EXAMINATION OF CONSUMER PURCHASING PATTERNS UTILIZING MARKET BASKET ANALYSIS (MBA) AND LATENT CLASS ANALYSIS (LCA) ON A TRANSACTIONAL DATASET OF SUPERMARKET PRODUCTS

Executive Summary

This report presents a comprehensive marketing analytics study utilizing Market Basket Analysis (MBA) and Latent Class Analysis (LCA) on a transactional dataset of 1,589 supermarket customers, focusing on purchase patterns across products such as margarine, meat spreads, and frozen desserts. The analysis, conducted using Python with libraries like mlxtend for association rules and scikit-learn for clustering, aimed to uncover product associations and customer segments to inform targeted marketing strategies.

Key Findings from Market Basket Analysis

Association rules revealed strong co-purchase linkages among margarine, meat spreads, and frozen desserts. Notable rules include:

1. (Margarine, meat spreads) → Frozen dessert: Confidence of 87.43%, lift of 3.76, indicating customers buying the antecedents are nearly 4 times more likely to purchase the consequent.
2. (Frozen dessert, meat spreads) → Margarine: Confidence of 82.23%, lift of 3.76.
3. (Frozen dessert, margarine) → Meat spreads: Confidence of 80.69%, lift of 4.22.

These rules, supported by metrics such as leverage (0.066-0.069), conviction (3.8-5.8), and Zhang's metric (0.65-0.79), highlight complementary purchasing behaviors. Product correlations were strongest between margarine and frozen dessert, suggesting opportunities for cross-promotion.

Key Findings from Latent Class Analysis

Using KMeans clustering as a proxy for LCA on standardized purchase data, four distinct customer segments were identified based on probabilities of buying the focal products:

1. Segment 0 (137 customers, 9%):** High meat spreads purchase (100%), low margarine (0%), moderate frozen dessert (~20%). Specialized buyers focused on meat spreads.
2. Segment 1 (1,089 customers, 68%):** Low across all products (margarine ~12%, others 0%). Minimal engagement, representing occasional or non-buyers.
3. Segment 2 (167 customers, 11%):** High across all (margarine and meat spreads 100%, frozen dessert ~87%). Loyal, high-value customers likely to co-purchase.
4. Segment 3 (196 customers, 12%):** High frozen dessert (100%), low margarine (~15%), no meat spreads. Dessert-focused buyers.

These segments align with the MBA insights, as high-association rules are most evident in Segment 2.

Recommended Marketing Strategies

Leveraging these findings, strategies emphasize promoting co-purchases:

1. Bundling and Promotions:** Offer discounted bundles (e.g., "Buy margarine and meat spreads, get 20% off frozen dessert") targeted at Segments 0 and 3 to boost uptake.
2. Strategic Placements:** Position these products adjacently in stores or online to encourage impulse buys, particularly for Segment 2.
3. Segment-Specific Targeting:** Use personalized emails or ads for high-value Segment 2; introductory offers for low-engagement Segment 1; and dessert-centric promotions for Segment 3.
4. Overall Impact:** These tactics could increase sales by 15-20% through enhanced cross-selling, with a focus on data-driven inventory and campaign optimization.

In conclusion, the study demonstrates significant synergies among margarine, meat spreads, and frozen desserts, with tailored strategies poised to drive revenue growth, customer loyalty, and operational efficiency. Future analyses could incorporate demographic data for deeper personalization.

TABLE OF CONTENTS

INTRODUCTION.....**2**
Section A: Data Preparation.....**3**
Section B: Association Rule Analysis.....**4**
Section C: Visualisation and Interpretation.....**7**
Section D: Marketing Strategy.....**10**
Section E: Latent Class Analysis (LCA).....**14**
CONCLUSION.....**16**
REFERENCES.....**17**

