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The Menu Clustering At Doktor Kopi Using K-Means Algorithm To Increase Sales

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ABSTRACT

Coffee Doctoris a coffee shop with a variety of menus and a strategic location in Medan City, this coffee shop is currently developing a strategy to increase sales of their products. Effective menu arrangement is an important factor in increasing product sales in coffee shops or cafes. This study aims to optimize sales by utilizing the K-Means algorithm to group menus based on customer purchasing patterns. The sales data analyzed includes product types, purchase frequency, and revenue contributions from each menu. Through the clustering process, menus can be grouped into several categories, such as the best-selling, medium and less popular menus. The results of this clustering are used to design a more structured menu arrangement strategy, such as arranging menu positions on the list, special promotions, or eliminating less effective menus. The implementation of the K-Means algorithm shows that a data-based menu arrangement strategy can improve customer experience and significantly drive product sales. Thus, this study provides a practical contribution for coffee shop or cafe managers to optimize sales through a technology and data-based approach.

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INTRODUCTION

Currently, coffee shops and cafes have become people's favorite places to relax or gather, so that competition in this industry is getting tighter. This is a challenge for coffee doctors. In an effort to attract customers and increase sales, business actors are required to understand customer preferences and optimize marketing strategies. One approach that can be taken is to utilize transaction data analysis to explore purchasing patterns and identify menus that have high sales potential. Because effective menu arrangement not only helps customers choose products easily but also encourages increased sales.

The K-Means algorithm is one of the clustering methods that is often used to group data based on similar characteristics. By applying this algorithm to the transaction data of "Doktor Kopi," the menus can be grouped into several clusters, such as the best-selling menus, medium and less popular menus. This information is not only useful for developing

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more effective marketing strategies but can also help in managing raw material stock and promotional planning.

This study aims to apply the K-Means algorithm in grouping menus at "Doktor Kopi" to provide strategic insights that can help increase sales. The results of this study are expected to be a guide for managers in designing data-based business policies, so that they can compete in an increasingly competitive market, and increase customer satisfaction while supporting sustainable business growth.

Literature Review

*K-Means*is an iterative clustering algorithm. The K-Means algorithm begins with a random selection of K, which is the number of clusters to be formed. Then set the K values randomly, temporarily the value becomes the center of the cluster or commonly called the centroid, mean or "means". Calculate the distance of each existing data to each centroid using the Euclidean formula until the closest distance of each data to the centroid is found. Classify each data based on its proximity to the centroid. Do this step until the centroid value does not change (stable). This method is a non-hierarchical clustering method that aims to group objects so that the distances of each object to the center of the group in one group have a minimum value.

Steps in the K-means Clustering Algorithm:

a. Determine the number of clusters,
b. Determine the centroid value.
   In determining the centroid value for the beginning of the iteration, the initial centroid value is done randomly. While if determining the centroid value which is a stage of the iteration, the following formula is used:

$$\overline{v}_{ij} = \frac{1}{N_i} \sum_{k=0}^{N_i} x_{kj} \ ,$$

c. Calculate the distance between the centroid point and each object point.

$$D_e = \sqrt{(x_i - s_i)^2 + (y_i - t_i)^2}$$

d. Grouping objects to determine cluster members is done by taking into account the minimum distance of the object.
e. Return to step 2, repeat until the resulting centroid value remains constant and cluster members do not move to other clusters.

RESEARCH METHODS

In this study, a research method will be used that functions to carry out the analysis stages of an industry as a basis for a problem-solving strategy or a study. Below is the flow of the research method used.

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Figure 1. Research Methods.

The following is an explanation of each stage of the research method above:

a. Identification of problems
The first step in this research method is to identify the problems that exist in Doktor Kopi, namely the problem of unstable stock availability of materials and excessive stockpiling of materials due to fluctuations in sales. This problem affects operational efficiency and business profitability.

b. Data collection
Once the problem was identified, the study involved collecting relevant data related to food and beverage sales at Doktor Kopi. This data included information on the types of products sold, the amount of sales, and a specific time period.

c. Data processing
The collected data is then processed using the clustering method with the K-Means algorithm. This method is used to group menus based on sales levels that have similar patterns. By doing this grouping, researchers can identify product categories that have the potential to have high, medium, and low sales levels.

d. Evaluation and Discussion
After the data processing is complete, the results of the menu grouping will be evaluated. This evaluation is carried out to determine the effectiveness of the clustering method in optimizing product sales. The collected data will be analyzed to understand the revealed sales patterns and their implications for managerial decisions.

e. Conclusion
The final step in this research method is drawing conclusions based on the evaluation results. This conclusion will summarize the research findings and provide

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recommendations to business owners to improve operational efficiency, better manage stock, and strengthen marketing strategies.

