



ÇUKUROVA UNIVERSITY

DEPARTMENT OF COMPUTER ENGINEERING

VISUALIZATION WITH PYTHON OF
SUPERMARKET SALES DATA

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Supermarket Sales

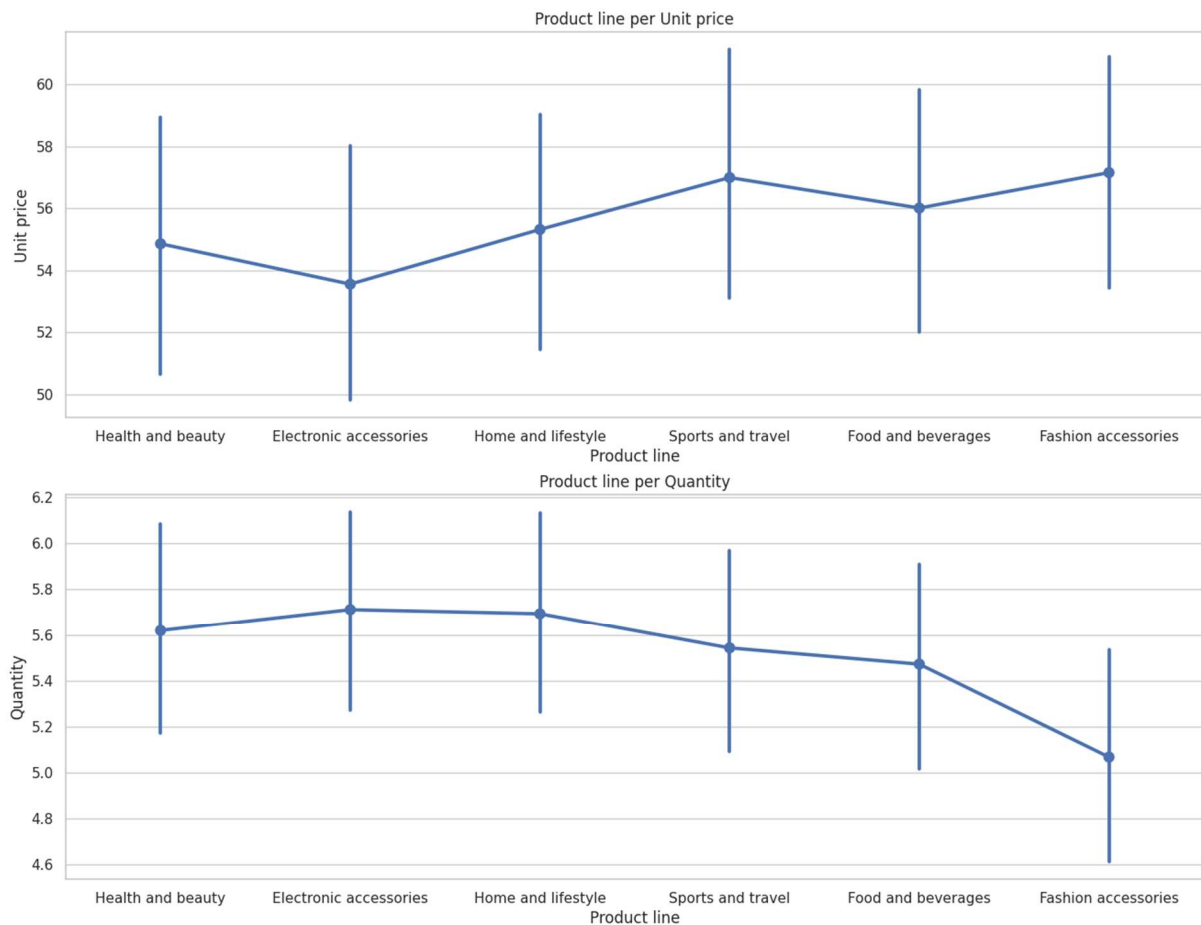
Context

The growth of supermarkets in most populated cities are increasing and market competitions are also high. The dataset is one of the historical sales of supermarket company which has recorded in 3 different branches for 3 months data. Predictive data analytics methods are easy to apply with this dataset.