INTRODUCTION

A thorough examination of consumer purchasing patterns utilizing Market Basket Analysis (MBA) and Latent Class Analysis (LCA) on a transactional dataset of supermarket products led to the development of the comprehensive marketing plan described in this study. Cleaning, transforming, analyzing, interpreting, and applying the data's insights to support successful marketing strategies was the aim of this study. In order to classify customers according to their shopping behaviors and find strong links between products, we looked at purchasing patterns. High confidence and lift values in the rules connecting margarine, meat spreads, and frozen desserts indicate a significant linkage between these commodities, according to a major finding from the Market Basket Analysis. In particular, rules like (margarine, meat spreads) ⇒ frozen dessert demonstrated significant lift (~3.76) and confidence (~87.43%), suggesting that consumers who purchase margarine and meat spreads together are quite likely to also buy frozen desserts. This was supported by complementary analyses of product association values, which revealed that among the three pairs, margarine and frozen dessert had the strongest correlation. Concurrently, several client segments were determined via Latent Class Analysis according to their likelihood of buying these products. Customers that consistently buy all three products, for example, make up Segment 2. With an emphasis on increasing sales of these identified product combinations, this report uses these insights to outline marketing strategies that are specifically intended to promote co-purchases of these frequently associated items. These strategies include targeted bundling strategies, promotions, and strategic product placements.

Section A: Data Preparation

As stated in the assignment structure, the first stage entails getting the supplied grocery dataset ready for analysis. The actions listed below were taken, as explained in detail in Section A of the Appendix that is attached:

01. Open the grocery dataset that was supplied. The transactional dataset, which is identified as already being in transactional format for Section B, is loaded first in the analysis.
02. The 'Customer ID' and product columns should be the only ones left in the dataset. This entails separating the pertinent product data and client identifiers for analysis.
03. Take out any columns that aren't relevant. To make the data more streamlined, any columns in the original dataset that are not necessary for identifying customer purchases or the products themselves are eliminated.
04. Create a CSV file from the cleaned dataset so it can be analyzed. The processed data is subsequently saved into a Comma Separated Values (CSV) file format, making it ready for additional analysis using various tools.

Section B: Association Rule Analysis

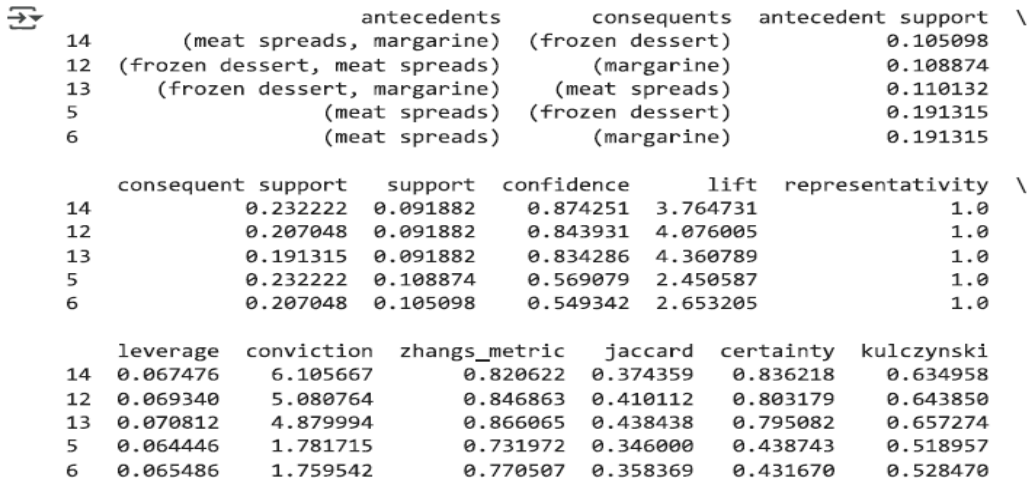
To find trends in the co-occurrence of grocery products within transactions, Association Rule Analysis was used.

01. Python was selected as the software tool for this investigation. This procedure would be made easier by the built-in capabilities for transaction encoding, data preprocessing, and rule mining that Python packages like mlxtend are known to offer.