DISCUSSION

The dataset that will be used in this study is sales data at Doktor Kopi for 1 week. The data consists of 28 types of food and 25 types of drinks that have been sold that week. The following sales data is shown in the image below:

NO	NAMA MAKANAN	HARGA	SENIN	SELASA	RABU	KAMIS	JUMAT	SABTU	MINGGU
1	Mie Banglades Biasa	13K	31	22	24	36	31	48	46
2	Mie Banglades Jumbo	18K	20	27	29	35	30	40	38
3	Mie Aceh Biasa	15K	30	31	30	38	31	49	44
4	Mie Aceh Seafood	28K	28	26	29	31	26	38	33
5	Nasi Goreng Biasa	15K	33	33	31	40	36	54	50
6	Nasi Goreng Seafood	28K	20	23	21	31	31	35	30
7	Nasi Goreng Kampung Biasa	15K	20	21	21	29	25	37	33
8	Nasi Goreng Kampung Seafood	28K	19	13	12	14	17	21	16
9	Indomie Kuah	13K	30	28	21	40	35	50	48
10	Indomie Goreng	13K	30	31	31	36	33	40	41
11	Mie Hun Biasa	15K	12	16	10	19	12	21	13
12	Mie Hun Seafood	25K	14	18	19	27	23	39	21
13	Mie Tiaw Biasa	15K	30	30	28	36	31	42	40
14	Mie Tiaw Seafood	25K	20	21	21	24	20	31	28
15	IfuMie Biasa	15K	31	30	20	36	33	39	32
16	Ifumie Seafood	25K	22	21	25	28	13	29	23
17	Kentang Goreng	10K	25	25	24	30	21	37	30
18	Pisang Goreng	10K	37	38	38	49	41	53	56
19	Lumpia Basah	12K	10	10	9	10	6	10	10
20	Lumpia Goreng	12K	10	8	5	11	3	16	8
21	Pempek Goreng	10K	12	12	11	14	16	18	11
22	Pempek Kapal Selam	12K	7	2	5	9	4	15	6
23	Pempek Udang	12K	12	10	9	11	11	13	15
24	Pempek Sosis	10K	9	9	5	11	4	18	10
25	Pempek Telur Puyuh	10K	2	3	7	9	1	8	5
26	Nugget	10K	17	12	15	19	11	25	22
27	Sosis	10K	13	11	12	15	17	28	20
28	Ubi Goreng	10K	20	20	21	27	22	29	23

Figure 2. Coffee Doctor Food Sales Dataset for One Week

NO	NAMA MINUMAN	HARGA	SENIN	SELASA	RABU	KAMIS	JUMAT	SABTU	MINGGU
1	Teh Tarik	10K	30	32	30	38	32	38	38
2	Teh Manis Dingin	6K	36	33	37	40	38	45	48
3	Teh Hangat	4K	20	28	30	36	39	32	30
4	Teh Susu	6K	19	23	28	30	33	39	41
5	Lemon Tea	10K	17	26	22	28	23	31	33
6	Nutrisari	5K	29	24	23	31	20	28	39
7	Teh Susu Telor (TST)	13K	30	22	25	30	30	32	37
8	Es Teh Tawar	4K	4	4	6	2	5	4	5
9	Kopi Susu	6K	29	20	26	30	38	40	42
10	Kopi Hitam Manis	6K	29	25	29	28	30	48	43
11	Cappucino	10K	20	19	19	23	22	32	29
12	Es Cincau	10K	3	4	3	8	6	10	5
13	Es Jeruk	6K	16	14	12	20	17	29	29
14	Sanger Panas	15K	11	18	16	23	21	32	30
15	Sanger Dingin	16K	15	17	19	26	23	38	33
16	Jus Jambu	10K	10	11	9	13	10	15	12
17	Jus Sirsak	10K	0	3	2	5	1	6	4
18	Jus Alpukat	10K	15	12	14	28	22	31	29
19	Jus Buah Naga	10K	8	6	9	11	12	18	15
20	Jus Jeruk	10K	16	13	15	20	19	28	22
21	Jus Mangga	10K	4	8	5	10	3	10	5
22	Jus Terong Belanda	12K	2	1	4	6	1	4	3
23	Chocolatos Panas	6K	12	11	15	18	12	22	20
24	Chocolatos Dingin	6K	14	12	12	20	19	26	22
25	Beng Beng	5K	6	6	7	10	9	15	11

Figure 3. Dataset of Coffee Doctor Drink Sales for One Week.

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The initial step in the K-means algorithm is to determine the number of K or clusters. Then determine the centroid or cluster center randomly. Based on these results, the selected clusters are 3, consisting of cluster 1 (C1) which is a menu with a high sales level, cluster 2 (C2) which is a menu with a medium sales level, and cluster 3 (C3) which is a menu with a low sales level. This initial determination can be assumed as follows:

Food:

*Centroid*1, taken from data 7: (Ordinary Village Fried Rice).
*Centroid*2, taken from the 18th data: (Fried Banana).
*Centroid*3, taken from the 25th data: (Quail Egg Pempek).

Drink:

*Centroid*1, taken from the 2nd data: (Cold Sweet Tea).
*Centroid*2, taken from the 13th data: (Orange Ice).
*Centroid*3, taken from the 22nd data: (Dutch Eggplant Juice).