Attribute information

<u>Invoice id</u> : Computer generated sales slip invoice identification number.
<u>Branch</u> : Branch of supercenter (3 branches are available identified by A, B and C).
<u>City</u> : Location of supercenters.
<u>Customer type</u> : Type of customers, recorded by Members for customers using member card and Normal for without member card.
<u>Gender</u> : Gender type of customer.
<u>Product line</u> : General item categorization groups - Electronic accessories, Fashion accessories, Food and beverages, Health and beauty, Home and lifestyle, Sports and travel.
<u>Unit price</u> : Price of each product in \$.
<u>Quantity</u> : Number of products purchased by customer.
<u>Tax</u> : 5% tax fee for customer buying.
<u>Total</u> : Total price including tax.
<u>Date</u> : Date of purchase (Record available from January 2019 to March 2019).
<u>Time</u> : Purchase time (10am to 9pm).
<u>Payment</u> : Payment used by customer for purchase (3 methods are available – Cash, Credit card and Ewallet).
<u>COGS</u> : Cost of goods sold.
<u>Gross margin percentage</u> : Gross margin percentage.
<u>Gross income</u> : Gross income.
<u>Rating</u> : Customer stratification rating on their overall shopping experience (a scale of 1 to 10).

Question 1.1 - How does the total number of sales of products according to their prices vary by category?



Electronic Accessories hold a favorable position in terms of pricing, being budget-friendly and thereby attracting increased customer attention. The high quantities sold in this category underscore its popularity, indicating a compelling price-performance ratio. To capitalize on this, a recommended strategy is to emphasize regularly priced items and implement special discounts to foster and strengthen customer loyalty.

Moving to Health and Beauty products, the moderate price range suggests a balance between affordability and quality. The moderate quantity sold implies a steady demand in this category. A strategic approach involves increasing customer engagement through the introduction of new products and providing content such as beauty tips.

In the Home and Lifestyle category, mid-range prices convey a commitment to quality lifestyle products, and the moderate quantities sold point to a broad customer base. Building trust with campaigns highlighting home decor trends and customer reviews is recommended to enhance the appeal of these products.

For Food and Beverages, lower prices compared to other categories indicate affordability, while the high quantities sold underscore the daily consumption nature of these items. Strategies to consider include special tasting events, packaging campaigns, or loyalty programs aimed at fostering customer loyalty.

In the Sports and Travel category, mid to high prices may suggest quality products, while lower quantities sold indicate specialized items catering to specific demands. Tailoring campaigns to attract the target audience, such as those focused on sports events or travel-related promotions, can be an effective strategy.

Fashion Accessories, with higher prices, are positioned as fashionable and uniquely designed products. Lower quantities sold suggest exclusivity and demand-driven offerings. Strengthening customer experience through exclusive launches, fashion events, and VIP customer programs can enhance the premium image of this category.

In summary, the assigned rankings offer a strategic foundation for pricing and customer relations in each category. Tailoring campaigns and events to specific customer segments based on these rankings can effectively boost sales and foster customer loyalty across the diverse product categories.

Question 1.2 - The previous chart showed the effect of the total number of sales according to the prices of the products by category. So, how does this effect vary depending on payment methods (defined as size=quantity)? Let's examine this change according to January and March.





The graphical representation based on unit price for the months of January and March reveals valuable insights into the purchasing patterns and payment preferences within different product categories. The size of the data points reflects the quantity sold, while the color signifies the payment method (ewallet, credit card, and cash). Larger points indicate higher quantities, suggesting increased sales in those areas.

In January, a notable prevalence of cash payments is observed, especially in the Sport and Travel category, where larger data points are evident. This suggests that lower-priced items in this category might be attracting more cash transactions. On the other hand, ewallet transactions appear to be less frequent, possibly due to a smaller customer base or lower preference for electronic payment methods.

Moving to March, a shift in payment methods becomes apparent. Ewallet transactions now dominate, with larger data points concentrated in various categories, indicating a preference

for electronic payments. Conversely, cash transactions are less prominent in March, and ewallet transactions are the least visible, implying a shift towards digital payment methods.