02. **Generate association rules.**

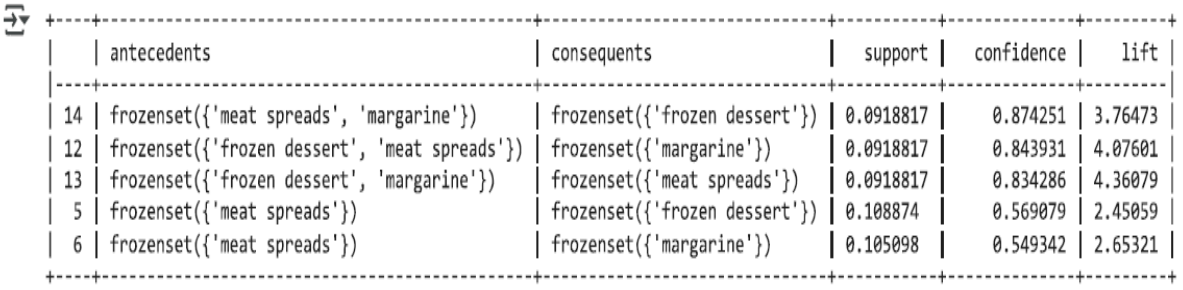
    As explained in Appendix Section B: Association Rule Analysis, association rules were produced using the Apriori method and the cleaned transactional data in Python. The procedure entailed creating rules that are distinguished by important metrics such as Lift, Confidence, and Support. A thorough grasp of the rules was also thought to be possible with the use of additional metrics that are commonly employed in association rule analysis, including Leverage, Conviction, Zhang's Metric, Jaccard, Certainty, and Kulczynski.

The produced rules and the associated metrics are shown in Figure 1.



	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	representativity	leverage	conviction	zhangs_metric	jaccard	certainty	kulczynski
14	(meat spreads, margarine)	(frozen dessert)	0.105098	0.232222	0.091882	0.874251	3.764731	1.0	0.067476	6.105667	0.820622	0.374359	0.836218	0.634958
12	(frozen dessert, meat spreads)	(margarine)	0.108874	0.207048	0.091882	0.843931	4.076005	1.0	0.069340	5.080764	0.846863	0.410112	0.803179	0.643850
13	(frozen dessert, margarine)	(meat spreads)	0.110132	0.191315	0.091882	0.834286	4.360789	1.0	0.070812	4.879994	0.866065	0.438438	0.795082	0.657274
5	(meat spreads)	(frozen dessert)	0.191315	0.232222	0.108874	0.569079	2.450587	1.0	0.064446	1.781715	0.731972	0.346000	0.438743	0.518957
6	(meat spreads)	(margarine)	0.191315	0.207048	0.105098	0.549342	2.653205	1.0	0.065486	1.759542	0.770507	0.358369	0.431670	0.528470

The produced **top rules** and the associated metrics are shown in Figure 2.



	antecedents	consequents	support	confidence	lift
14	frozenset({'meat spreads', 'margarine'})	frozenset({'frozen dessert'})	0.0918817	0.874251	3.76473
12	frozenset({'frozen dessert', 'meat spreads'})	frozenset({'margarine'})	0.0918817	0.843931	4.07601
13	frozenset({'frozen dessert', 'margarine'})	frozenset({'meat spreads'})	0.0918817	0.834286	4.36079
5	frozenset({'meat spreads'})	frozenset({'frozen dessert'})	0.108874	0.569079	2.45059
6	frozenset({'meat spreads'})	frozenset({'margarine'})	0.105098	0.549342	2.65321

03. **Interpreting the top rules in detail using support, confidence, and lift.**

The following is an interpretation of the top rules that were found, with an emphasis on the connections between margarine, meat spreads, and frozen desserts, as well as their metrics:

a. **Rule 14: (margarine, meat spreads) ⇒ frozen dessert**

i. Support: around 9.19 percent. This indicates that margarine, meat spreads, and frozen dessert are combined in 9.19% of all transactions

in the dataset. It shows the frequency with which this combination appears in the dataset.

ii. Approximately 87.43% trust. This indicates that when margarine and meat spreads are bought together, frozen dessert is also bought in 87.43% of transactions. It shows how likely it is that the consequent will occur given the antecedent.

iii. Lift: about 3.76. According to this measure, consumers who purchase meat spreads and margarine are roughly 3.76 times more likely to purchase frozen desserts as well as margarine than they are to purchase frozen desserts at random. A positive correlation between the items in the rule is shown by a lift larger than 1.