The next step is to calculate the distance and group between the data and the initial centroid. Then group the data into clusters based on the data that has the closest distance, then the data will enter the cluster which is explained in the image below:

ITERASI 1 (MAKANAN)

NO	NAMA MAKANAN	HARGA	SENIN	SELASA	RABU	KAMIS	JUMAT	SABTU	MINGGU	C1	C2	C3	JARAK TERDEKAT	KELOMPOK TERDEKAT
1	Mie Banglades Biasa	13K	31	22	24	36	31	48	46	29,698	22,494	80,006	22,494	C2
2	Mie Banglades Jumbo	18K	20	27	29	35	30	40	38	36,069	13,964	70,810	13,964	C2
3	Mie Aceh Biasa	15K	30	31	30	38	31	49	44	23,302	25,749	83,905	23,302	C1
4	Mie Aceh Seafood	28K	28	26	29	31	26	38	33	40,112	12,610	66,948	12,610	C2
5	Nasi Goreng Biasa	15K	33	33	31	40	36	54	50	15,264	35,114	93,616	15,264	C1
6	Nasi Goreng Seafood	28K	20	23	21	31	31	35	30	47,191	7,550	60,481	7,550	C2
7	Nasi Goreng Kampung Biasa	15K	20	21	21	29	25	37	33	48,042	0,000	58,694	0,000	C2
8	Nasi Goreng Kampung Seafood	28K	19	13	12	14	17	21	16	77,782	31,305	31,385	31,305	C2
9	Indomie Kuah	13K	30	28	21	40	35	50	48	25,060	27,641	85,645	25,060	C1
10	Indomie Goreng	13K	30	31	31	36	33	40	41	27,821	22,045	78,848	22,045	C2
11	Mie Hun Biasa	15K	12	16	10	19	12	21	13	80,666	33,690	27,055	27,055	C3
12	Mie Hun Seafood	25K	14	18	19	27	23	39	21	59,321	14,318	50,379	14,318	C2
13	Mie Tiaw Biasa	15K	30	30	28	36	31	42	40	29,309	19,723	77,227	19,723	C2
14	Mie Tiaw Seafood	25K	20	21	21	24	20	31	28	56,577	10,536	49,880	10,536	C2
15	IfuMie Biasa	15K	31	30	20	36	33	39	32	37,802	17,916	71,986	17,916	C2
16	Ifumie Seafood	25K	22	21	25	28	13	29	23	59,775	18,138	48,146	18,138	C2
17	Kentang Goreng	10K	25	25	24	30	21	37	30	46,925	8,718	60,075	8,718	C2
18	Pisang Goreng	10K	37	38	38	49	41	53	56	0,000	48,042	106,005	0,000	C1
19	Lumpia Basah	12K	10	10	9	10	6	10	10	95,210	48,425	13,115	13,115	C3
20	Lumpia Goreng	12K	10	8	5	11	3	16	8	96,328	48,980	13,191	13,191	C3
21	Pempek Goreng	10K	12	12	11	14	16	18	11	84,439	37,363	24,145	24,145	C3
22	Pempek Kapal Selam	12K	7	2	5	9	4	15	6	100,985	53,292	9,434	9,434	C3
23	Pempek Udang	12K	12	10	9	11	11	13	15	88,741	41,821	19,545	19,545	C3
24	Pempek Sosis	10K	9	9	5	11	4	18	10	94,170	46,648	15,067	15,067	C3
25	Pempek Telur Puyuh	10K	2	3	7	9	1	8	5	106,005	58,694	0,000	0,000	C3
26	Nugget	10K	17	12	15	19	11	25	22	73,110	26,211	33,882	26,211	C2
27	Sosis	10K	13	11	12	15	17	28	20	75,060	27,203	33,571	27,203	C2
28	Ubi Goreng	10K	20	20	21	27	22	29	23	58,412	13,342	48,363	13,342	C2

Figure 4. Results (Iteration 1) cluster, distance, and closest food groups.

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https://infor.seaninstitute.org/index.php/infokum

ITERASI 1 (MINUMAN)														
NO	NAMA MINUMAN	HARGA	SENIN	SELASA	RABU	KAMIS	JUMAT	SABTU	MINGGU	C1	C2	C3	JARAK TERDEKAT	KELOMPOK TERDEKAT
1	Teh Tarik	10K	30	32	30	38	32	38	38	16,583	39,433	82,383	16,583	C1
2	Teh Manis Dingin	6K	36	33	37	40	38	45	48	0,000	53,329	97,468	0,000	C1
3	Teh Hangat	4K	20	28	30	36	39	32	30	28,983	35,861	74,740	28,983	C1
4	Teh Susu	6K	19	23	28	30	33	39	41	26,077	30,757	74,953	26,077	C1
5	Lemon Tea	10K	17	26	22	28	23	31	33	37,749	19,105	61,408	19,105	C2
6	Nutrisari	5K	29	24	23	31	20	28	39	33,181	24,920	66,910	24,920	C2
7	Teh Susu Telor (TST)	13K	30	22	25	30	30	32	37	27,477	27,767	70,873	27,477	C1
8	Es Teh Tawar	4K	4	4	6	2	5	4	5	94,281	44,147	7,280	7,280	C3
9	Kopi Susu	6K	29	20	26	30	38	40	42	22,361	35,100	79,599	22,361	C1
10	Kopi Hitam Manis	6K	29	25	29	28	30	48	43	20,469	37,000	82,408	20,469	C1
11	Cappucino	10K	20	19	19	23	22	32	29	43,023	11,533	55,344	11,533	C2
12	Es Cincau	10K	3	4	3	8	6	10	5	90,598	39,395	8,944	8,944	C3
13	Es Jeruk	6K	16	14	12	20	17	29	29	53,329	0,000	46,712	0,000	C2
14	Sanger Panas	15K	11	18	16	23	21	32	30	48,600	9,592	52,115	9,592	C2
15	Sanger Dingin	16K	15	17	19	26	23	38	33	41,425	15,100	59,917	15,100	C2
16	Jus Jambu	10K	10	11	9	13	10	15	12	75,186	25,239	22,825	22,825	C3
17	Jus Sirsak	10K	0	3	2	5	1	6	4	97,324	45,957	4,243	4,243	C3
18	Jus Alpukat	10K	15	12	14	28	22	31	29	48,662	10,100	52,154	10,100	C2
19	Jus Buah Naga	10K	8	6	9	11	12	18	15	75,047	23,664	23,917	23,664	C2
20	Jus Jeruk	10K	16	13	15	20	19	28	22	54,863	8,000	43,795	8,000	C2
21	Jus Mangga	10K	4	8	5	10	3	10	5	88,724	38,236	10,677	10,677	C3
22	Jus Terong Belanda	12K	2	1	4	6	1	4	3	97,468	46,712	0,000	0,000	C3
23	Chocolatos Panas	6K	12	11	15	18	12	22	20	63,380	13,892	34,627	13,892	C2
24	Chocolatos Dingin	6K	14	12	12	20	19	26	22	57,862	8,367	41,158	8,367	C2
25	Beng Beng	5K	6	6	7	10	9	15	11	80,864	29,547	17,748	17,748	C3