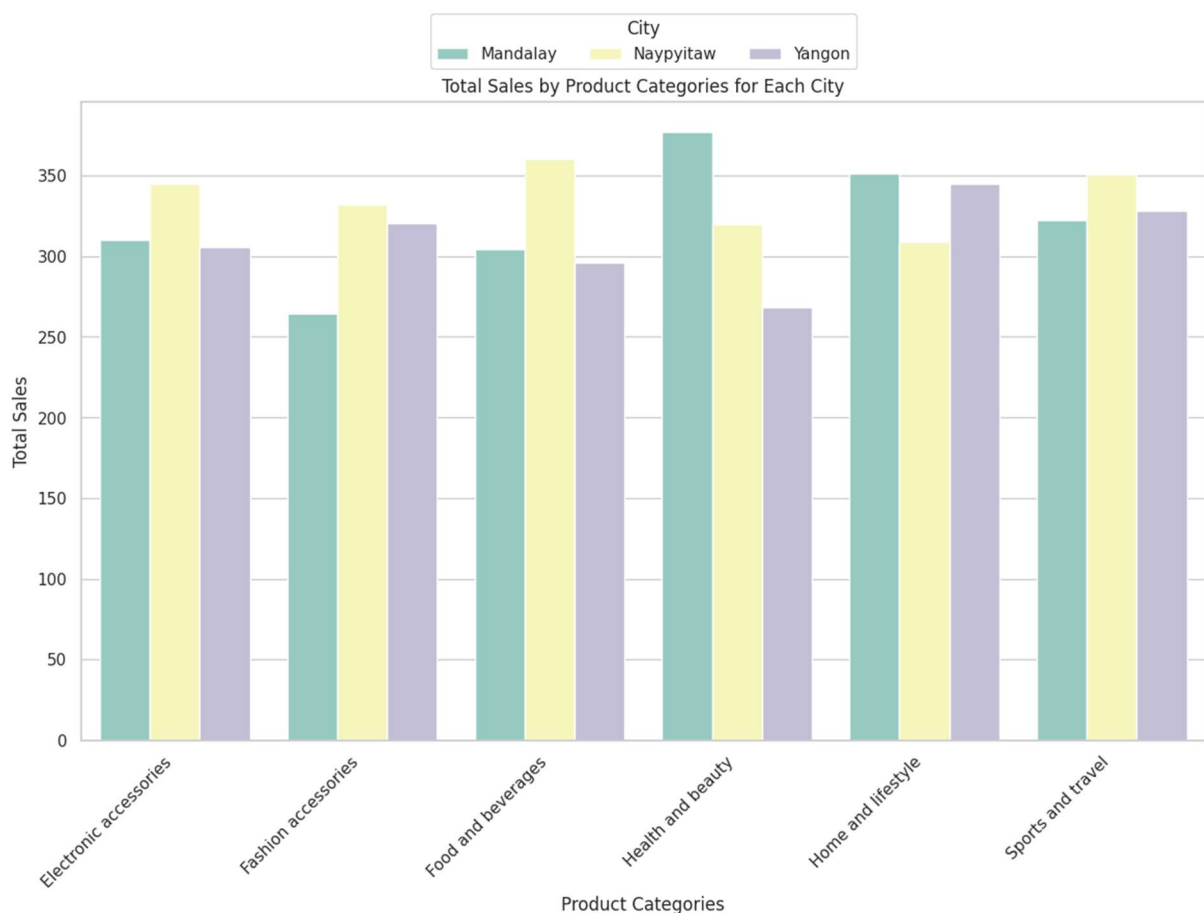
Examining payment preferences within specific categories in January, Sport and Travel stand out for cash payments, while Health and Beauty show a preference for credit card transactions. In March, Home and Lifestyle lead in ewallet payments, while Food and Beverages opt for cash transactions, and Health and Beauty favor credit cards.

Interestingly, the analysis does not reveal a direct correlation between the high or low unit prices and the payment method. Instead, variations are seen on a monthly and category basis, suggesting that customer behavior is influenced by factors beyond just price points.

From a sales and marketing strategy perspective, these findings suggest a need for targeted approaches. In January, initiatives to promote electronic payment methods and perhaps introducing loyalty programs for cash transactions could enhance customer engagement. In March, focusing on ewallet promotions and tailored marketing for specific categories could further boost electronic payment adoption.

In conclusion, understanding the interplay between payment methods, unit prices, and product categories allows for more nuanced and effective customer relationship management and sales and marketing strategies.

Question 2 - How do total sales vary by category and city?



Analyzing the total sales data for various product categories across different cities provides insights into consumer preferences. In Naypyitaw, Fashion Accessories, Food and Beverages, and Sports and Travel categories lead in sales. Mandalay shows strength in Electronic Accessories and Sports and Travel, while Yangon performs well in Health and Beauty as well as Home and Lifestyle categories.