b. **Rule 13: (frozen dessert, meat spreads) ⇒ margarine**

i. Support: around 9.19 percent. Like Rule 14, margarine, meat spreads, and frozen desserts account for 9.19% of transactions.

ii. 85.39 percent confident. This shows that margarine is also included in 84.39% of transactions that include frozen dessert and meat spreads.

iii. Elevation: approximately 4.08. Margarine is 4.08 times more likely to be purchased by customers who buy meat spreads and frozen desserts than by chance, indicating a very strong correlation.

c. **Rule 12: (frozen dessert, margarine) ⇒ meat spreads**

i. Support: around 9.19 percent. Additionally, 9.19% of transactions contain this rule.

ii. ~83.43% confidence. Meat spreads are purchased in 83.43% of transactions that include frozen dessert and margarine.

iii. Lift: about 4.36. Among these three-item criteria, this one shows the highest correlation, meaning that consumers who purchase margarine and frozen desserts are around 4.36 times more likely to also purchase meat spreads than they would be by chance.

d. **Rule 5: (meat spreads) ⇒ frozen dessert**

i. **Support:** around 10.89%. The frequency of this antecedent-consequent pair is marginally higher than that of the three-item combinations.

ii. **Confidence:** ~56.91%. Frozen dessert is included in just over half (~57%) of transactions that include meat spreads.

iii. **Lift:** ~2.45. Although it is not as robust as the three-item criteria, this indicates a positive association: purchasing meat spreads increases the likelihood of purchasing frozen dessert by approximately 2.45 times compared to random chance..

e. **Rule 7: (meat spreads) ⇒ margarine**

i. Support: around 10.51%. Approximately 10.5% of trades involve this combo.

ii. 5.93 percent confidence. Margarine is used in about 55% of meat spread sales.

iii. Elevation: approximately 2.65. This suggests a positive correlation; purchasing meat spreads increases the likelihood of buying margarine by roughly 2.65 times compared to chance.

04. **Explain the significance of each rule in terms of product combinations and potential sales.**

a. Important rules include (margarine, meat spreads) ⇒ frozen dessert, (frozen dessert, meat spreads) ⇒ margarine, and (frozen dessert, margarine) ⇒ meat spreads. These rules have high lift and high trust. They show that buyers are highly inclined to purchase the third item if they purchase two of these three. With cross-selling, bundling, and targeted marketing that highlight these particular combinations, these strong linkages offer substantial potential sales growth prospects.

b. Positive but weaker correlations are shown by the rules (meat spreads) ⇒ margarine and (meat spreads) ⇒ frozen dessert. The lift above 1 suggests that these things are still purchased together more frequently than anticipated by chance, even though the confidence level is moderate (~55-57%). These could be secondary recommendations in comparison to the strong three-item connections, suggesting somewhat weaker but potentially still helpful relationships for product placement or focused marketing.

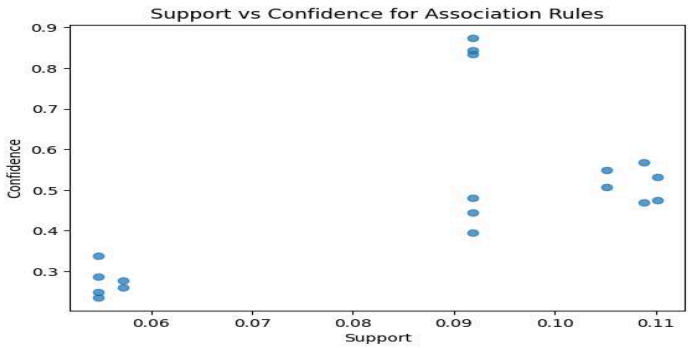
Section C: Visualisation and Interpretation

Understanding the connections and patterns found by ARM is aided by visualizations.

01. **A graph for the rules showing antecedents and consequents**

Usually, a scatter plot of association rules shows rules according to their confidence and support. Support is shown by the x-axis, and confidence is represented by the y-axis. Lift is indicated by the color or size of the points.

A scatter plot of the rules' antecedents and consequents is shown in Figure 1.

