice}	{Soy Sauce}	1.000000	0.000000	100.000000
2	{Rice, Instant Noodles}	{Rice}	{Instant Noodles}	1.000000	0.000000	100.000000
3	{Rice, Salt}	{Rice}	{Salt}	1.000000	0.000000	100.000000
4	{Soy Sauce, Instant Noodles}	{Soy Sauce}	{Instant Noodles}	1.000000	0.000000	100.000000
5	{Soy Sauce, Salt}	{Soy Sauce}	{Salt}	1.000000	0.000000	100.000000
6	{Instant Noodles, Salt}	{Instant Noodles}	{Salt}	1.000000	0.000000	100.000000
7	{Rice, Soy Sauce, Instant Noodles}	{Rice, Soy Sauce}	{Instant Noodles}	1.000000	0.000000	100.000000
8	{Rice, Soy Sauce, Salt}	{Rice, Soy Sauce}	{Salt}	1.000000	0.000000	100.000000
9	{Rice, Instant Noodles, Salt}	{Rice, Instant Noodles}	{Salt}	1.000000	0.000000	100.000000
10	{Soy Sauce, Instant Noodles, Salt}	{Soy Sauce, Instant Noodles}	{Salt}	1.000000	0.000000	100.000000
11	{Rice, Soy Sauce, Instant Noodles, Salt}	{Rice, Soy Sauce, Instant Noodles}	{Salt}	1.000000	0.000000	100.000000
12	{Rice, Soy Sauce, Instant Noodles, Salt}	{Rice, Soy Sauce, Instant Noodles, Salt}	{Rice, Soy Sauce, Instant Noodles, Salt}	1.000000	0.000000	100.000000

Figure 10. Association Rule Results

After filling in the data in the previous form, the display in the picture above will appear by the system. The association is based on the rules that have been given in the previous stage, namely the minimum *support* of the itemset which is 0.6 or 60%, *confidence* 1 or 100% and *lift* 1. On the display there are several parts, namely *parameters* consisting of *min support*, *confidence*, *max length* and *lift*. Then the *results* are *items* and *rules*. In the *rules* section is the overall result of the apriori algorithm process in the form of a table consisting of number, *antecedent*, *consequent*, *lift*, *support* and *confidence*. These results will later be used to determine product sales patterns at Warung Dini.

Conclusion

After going through various stages of the a priori algorithm in determining sales patterns, the authors can draw the following conclusions:

1. The application of the Apriori algorithm in this study can help identify significant sales patterns, which can be utilised for more effective business decision making.
2. From the results of the apriori algorithm process on sales data at Warung Dini, there are 12 association rules, 5 combinations of 2 itemsets and 2 combinations of 3 itemsets of product item sales patterns that meet the minimum *support* value of 60%, *confidence* 100% and *lift ratio* 1.
3. The results of 5 combinations of 2 itemsets are Rice and Soy Sauce, Rice and Instant Noodles, Salt and Soy Sauce, Salt and Instant Noodles, and Soy Sauce and Instant Noodles. The results of 2 combinations of 3 itemsets are Rice, Soy Sauce and Instant Noodles, and Salt, Soy Sauce and Instant Noodles.
4. The results of the combination of product items can be used by Warung Dini to optimise marketing strategies, such as developing promotional packages or placing products that are often purchased together in order to increase sales.
5. The a priori algorithm process performed by Tanagra 1.4 software has the same results as the manual process that has been carried out.