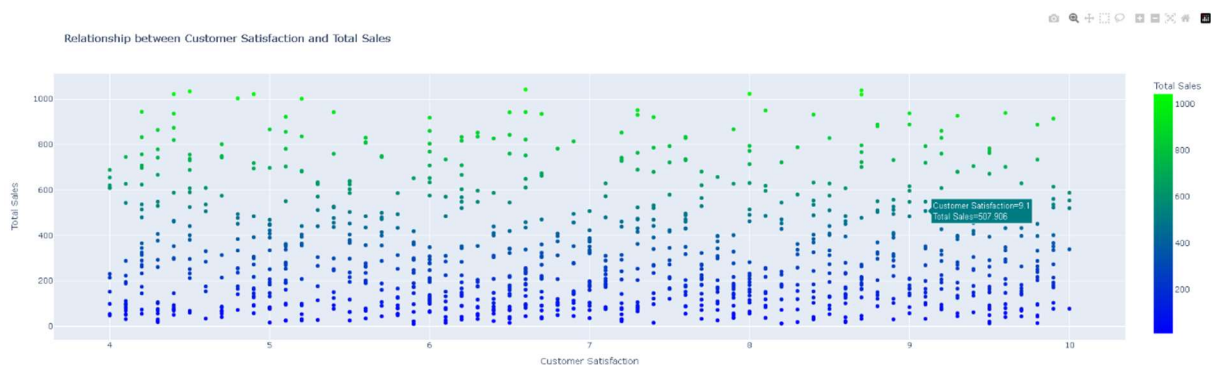
Naypyitaw stands out as a diverse market, indicating a broad range of consumer interests. On the other hand, Yangon suggests potential areas for improvement, possibly by tailoring products or marketing strategies to better align with local preferences.

To capitalize on Naypyitaw's diverse market, implementing targeted promotions or loyalty programs across various categories could be effective. In Yangon, conducting market research to understand specific preferences and adjusting product assortments accordingly may help boost sales.

Mandalay's strength in certain categories presents an opportunity for focused marketing efforts. Introducing exclusive offers or promotions in these categories could further enhance sales in this city.

In summary, understanding the variations in category-specific sales across cities allows businesses to tailor their strategies, optimizing offerings and marketing approaches to align with local consumer preferences.

Question 3.1 - What is the effect of customer satisfaction on product sales?



Customer satisfaction significantly influences product sales, as evident in the graph. In the 200-sales range, a high 7-8 rating corresponds to steady sales, emphasizing the positive impact of customer contentment. In the 400-sales band, a balanced rating indicates stable sales, with potential for incremental improvement. The 600-sales band with a 5-6 rating presents an opportunity to elevate satisfaction and drive higher sales. In the 800-sales band, a 6-7 rating suggests room for improvement to capitalize on substantial sales. Lastly, in the 1000-sales band, a lower rating signals the need for targeted improvements to enhance both satisfaction and sales. Strategic efforts focused on understanding customer feedback, making enhancements, and implementing customer-centric strategies can optimize sales performance across different bands.

Question 3.2 - How does this impact vary by city?