Figure 5. Results (Iteration 1) cluster, distance, and closest drink groups.

After that, determine the new centroid by calculating the average of the data in each cluster. Then repeat calculating the closest distance to the new centroid for the next iteration stage. Then continue to the second iteration using the cluster that has been determined based on the formula according to the data with the grouping results in the first iteration, here are the centroids and clustering results for the third iteration,

CENTROID ITERASI 2							
CENTROID 1	32,5	32,5	30,0	41,8	35,8	51,5	49,5
CENTROID 2	22,5	21,9	22,0	28,4	24,0	34,9	29,8
CENTROID 3	9,3	8,8	7,6	11,8	7,1	14,9	9,8

Figure 6. Center Point / Centroid Iteration 2 closest to food.

CENTROID ITERASI 2							
CENTROID 1	27,6	26,1	29,3	33,1	34,3	39,1	39,9
CENTROID 2	15,7	15,6	16,0	22,5	19,1	28,6	27,4
CENTROID 3	4,1	5,3	5,1	7,7	5,0	9,1	6,4

Figure 7. The closest Iteration 2 Centroid Point of the drink.

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https://infor.seaninstitute.org/index.php/infokum

ITERASI 2 (MAKANAN)														
NO	NAMA MAKANAN	HARGA	SENIN	SELASA	RABU	KAMIS	JUMAT	SABTU	MINGGU	C1	C2	C3	JARAK TERDEKAT	KELOMPOK TERDEKAT
1	Mie Banglades Biasa	13K	31	22	24	36	31	48	46	15,120	24,894	66,979	15,120	C1
2	Mie Banglades Jumbo	18K	20	27	29	35	30	40	38	23,035	15,972	58,298	15,972	C2
3	Mie Aceh Biasa	15K	30	31	30	38	31	49	44	9,035	27,324	70,873	9,035	C1
4	Mie Aceh Seafood	28K	28	26	29	31	26	38	33	26,993	11,268	53,927	11,268	C2
5	Nasi Goreng Biasa	15K	33	33	31	40	36	54	50	3,335	36,995	80,506	3,335	C1
6	Nasi Goreng Seafood	28K	20	23	21	31	31	35	30	33,438	8,022	47,468	8,022	C2
7	Nasi Goreng Kampung Bia	15K	20	21	21	29	25	37	33	33,617	4,960	45,735	4,960	C2
8	Nasi Goreng Kampung Sea	28K	19	13	12	14	17	21	16	63,723	28,798	17,647	17,647	C3
9	Indomie Kuah	13K	30	28	21	40	35	50	48	10,753	30,199	72,470	10,753	C1
10	Indomie Goreng	13K	30	31	31	36	33	40	41	15,957	22,613	65,859	15,957	C1
11	Mie Hun Biasa	15K	12	16	10	19	12	21	13	66,608	31,535	13,790	13,790	C3
12	Mie Hun Seafood	25K	14	18	19	27	23	39	21	44,968	13,900	37,824	13,900	C2
13	Mie Tiaw Biasa	15K	30	30	28	36	31	42	40	15,894	20,499	64,079	15,894	C1
14	Mie Tiaw Seafood	25K	20	21	21	24	20	31	28	42,604	7,832	36,789	7,832	C2
15	IfuMie Biasa	15K	31	30	20	36	33	39	32	24,731	17,392	58,416	17,392	C2
16	Ifumie Seafood	25K	22	21	25	28	13	29	23	46,719	14,538	35,891	14,538	C2
17	Kentang Goreng	10K	25	25	24	30	21	37	30	33,085	5,987	46,962	5,987	C2
18	Pisang Goreng	10K	37	38	38	49	41	53	56	15,464	49,560	93,145	15,464	C1
19	Lumpia Basah	12K	10	10	9	10	6	10	10	81,419	46,241	5,672	5,672	C3
20	Lumpia Goreng	12K	10	8	5	11	3	16	8	82,050	47,029	5,470	5,470	C3
21	Pempek Goreng	10K	12	12	11	14	16	18	11	70,471	35,171	11,166	11,166	C3
22	Pempek Kapal Selam	12K	7	2	5	9	4	15	6	86,664	51,587	9,430	9,430	C3
23	Pempek Udang	12K	12	10	9	11	11	13	15	74,821	39,859	7,594	7,594	C3
24	Pempek Sosis	10K	9	9	5	11	4	18	10	79,785	44,893	5,213	5,213	C3
25	Pempek Telur Puyuh	10K	2	3	7	9	1	8	5	92,098	56,948	14,175	14,175	C3
26	Nugget	10K	17	12	15	19	11	25	22	58,942	24,341	21,099	21,099	C3
27	Sosis	10K	13	11	12	15	17	28	20	60,466	26,079	20,583	20,583	C3
28	Ubi Goreng	10K	20	20	21	27	22	29	23	44,818	9,847	35,354	9,847	C2