References

- Ahmadar, Mohamad, Perwito Perwito, and Candra Taufik. 2021. "Perancangan Sistem Informasi Penjualan Berbasis Web Pada Rahayu Photo Copy Dengan Database MySQL." *Dharmakarya* 10(4): 284.
- Ashari, Mochamad Ikbali, Indwiarti, and Yuliant Sibaroni. 2015. "Aplikasi Data Mining Menggunakan Aturan Asosiasi Dengan Algoritma Pincer Search Untuk Menganalisis Data Transaksi Penjualan Studi Kasus: Data Transaksi Penjualan Yomart Margacinta Bandung." *e-Proceeding of Engineering* 2(2): 6833–40.
- Chen, H. (2024). Association rule mining of aircraft event causes based on the Apriori algorithm. *Scientific Reports*, 14(1). <https://doi.org/10.1038/s41598-024-64360-6>
- Chen, S. (2024). Information literacy of college students from library education in smart classrooms: based on big data exploring data mining patterns using Apriori algorithm. *Soft Computing*, 28(4), 3571–3589. <https://doi.org/10.1007/s00500-023-09621-8>
- Dasgupta, S. (2024). Big data analysis on medical field for drug recommendation using apriori algorithm and deep learning. *Multimedia Tools and Applications*, 83(35), 83029–83051. <https://doi.org/10.1007/s11042-024-18832-6>
- Dena, Yunita Meli, Muhammad Husni Rifqo, Yuza Reswan, and A. .. Walad Mahfuzi. 2023. "Data Mining Implementation Of Electronic Products Sales Using Apriori Algorithm (Case Study Of Fokus Komputer Shop)." *Jurnal Komputer, Informasi Dan Teknologi* 3(1):171–86. doi: 10.53697/jkomitek.v3i1.1200.
- Elvis Syahri, Mohamad, Dadang Yusuf, Universitas Singaperbangsa Karawang, and Karawang Jawa Barat. 2023. "Penerapan Data Mining Menggunakan Algoritma Apriori Terhadap Data Transaksi Penjualan Untuk Menentukan Paket Promosi (Studi Kasus Kedai Warung Jambu)." *Jurnal Mahasiswa Teknik Informatika* 7(4): 2690–99.
- Kasus, Studi, and Kalibaru Mart. "Penerapan Algoritma Apriori Untuk Analisis Data Transaksi Penjualan Pada Toko Berbasis Web." : 1–8.
- Kurniawan, H. (2019). Implementation Data Mining in Prediction of Sales Chips with Rough Set Method. *2018 6th International Conference on Cyber and IT Service Management, CITSM 2018*. <https://doi.org/10.1109/CITSM.2018.8674280>
- Kusumo, Haryo, Eko Sedyono, and Marwata Marwata. 2019. "Analisis Algoritma Apriori Untuk Mendukung Strategi Promosi Perguruan Tinggi." *Walisongo Journal of Information Technology* 1(1): 49.
- Lu, P. H. (2024). An Apriori algorithm-based association rule analysis to identify acupoint combinations for treating uremic pruritus. *Tzu Chi Medical Journal*, 36(2), 195–202. https://doi.org/10.4103/tcmj.tcmj_217_23
- Mai, Putri et al. 2022. "Implementasi Data Mining Menggunakan Algoritma Apriori Dalam Menentukan Persediaan Barang (Studi Kasus : Toko Sinar Harahap)." 12(2): 51–61.
- Pradnyana, Gede Aditra, and Ketut Agustini. 2022. "Konsep Dasar Data Mining." *Konsep Data Mining* 1: 1–16.

- Saefudin, Saefudin, and Septian DN. 2019. "Penerapan Data Mining Dengan Metode Algoritma Apriori Untuk Menentukan Pola Pembelian Ikan." *JSiI (Jurnal Sistem Informasi)* 6(2): 36.
- Sitanggang, Delima, M Kom, and Algoritma Apriori. 2023. "Delima Sitanggang, M.Kom." Suardi, Clara Falisha, Hasyrif S Y, and Sunardi Sunardi. 2023. "Implementasi Algoritma Apriori Untuk Analisis Data Transaksi Penjualan Pada Toko Berbasis Desktop." *Jurnal Tekno Kompak* 17(1): 136.
- Sugiyono, yeyen maryani. 2008. *Kamus Besar Bahasa Indonesia*. Jakarta: Kamus Pusat Bahasa.
- Sutrisno, Sutrisno. 2020. "Penerapan Algoritma Apriori Untuk Mencari Pola Penjualan Produk Dana Pada Pt Bank Rakyat Indonesia (Persero) Tbk Kanca Jakarta Pasar Minggu." *Jurnal Sistem Informasi dan Informatika (Simika)* 3(1): 12–26.
- Syahriani, Syahriani. 2022. "Penerapan Data Mining Untuk Menentukan Pola Penjualan Sepatu Menggunakan Metode Algoritma Apriori." *Bina Insani Ict Journal* 9(1): 43.
- Xie, B. (2022). Design and Implementation of Data Mining in Information Management System. *IEEE International Conference on Knowledge Engineering and Communication Systems, ICKES 2022*. <https://doi.org/10.1109/ICKECS56523.2022.10060029>
- Yu, X. (2024). Apriori algorithm-based statistical analysis of hydrogen accidents. *China Safety Science Journal*, 34(4), 128–134. <https://doi.org/10.16265/j.cnki.issn1003-3033.2024.04.0839>