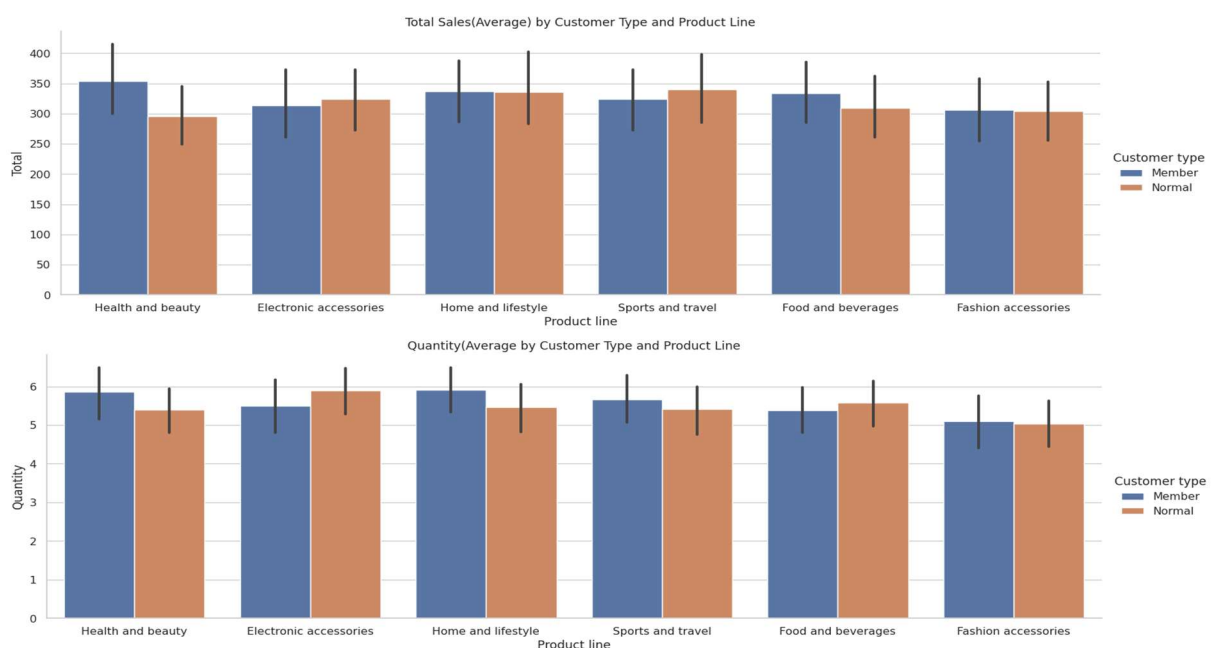


The city-specific evaluations shed light on the nuanced relationship between customer satisfaction and sales performance. In Yangon, a pronounced 7-9 rating dominance in the 0-400 sales range suggests high customer satisfaction, contributing to consistent sales. The 8-10 rating prominence in the 1000 sales band indicates a strong correlation between higher sales volume and increased satisfaction.

Naypyitaw exhibits a more balanced rating distribution, implying a generally even distribution of sales satisfaction. Mandalay, with a 6-8 rating concentration in the 0-400 sales range, suggests moderate satisfaction, while the 4-6 rating density in the 1000 sales band indicates room for improvement despite high sales.

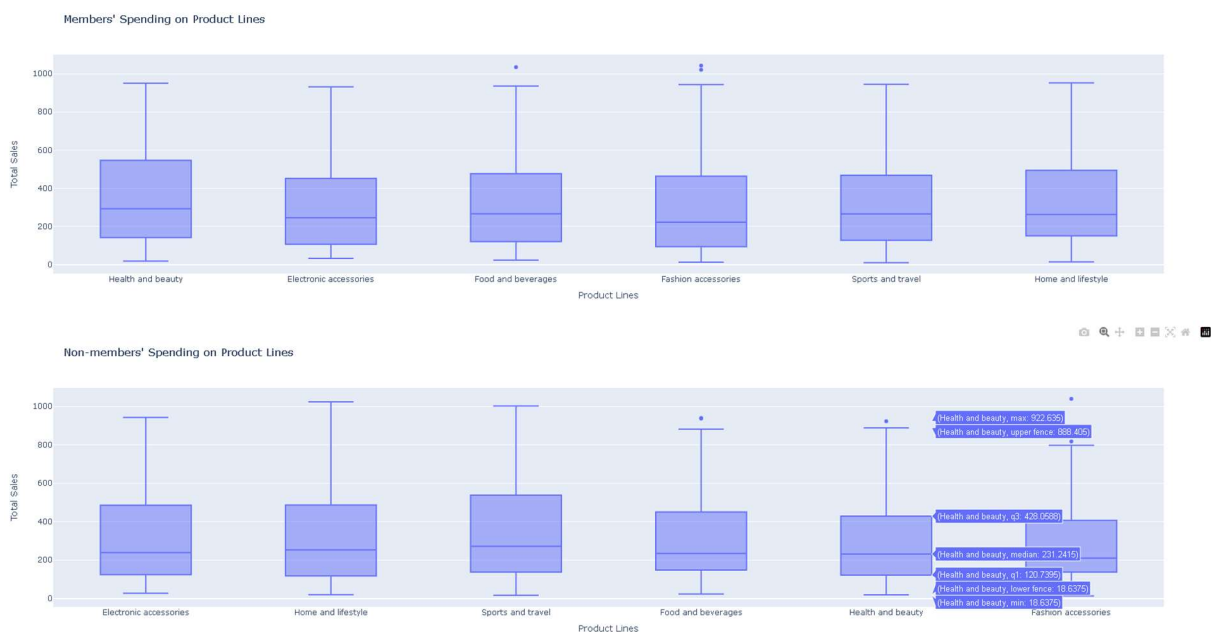
In conclusion, city-specific analyses highlight the importance of tailoring strategies to enhance customer satisfaction and optimize sales performance in each location.

Question 4.1 - What are the total sales and unit price values of member and non-member customers based on categories?



Examining total sales and quantity data for member and non-member customers across product categories uncovers noteworthy patterns. Notably, Health and Beauty experiences substantial member-driven sales, while Electronic Accessories and Sports and Travel witness higher non-member participation. In terms of quantity, Electronic Accessories and Food and Beverages stand out with higher non-member quantities, signaling frequent but smaller transactions. These insights provide a basis for targeted strategies, like exclusive offers for Health and Beauty members, to enhance sales in specific categories.