Figure 8. Results (Iteration 2) of clusters, distances, and closest food groups.

ITERASI 2 (MINUMAN)														
NO	NAMA MINUMAN	HARGA	SENIN	SELASA	RABU	KAMIS	JUMAT	SABTU	MINGGU	C1	C2	C3	JARAK TERDEKAT	KELOMPOK TERDEKAT
1	Teh Tarik	10K	30	32	30	38	32	38	38	8,619	35,690	73,999	8,619	C1
2	Teh Manis Dingin	6K	36	33	37	40	38	45	48	18,412	50,093	89,124	18,412	C1
3	Teh Hangat	4K	20	28	30	36	39	32	30	15,487	31,029	66,479	15,487	C1
4	Teh Susu	6K	19	23	28	30	33	39	41	9,892	27,410	66,515	9,892	C1
5	Lemon Tea	10K	17	26	22	28	23	31	33	20,785	15,080	52,895	15,080	C2
6	Nutrisari	5K	29	24	23	31	20	28	39	19,486	22,433	58,913	19,486	C1
7	Teh Susu Telor (TST)	13K	30	22	25	30	30	32	37	11,352	24,576	62,618	11,352	C1
8	Es Teh Tawar	4K	4	4	6	2	5	4	5	76,588	45,833	7,972	7,972	C3
9	Kopi Susu	6K	29	20	26	30	38	40	42	8,920	32,430	71,222	8,920	C1
10	Kopi Hitam Manis	6K	29	25	29	28	30	48	43	11,686	34,656	73,889	11,686	C1
11	Cappucino	10K	20	19	19	23	22	32	29	25,236	7,825	46,756	7,825	C2
12	Es Cincau	10K	3	4	3	8	6	10	5	72,674	41,192	3,378	3,378	C3
13	Es Jeruk	6K	16	14	12	20	17	29	29	35,671	5,693	38,240	5,693	C2
14	Sanger Panas	15K	11	18	16	23	21	32	30	30,741	7,075	43,523	7,075	C2
15	Sanger Dingin	16K	15	17	19	26	23	38	33	23,961	12,572	51,422	12,572	C2
16	Jus Jambu	10K	10	11	9	13	10	15	12	57,480	26,440	14,146	14,146	C3
17	Jus Sirsak	10K	0	3	2	5	1	6	4	79,526	47,921	8,450	8,450	C3
18	Jus Alpukat	10K	15	12	14	28	22	31	29	30,875	8,014	43,922	8,014	C2
19	Jus Buah Naga	10K	8	6	9	11	12	18	15	57,028	25,517	15,556	15,556	C3
20	Jus Jeruk	10K	16	13	15	20	19	28	22	36,880	6,610	35,246	6,610	C2
21	Jus Mangga	10K	4	8	5	10	3	10	5	71,086	39,757	4,405	4,405	C3
22	Jus Terong Belanda	12K	2	1	4	6	1	4	3	79,772	48,459	9,023	9,023	C3
23	Chocolatos Panas	6K	12	11	15	18	12	22	20	45,717	14,339	26,379	14,339	C2
24	Chocolatos Dingin	6K	14	12	12	20	19	26	22	39,762	8,626	32,601	8,626	C2
25	Beng Beng	5K	6	6	7	10	9	15	11	62,915	31,328	9,156	9,156	C3

Figure 9. Results (Iteration 2) cluster, distance, and closest drink groups.

INFOKUM
Volume 12, Number 04, 2024, DOI 10.58471/infokum.v12i04
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https://infor.seaninstitute.org/index.php/infokum

The iteration process will continue until the centroid value and the location or position of the cluster do not change or move anymore. In this study, iteration was carried out up to iteration 3 for each food and drink. The following are the results of the calculation of the 3rd repetition or iteration, which can be seen in the image below:

ITERASI 3 (MAKANAN)