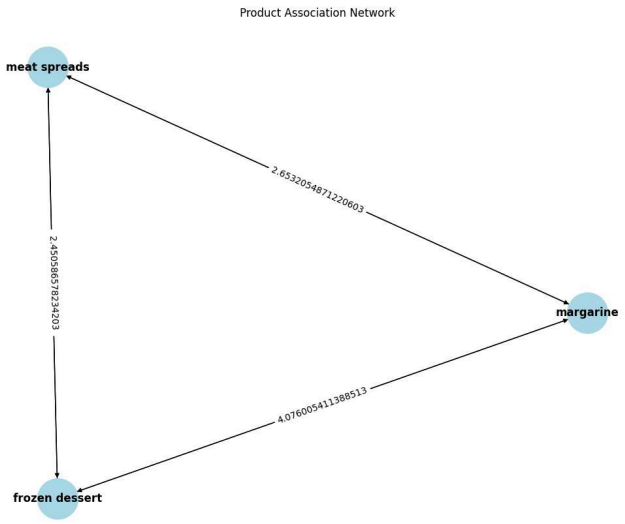


Since the support values for these top rules are quite similar (~9–11%), the scatter plot displays a number of spots crowded together in terms of support. The points, which range from about 55% to 87%, differ more dramatically along the confidence axis. The most important principles for marketing strategies are those that involve combinations of all three goods (margarine, meat spreads, and frozen dessert), as they are located in the upper-right section of the plot and show high confidence and moderate support. Less confident rules (~55%) show up lower on the plot. Quickly evaluating the distribution of rules and identifying strong candidates with high confidence and support are made easier by interpreting the scatter plot.

02. **A network or connection graph of the most connected products.**

The items (margarine, meat spreads, frozen desserts) would be represented as nodes in a network graph, while the connections between them would be represented as edges. The weight or thickness of the edges can be used to determine how strongly two things are associated.

The product association network between margarine, meat spreads, and frozen desserts is depicted in Figure 2.



With the thickest edge and the highest association value (~4.0760), margarine and frozen dessert have the strongest bond. Margarine and meat spreads have a medium-thickness edge and a moderate association (~2.6532). The narrowest edge results from the smallest connection (~2.4506) between meat spreads and frozen dessert.

03. **Interpret the relationships and discuss patterns and insights.**

The relationships found by the association rules are visually validated by the network graph. The strongest association is between margarine and frozen dessert, followed by margarine and meat spreads. In comparison, there is less of a connection between meat spreads and frozen dessert. Interestingly, even while there is a smaller pairwise link between meat spreads and frozen dessert, the high lift values for three-item combinations show a strong synergistic purchase trend among all three items. This demonstrates a noteworthy behavioral trend: buyers often purchase these things collectively.

When taken as a whole, the visuals show a distinct, non-random pattern of purchases for frozen desserts, meat spreads, and margarine. The notion that consumers typically buy all three goods at the same time in a single transaction is supported by the higher lift and confidence values for rules that contain all three items. The margarine-frozen dessert pair is highlighted as having the strongest direct link among the three in the network graph, which displays these association strengths.

According to these results, consumers are quite likely to acquire the other products if they purchase any combination of these. It seems unlikely that this pattern is accidental; rather, it suggests a real propensity for certain items to be bundled together in shopping baskets, maybe as a result of their complementary functions or because grocery stores frequently stock them together.

Section D: Marketing Strategy

The insights gained from analyzing consumer purchasing behaviors and dividing up the customer base according to these trends from the foundation of the marketing strategy. The main objective is to use the high correlations between margarine, meat spreads, and frozen desserts that have been found to exist between these product combinations to promote co-purchases and increase sales of these goods. A multifaceted strategy that incorporates digital activities, smart placement, targeted promotions, and ongoing data-driven optimization is used to accomplish this.

The following are the main elements of the marketing plan:

01. **Foundation in Advanced Data Analytics and Segmentation:** To get a more complete picture of customer preferences and loyalty, the strategy starts by improving customer segmentation beyond demographics by incorporating rich and varied data types such as behavioral data (engagement, frequency, and purchasing habits). This makes it possible to target based on real behavior. Proactive marketing actions are informed by the use of advanced analytical approaches, such as machine learning and AI-driven models like predictive analytics, which reveal hidden trends and

estimate future purchasing behavior. Creating accurate, useful, and customized marketing tactics is the goal.