Question 4.2 - How are the total sales of member and non-member customers divided by category?



The analysis of total sales divided between member and non-member customers across various product categories unveils distinct sales dynamics. In general, members tend to contribute significantly more to total sales, with the exception of the Home and Style category where non-members lead. The highest total sales values, apart from Home and Style, are consistently attributed to members.

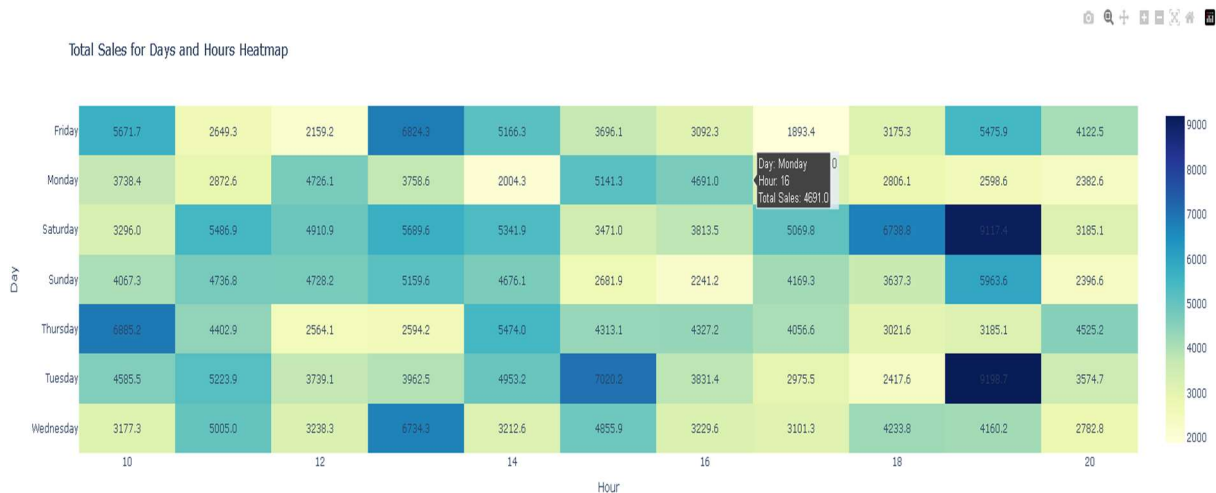
However, in the Sport and Travel and Electronic Accessories categories, non-member customers play a more substantial role. In these areas, implementing more effective marketing strategies tailored to members could potentially enhance both the shopping value of existing members and attract non-members to join the program.

Examining the overall sales ratios, the Food and Beverages and Fashion Accessories categories stand out with relatively lower sales. Strategies aimed at improvement and customer attraction, such as special promotions, package deals, or loyalty programs, could be implemented to boost sales in these categories.

In conclusion, this analysis underscores the importance of customized marketing strategies for each category. Enhancing the value of member customers and devising effective strategies to attract new members could lead to increased sales. Additionally, implementing targeted

improvements and promotional campaigns can address the lower performance in certain categories, such as Food and Beverages and Fashion Accessories.

Question 5 - How does the sales density vary depending on the days of the week and the hours of those days?



The heatmap depicting total sales across days of the week and hours offers valuable insights into the variations in sales density over different time periods. Notably, Saturdays and Tuesdays stand out with peak shopping values around 19:00. Conversely, the lowest sales values are observed on Mondays around 14:00 and Fridays at 12:00. Saturdays consistently exhibit a high shopping intensity, suggesting a trend of heightened consumer activity on weekends. Wednesdays, on the other hand, emerge as the day with the least sales density.

On average, sales peak between 13:00 and 14:00 throughout the week. These findings imply potential opportunities for optimizing sales strategies. For instance, leveraging promotions or targeted marketing campaigns during peak hours on high-density days could further boost sales. Additionally, recognizing the lower sales density on Wednesdays may prompt the implementation of special mid-week promotions or incentives to stimulate consumer activity.

Understanding these patterns allows for the development of more informed and strategic sales approaches. By tailoring promotional efforts to peak days and hours, businesses can capitalize on consumer behavior, enhancing overall sales performance.

Drive Link:

https://colab.research.google.com/drive/1jHiaus0n_yXimX6nLeGG1wUfAWIRWDIj?usp=sharing

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