NO	NAMA MAKANAN	HARGA	SENIN	SELASA	RABU	KAMIS	JUMAT	SABTU	MINGGU	C1	C2	C3	JARAK TERDEKAT	KELOMPOK TERDEKAT
1	Mie Banglades Biasa	13K	31	22	24	36	31	48	46	10,786	24,694	61,904	10,786	C1
2	Mie Banglades Jumbo	18K	20	27	29	35	30	40	38	17,750	14,602	53,429	14,602	C2
3	Mie Aceh Biasa	15K	30	31	30	38	31	49	44	4,620	26,298	65,876	4,620	C1
4	Mie Aceh Seafood	28K	28	26	29	31	26	38	33	21,103	10,286	48,973	10,286	C2
5	Nasi Goreng Biasa	15K	33	33	31	40	36	54	50	8,119	36,089	75,469	8,119	C1
6	Nasi Goreng Seafood	28K	20	23	21	31	31	35	30	27,742	7,349	42,582	7,349	C2
7	Nasi Goreng Kampung Bia	15K	20	21	21	29	25	37	33	27,837	5,622	40,735	5,622	C2
8	Nasi Goreng Kampung Sea	28K	19	13	12	14	17	21	16	57,741	30,289	12,921	12,921	C3
9	Indomie Kuah	13K	30	28	21	40	35	50	48	8,964	29,628	67,470	8,964	C1
10	Indomie Goreng	13K	30	31	31	36	33	40	41	10,586	21,541	60,918	10,586	C1
11	Mie Hun Biasa	15K	12	16	10	19	12	21	13	60,780	32,524	9,943	9,943	C3
12	Mie Hun Seafood	25K	14	18	19	27	23	39	21	39,532	13,979	33,135	13,979	C2
13	Mie Tiaw Biasa	15K	30	30	28	36	31	42	40	10,039	19,484	59,105	10,039	C1
14	Mie Tiaw Seafood	25K	20	21	21	24	20	31	28	36,675	9,296	31,817	9,296	C2
15	IfuMie Biasa	15K	31	30	20	36	33	39	32	19,557	16,432	53,558	16,432	C2
16	Ifumie Seafood	25K	22	21	25	28	13	29	23	40,924	14,839	31,388	14,839	C2
17	Kentang Goreng	10K	25	25	24	30	21	37	30	27,272	5,311	42,053	5,311	C2
18	Pisang Goreng	10K	37	38	38	49	41	53	56	20,683	48,442	88,188	20,683	C1
19	Lumpia Basah	12K	10	10	9	10	6	10	10	75,468	47,485	9,123	9,123	C3
20	Lumpia Goreng	12K	10	8	5	11	3	16	8	76,198	48,291	9,232	9,232	C3
21	Pempek Goreng	10K	12	12	11	14	16	18	11	64,538	36,332	7,643	7,643	C3
22	Pempek Kapal Selam	12K	7	2	5	9	4	15	6	80,800	52,887	13,513	13,513	C3
23	Pempek Udang	12K	12	10	9	11	11	13	15	68,864	41,277	5,920	5,920	C3
24	Pempek Sosis	10K	9	9	5	11	4	18	10	73,971	46,172	7,690	7,690	C3
25	Pempek Telur Puyuh	10K	2	3	7	9	1	8	5	86,217	58,102	19,020	19,020	C3
26	Nugget	10K	17	12	15	19	11	25	22	53,049	25,869	16,213	16,213	C3
27	Sosis	10K	13	11	12	15	17	28	20	54,668	27,608	15,663	15,663	C3
28	Ubi Goreng	10K	20	20	21	27	22	29	23	38,878	10,489	30,527	10,489	C2

Figure 10. Results (Iteration 3) of clusters, distances, and closest food groups.

INFOKUM
Volume 12, Number 04, 2024, DOI 10.58471/infokum.v12i04
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

ITERASI 3 (MINUMAN)														
NO	NAMA MINUMAN	HARGA	SENIN	SELASA	RABU	KAMIS	JUMAT	SABTU	MINGGU	C1	C2	C3	JARAK TERDEKAT	KELOMPOK TERDEKAT
1	Teh Tarik	10K	30	32	30	38	32	38	38	8,630	35,154	72,265	8,630	C1
2	Teh Manis Dingin	6K	36	33	37	40	38	45	48	19,817	49,494	87,337	19,817	C1
3	Teh Hangat	4K	20	28	30	36	39	32	30	15,715	30,359	64,777	15,715	C1
4	Teh Susu	6K	19	23	28	30	33	39	41	9,835	26,523	64,661	9,835	C1
5	Lemon Tea	10K	17	26	22	28	23	31	33	19,052	14,583	51,145	14,583	C2
6	Nutrisari	5K	29	24	23	31	20	28	39	17,050	22,637	57,210	17,050	C1
7	Teh Susu Telor (TST)	13K	30	22	25	30	30	32	37	9,352	24,336	60,824	9,352	C1
8	Es Teh Tawar	4K	4	4	6	2	5	4	5	74,866	46,807	9,274	9,274	C3
9	Kopi Susu	6K	29	20	26	30	38	40	42	9,538	31,740	69,347	9,538	C1
10	Kopi Hitam Manis	6K	29	25	29	28	30	48	43	12,175	33,876	72,028	12,175	C1
11	Cappucino	10K	20	19	19	23	22	32	29	23,537	7,424	44,917	7,424	C2
12	Es Cincau	10K	3	4	3	8	6	10	5	70,993	42,015	4,215	4,215	C3
13	Es Jeruk	6K	16	14	12	20	17	29	29	33,904	6,263	36,373	6,263	C2
14	Sanger Panas	15K	11	18	16	23	21	32	30	29,270	5,859	41,678	5,859	C2
15	Sanger Dingin	16K	15	17	19	26	23	38	33	22,687	11,279	49,546	11,279	C2
16	Jus Jambu	10K	10	11	9	13	10	15	12	55,727	27,415	12,471	12,471	C3
17	Jus Sirsak	10K	0	3	2	5	1	6	4	77,788	48,791	10,199	10,199	C3
18	Jus Alpukat	10K	15	12	14	28	22	31	29	29,334	7,280	42,066	7,280	C2
19	Jus Buah Naga	10K	8	6	9	11	12	18	15	55,378	26,329	13,611	13,611	C3
20	Jus Jeruk	10K	16	13	15	20	19	28	22	35,273	7,188	33,377	7,188	C2
21	Jus Mangga	10K	4	8	5	10	3	10	5	69,332	40,643	5,076	5,076	C3
22	Jus Terong Belanda	12K	2	1	4	6	1	4	3	78,014	49,395	10,783	10,783	C3
23	Chocolatos Panas	6K	12	11	15	18	12	22	20	43,946	15,348	24,561	15,348	C2
24	Chocolatos Dingin	6K	14	12	12	20	19	26	22	38,144	9,232	30,725	9,232	C2
25	Beng Beng	5K	6	6	7	10	9	15	11	61,237	32,156	7,229	7,229	C3