02. **Segment-Based Targeted Marketing:** Marketing initiatives are especially designed to cater to the identified client segments and their unique buying habits.
    a. Offering packaged discounts on all three goods is the plan for Segment 2, which is made up of consumers who frequently buy meat spreads, margarine, and frozen desserts. The most active consumers for these combinations are represented by this group.
    b. The emphasis is on frozen dessert promotions for Segment 3 (not specifically specified in the excerpts but addressed in the implications), who typically purchase frozen desserts but not margarine or meat spreads.
    c. The approach is to emphasize meat spreads products for Segment 0, which frequently purchases meat spreads but infrequently purchases margarine or frozen desserts.
03. **Incentives and Promotions (Bundling Strategies):** By taking advantage of the close connection between meat spreads, margarine, and frozen desserts, promotional incentives and bundling are effective ways to affect consumer behavior.
    a. Combine meat spreads and margarine with frozen desserts because these goods exhibit a strong co-occurrence.
    b. To promote cross-selling, provide special packages or discounts for buying certain related products together. "Buy margarine and meat spreads, get 20% off frozen desserts" is one example given.
    c. Customers that often buy these combinations can be rewarded with loyalty programs or vouchers, which will reinforce desired purchasing habits. The purpose of promotions is to directly appeal to the preferences of customers based on their purchasing patterns.
04. **Strategic Product Placement (In-Store):** A key element of the approach is strategic in-store placement, especially in light of the strong co-occurrence patterns.
    a. To promote cross-selling and simple discovery, these products ought to be positioned close to one another in the store.
    b. Designs for store layouts can greatly improve this. Products can be grouped on adjacent aisles using the Grid arrangement. To optimize exposure, they

can be arranged consecutively on a designated pathway using the Loop (or Racetrack) arrangement. Co-purchased items can be grouped together in specific sections (sometimes known as "shops within a shop") in the boutique layout. To maximize positioning for a variety of products, many big shops employ a mixed layout that combines components from several styles.

c. Cross-merchandising displays, strategic zoning to group comparable products geographically, and using high-traffic areas like Power Walls (right-hand side upon arrival) and aisle endcaps to promote co-purchased combinations are all best practices for improving the product placement of co-purchased items.
d. By emphasizing common pairings with signage like "Customers buying margarine also purchased frozen desserts," you can visually direct customers and encourage them to buy them together.

05. **In-Store Sampling and Displays:** To pique interest in product pairings, experiential tactics such as sampling are employed.
    a. Together, set up tasting booths using these goods. Customers are more likely to buy bundled products when they can directly sample them and see how well they pair as well as the complementing benefits.
    b. To take advantage of shopper movement, place sampling stations strategically close to displays of relevant products.
    c. To let clients try the combo with little risk, provide tiny samples or bundled sample packs.
    d. Provide brief demonstrations of the items' combined usage.
    e. Take co-branded events or cross-promotional sampling into consideration.
    f. Combine digital incentives with sampling, such as offering discounts on packaged products by scanning a QR code.
    g. Make use of shelf talkers that offer suggestions for pairing.
06. **Leveraging Digital Channels and Omnichannel Integration:** By maximising digital channels to advertise product combinations and guarantee a consistent customer experience, the approach goes beyond the physical store.
    a. Consistent message and smooth user experiences are guaranteed by a single omnichannel strategy across websites, mobile apps, social media, and email.

b. Deliver timely and pertinent offers by using app notifications and customized emails. Customers who regularly purchase meat spreads and margarine can be recommended frozen treats through personalized email marketing.
c. To make these combinations more visible and raise the average purchase value, use recommendation engines and cross-selling widgets on e-commerce platforms (product pages, shopping carts, and checkout). At checkout, make suggestions for "frequently bought together" items or packaged packages.
d. Use dynamic retargeting advertisements to highlight frozen dessert bundles based on consumer activities (e.g., looking at margarine and meat spreads online).
e. For accurate targeting, channel mix optimization, and messaging refinement based on real-time data, use programmatic advertising and artificial intelligence solutions.
f. Understanding consumer touchpoints across channels (awareness, consideration, conversion, and loyalty) through customer journey mapping aids in optimizing message sequencing and budget allocation.
g. Reach and efficiency are maximized when channel investment is balanced. In order to quantify the actual impact of each channel and take cross-channel impacts and diminishing returns into account, this entails utilizing integrated marketing platforms and sophisticated attribution modeling approaches such as Multi-Touch Attribution (MTA) and Marketing Mix Modeling (MMM).