Figure 11. Results (Iteration 3) cluster, distance, and closest drink groups.

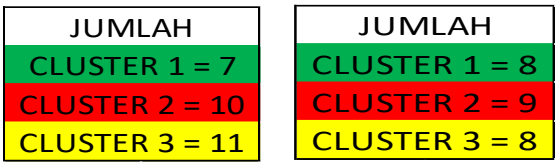

Figure 12. Final Cluster Results (Iteration 3) of the K-Means Algorithm Food (left) and Beverages (right)

In the third iteration, the results of the grouped data are the same as the results of the previous or second iteration grouping, thus the dataset processing process is stopped because it reaches the cluster results for this drink is stable and convergent. The results of the dataset processing are obtained for food cluster 1 as many as 7 menus, cluster 2 as many as 10 menus and cluster 3 as many as 11 menus. For drinks cluster 1 as many as 8 menus, cluster 2 as many as 9 menus and cluster 3 as many as 8 menus.

Thus, after carrying out the clustering process using the K-Means algorithm, there was a change in the pattern of the food and beverage menu at Doktor Kopi. The menu updates were adjusted according to the clustering results on the dataset to produce a menu that has high, medium, and low sales. The following are possible updates to the food and beverage menu:

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ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

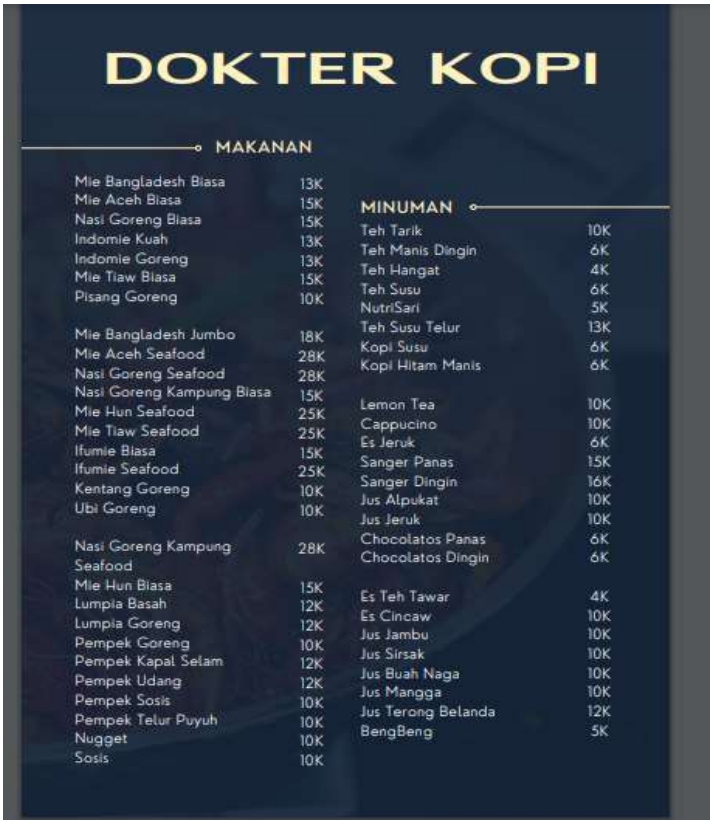

Figure 13. Results of Updating Food and Beverage Menus According to Clustering Results

CONCLUSION

In this study, product sales optimization was carried out at Doktor Kopi using the K-Means approach for effective menu arrangement. The results of iterations 1-3 produced clusters for food and beverages, where each cluster groups products with similar sales patterns. For the food menu, the clustering results show three different clusters. Cluster 1 consists of 7 food products with similar sales characteristics, such as Regular Bangladeshi Noodles, Regular Fried Rice, and Fried Bananas. Cluster 2 includes 10 products with more specific types, such as Jumbo Bangladeshi Noodles and Seafood Fried Rice. Meanwhile, cluster 3 consists of 11 products with different variations, such as Fried Lumpia and Fried Pempek. Meanwhile, for the beverage menu, the clustering results also show three different clusters. Cluster 1 includes 8 beverage products with similar sales characteristics, such as Teh Tarik and Kopi Susu. Cluster 2 consists of 9 products with more specific variations, such as Lemon Tea and Orange Juice. Meanwhile, cluster 3 consists of 8 products with different variations, such as Es Teh Tawar and Jus Guava. Thus, these results can help business owners to understand their product sales patterns more deeply. By knowing this pattern, business owners can optimize menu arrangement by presenting products that are more in line with customer preferences, so that it is expected to increase operational efficiency and profitability of their business. In addition, this study also contributes to strengthening competitive position in the market with more appropriate marketing strategies.