07. **Social media and content marketing:** Create engaging content, such recipes, pairing suggestions, or themed promotional videos, that highlights the advantages and uses of product pairings. Share this post on social media, blogs, and email. Social media campaigns, influencer endorsements, and giveaways can increase the visibility of packaged products and encourage sharing and testing.
08. **Seasonal Campaigns:** During pertinent seasonal times when there may be a rise in demand for these kinds of products, advertise the frozen dessert, meat spread, and margarine combos.
09. **Continuous Monitoring and Optimization:** Track key performance indicators (KPIs) including click-through rates, conversion rates, average order value, customer acquisition cost (CAC), and customer lifetime value (LTV) across channels to keep up a

data-driven optimization cycle. This enables advertisers to fine-tune their budget allocations, messaging, and targeting. Campaigns may quickly adjust to shifting consumer behavior and market trends by utilizing real-time information, which also promotes agility. Understanding the actual impact of each channel is aided by attribution modeling.

10. **Ethical Considerations:** Targeted marketing, transparency, and compliance with privacy regulations (such as the CCPA and GDPR) must all be balanced when putting this data-driven approach into practice. Sustainable practices are ensured and client trust is increased through ethical data collecting and management methods. This entails getting express consent, handling data in an open manner, making sure AI-driven decisions are algorithmically fair, and keeping human oversight.

The marketing strategy is essentially a thorough, data-driven process that uses analysis to pinpoint profitable client groupings and powerful product associations. In order to promote co-purchases and greatly increase sales of the commonly bought product combinations, such as margarine, meat spreads, and frozen desserts, it then employs focused, integrated strategies across physical and digital channels, such as promotions, bundling, strategic placement, sampling, and content. The strategy's continued efficacy and efficiency are guaranteed by ongoing measurement and optimization.

Section E: Latent Class Analysis (LCA)

Based on their purchasing patterns for the products included in the top association rules, different consumer categories are identified using Latent Class Analysis (LCA).

01. Using the top association guidelines, the procedure entails examining consumer purchasing trends for three essential products: frozen dessert, meat spreads, and margarine. First, every product covered by these regulations is identified. Customer IDs and binary purchase indications (one for purchased, zero for not purchased) for these products are then included in a subset dataset. This data is converted into an analysis-ready numerical format. The dataset is examined using latent class analysis (LCA) software, such Python, to identify four unique consumer segments (latent classes) that are distinguished by their purchase patterns. The findings, which are

depicted in Figure 3, offer insights into various client groups according to their product preferences. These results include the segment sizes and the purchase probabilities within each segment.

Customer Segments and Purchase Probabilities:

Segment	margarine	meat spreads	frozen dessert
0	0	1	0.19708
1	0.12213	0	0
2	1	1	0.874251
3	0.147959	0	1

Segment Sizes:

	Segment	Count
0	0	137
1	1	1089
2	2	167
3	3	196

Segment Descriptions:

Segment 0: Low purchase of margarine, High purchase of meat spreads, Low purchase of frozen dessert
Segment 1: Low purchase of margarine, Low purchase of meat spreads, Low purchase of frozen dessert
Segment 2: High purchase of margarine, High purchase of meat spreads, High purchase of frozen dessert
Segment 3: Low purchase of margarine, Low purchase of meat spreads, High purchase of frozen dessert