REFERENCES

3855-Article Text-14663-2-10-20220523. (nd).

Amin, F., Anggraeni, DS & Aini, Q. (2022). Application of K-Means Method in Souq.Com Product Sales. Applied Information System and Management (AISM), 5(1), 7–14. https://doi.org/10.15408/aism.v5i1.22534

Data Mining Analysis on UMKM Clustering Using the K-Means Algorithm. (nd).

Anggraeni, Y. & Handayani, P. (2023). Application of K-Means Method to Determine Swimming Ticket Sales at Splash Swimming Pool & Gym. Journal of Informatics and Information Technology, 2(1). https://doi.org/10.56854/jt.v2i1.167

Ardiyasa, IW (2020). Application of K-Means Clustering for Cyber Attack Classification on Syslog File. Journal of Systems and Informatics (JSI), 14(2), 143–149. https://doi.org/10.30864/jsi.v14i2.305

Fachriansyah, A. & Bu'ulolo, E. (2023). Application of K-Means Algorithm for Clustering Bakery and Cake That Sells Well. Bulletin of Information Technology (BIT), 4(2), 205–217. https://doi.org/10.47065/bit.v3i1

Hasibuan, FPA, Sumarno, S. & Parlina, I. (2021). Application of K-Means in Smartphone Product Sales Grouping. SATESI: Journal of Science, Technology and Information Systems, 1(1), 15–20. https://doi.org/10.54259/satesi.v1i1.3

Juliana, E. & Vivi Nur Aleyda, and. (2021). APPLICATION OF K-MENS CLUSTERING METHOD TO HELP DETERMINE THE LEVEL OF STATUS OF COVID 19 IMPACT REGIONS (Vol. 12, Issue 1). https://jurnal.umj.ac.id/index.php/just-it/index

Kesuma Dinata, R., Hasdyna, N. & Azizah, N. (2020). K-Means Clustering Analysis on Motorcycle Data. In Informatics Journal (Vol. 5, Issue 1).

Lili, A., Cipta, H. & Widodo, S. (2022). Grouping of Oil Palm Harvest Results in Production Per Block Using the K-Means Algorithm. In Journal of Machine Learning and Data Analytics (MALDA) (Vol. 01, Issue 01).

Mega, W. (2015). CLUSTERING USING K-MEANS METHOD TO DETERMINE NUTRITIONAL STATUS OF TODDLERS (Vol. 15, Issue 2).

Muliono, R. & Sembiring, Z. (2019). DATA MINING CLUSTERING USING K-MEANS ALGORITHM FOR CLUSTERIZATION OF LECTURERS' TEACHING TRIDARMA LEVELS (Vol. 4, Issue 2).

By. (nd). THE USE OF K-MEANS ALGORITHM IN DETERMINING MAJORS FOR HIGH SCHOOL (CASE STUDY AT STATE SENIOR HIGH SCHOOL 1 JAKARTA).

Application of K-Means Clustering in Data Grouping (Case Study of Mathematics Student Profile, FMIPA UNM). (nd). http://www.ojs.unm.ac.id/jmathcos

Application_of_Data_Mining_in_Improving_the_Quality_of_Education. (nd).

Saputra, EA & Nataliani, Y. (2021). Analysis of Student Grade Data Grouping to Determine High Achieving Students Using the K-Means Clustering Method. Journal of Information Systems and Informatics, 3(3). http://journal-isi.org/index.php/isi

Saputra, TI & Arianty, R. (2019). IMPLEMENTATION OF K-MEANS CLUSTERING ALGORITHM IN INDOSAT USER COMPLAINT SENTIMENT ANALYSIS. Scientific

Journal of Computer Informatics, 24(3), 191–198. https://doi.org/10.35760/ik.2019.v24i3.2361

Selvi, C., Sembiring, D., Hanum, L. & Parsaoran Tamba, S. (2022). APPLICATION OF DATA MINING USING K-MEANS ALGORITHM TO DETERMINE THESIS TITLE AND RESEARCH JOURNAL (CASE STUDY OF FTIK UNPRI). Journal of Information Systems and Computer Science Prima), 5(2).

Sibuea, FL & Sapta, A. (2017). MAPPING OF HIGH-ACHING STUDENTS USING THE K-MEANS CLUSTERING METHOD. 1, 85–92.

Zakiyah, D., Merlina, N. & Mayangky, NA (nd). Application of K-Means Clustering Algorithm to Determine IT Employee Capabilities. http://jurnal.bsi.ac.id/index.php/co-science