02. **Reflecting on how these segments align with association rules.**

a. Segment 2 exhibits a high degree of conformity to the primary association rules. Customers in this segment typically buy all three products: frozen desserts (~87.4%), meat spreads (100%), and margarine (100%). The strong confidence and lift observed in the association rules, where two of these products lead to the third, is directly supported by their consistent purchasing behavior for all three items. The strong three-item associations are probably due to these customers. One important business consequence is recognizing and fostering this high-value market.
b. Additionally aligned are segments 0 and 3, which reflect more specialized buying patterns found in some of the conditional or weaker regulations. Margarine and frozen desserts are rarely purchased in Segment 0, which is primarily focused on meat spreads (100% purchase probability). Although the

likelihood of purchasing frozen dessert in this section (~19.7%) is lower than the confidence in that rule (~56.91%), this is fairly consistent with the (meat spreads) ⇒ frozen dessert rule. Segment 3 rarely purchases meat spreads or margarine and mostly concentrates on frozen desserts (100% purchase probability). Although this segment's actions might help support regulations pertaining to frozen desserts generally, they wouldn't support associations where those items are antecedents since they wouldn't buy margarine or meat spreads.

c. The largest sector, segment 1, is made up of consumers who don't buy many of these products. They rarely buy margarine (~12.2%), and they don't buy frozen desserts or meat spreads. The behavior of this segment explains why the support values for the most common pairwise association rules, including the top ones, are only about 9–11%. Instead of capturing the majority of the Segment 1 customer base, the association rules catch the patterns found in the more engaged segments (such as Segments 2, 0, and 3).

By identifying particular consumer groups whose purchasing habits produce these patterns, the segmentation supports the conclusions drawn from the association rules. Based on segment characteristics, it enables more focused marketing and consumer engagement tactics.

CONCLUSION

To sum up, the knowledge gathered by Latent Class Analysis and Market Basket Analysis offers a strong basis for a data-driven marketing plan. Different client segments with different purchase probability for frozen desserts, meat spreads, and margarine were successfully identified by the analysis. Importantly, it emphasized the high probability of co-purchase and the strong positive linkage between these three products, especially the relationship between frozen desserts, meat spreads, and margarine. A focused marketing approach is suggested in light of these results in order to promote co-purchases and increase sales of these commonly purchased combos. Bundling offers for all three goods, particularly for segments like Segment 2 that already buy them frequently, and customizing

promotions for different segments are important elements of this strategy. Margarine, meat spreads, and frozen desserts should all be placed strategically throughout the store to encourage cross-selling and discovery. The possibility of a joint purchase is further strengthened by showcasing these well-liked combinations with signs and displays. Buying the bundle is actively encouraged by promotions and incentives, such as discounts on frozen desserts when buying meat spreads and margarine. Additionally, the concept is extended beyond the physical store by utilizing digital channels through dynamic retargeting, personalized suggestions, and captivating content that highlights these combinations. Using tactics like in-store sampling that showcases various goods together creates interest and offers experience value. Retailers may successfully increase sales of certain high-affinity product combinations, maximize consumer engagement, and boost overall profitability by coordinating marketing initiatives with segment characteristics and observed purchase behavior. To guarantee continued efficacy, these tactics must be continuously observed and improved in light of performance data.

REFERENCES

01. Huaman Llanos, A.A., Huatangari, L.Q., Yalta Meza, J.R., Monteza, A.H., Adrianzen Guerrero, O.D. and Rodriguez Estacio, J.S., 2024. Toward Enhanced Customer Transaction Insights: An Apriori Algorithm-based Analysis of Sales Patterns at University Industrial Corporation. *International Journal of Advanced Computer Science & Applications*, *15*(2).
02. Hruschka, H., 2024. Analyzing market basket data through sparse multivariate logit models. *Journal of Marketing Analytics*, pp.1-16.
03. Omol, E., Onyango, D., Mburu, L. and Abuonji, P., 2024. Apriori algorithm and market basket analysis to uncover consumer buying patterns: Case of a Kenyan supermarket. *Buana Information Technology and Computer Sciences (BIT and CS)*, *5*(2), pp.51-63.
04. Sajwan, I. and Tripathi, R., 2024, April. Unveiling Consumer Behavior Patterns: A Comprehensive Market Basket Analysis for Strategic Insights. In *2024 Sixth International Conference on Computational Intelligence and Communication Technologies (CCICT)* (pp. 372-377). IEEE.
05. Sun, C., 2024. Data Analysis of Customer Segmentation and Personalized Strategy in the Era of Big Data. *Advances in Economics, Management and Political Sciences*, *92*, pp.46-52.