Milestone 2 Progress Report

Enhancing Dairy Goods Sales through Interactive Data Visualization

**Milestone 2: Advanced Analysis and Dashboard Development**

**Data Source:** [Kaggle link](https://www.kaggle.com/datasets/suraj520/dairy-goods-sales-dataset)

**Progress Made:** During the milestone, there was some meaty work on data collection, data wrangling, that laid the foundation for future work. We imported the Dairy Goods Sales Dataset (source: Found the [Kaggle link](https://www.kaggle.com/datasets/suraj520/dairy-goods-sales-dataset)) and pre-processed it to check all the data was in good quality and cleaned appropriately.

**Data Cleaning and Preparation**

**Reason:** The process of data cleaning is important in order to remove inconsistencies, inaccuracies and missing values from our dataset so that the results are more believable. We also inspected for null values, cleaned data types, and normalized date fields for the separate monthly aggregation for seasonality methods or analysis . This was done before to return structure to data and increase the readability of analyses which was to achieve key aims of the methods.

**Seasonal Analysis**

**Reason:** Seasonality analysis is important primarily because consistent recognition of fluctuating demand patterns can effectively contribute to better inventory and sales management. Specifically, we aggregated the data at the product category and month level with the hope that this would help in their analysis for carrying out promotion and stock management.• When using seasonal sales data, it was observed that the products like dairy beverages and yogurt recorded high demand during some of the months of the yearned activities and inventory planning.

**Results:**

* The seasonal sales analysis revealed that certain products, such as dairy beverages and yogurt, showed significant spikes in specific months, indicating higher demand during those times.
* The line plot visualized clear seasonal peaks, allowing us to target marketing efforts during these high-demand periods.

**Interactive Visualization**

**Reason:** Interactive visualizations enhance the exploration of data by enabling stakeholders to interact with the graphs. This helps in identifying trends dynamically and allows decision-makers to view specific product performance.

**Results:**

* An interactive Plotly line chart was created to visualize seasonal sales trends. Users can filter by product to see how each category performs throughout the year, providing a user-friendly way to assess seasonality.

**Analyzing Price Elasticity**

**Reason:** Price elasticity analysis helps determine how changes in price affect the quantity sold. This insight is vital for setting optimal pricing strategies to maximize revenue.

**Results:**

* A scatter plot depicting price vs. quantity sold demonstrated that price elasticity varied by product. Products with lower price elasticity coefficients (e.g., cheese) showed less sensitivity to price changes, while products like milk and beverages were more sensitive.
* The plot underscored which products could bear price adjustments without significant impacts on sales.

**Regional Sales Performance**

**Reason:** Assessing revenue by customer location helps identify high-performing regions, informing geographic-focused marketing strategies and resource allocation.

**Results:**

* A bar plot highlighted that states such as Maharashtra and Tamil Nadu generated the highest revenue, indicating their significant market potential.
* This analysis pointed to regions that may benefit from increased stock and targeted marketing.

**Stock and Reorder Analysis**

**Reason:** Efficient stock management is essential to avoid lost sales due to stockouts and excessive holding costs due to overstock. By comparing current stock levels against minimum stock thresholds, we aimed to identify products needing immediate attention.

**Results:**

* Products flagged as "low stock" were visualized in a bar chart, displaying their reorder quantities. Key products, including yogurt and buttermilk, required prompt restocking.
* This analysis supports proactive stock management to maintain product availability and customer satisfaction.

**Interactive Dashboards**

**Reason:** They give a consolidated perspective on core data and permit quicker choices to be made. It means the benefit of having all the interactive tools that allow the stakeholders to work with data even without computer science background and manipulate data in view of different dimensions.

**Results:**

* Interactive dashboards were developed using Plotly and Seaborn for revenue by region and price elasticity analysis. These dashboards supported enhanced analysis of revenue split and effectiveness of pricing strategies.

**Self-Evaluation:**

This milestone allowed us to move from more frivolous data visualization to more profound trends identification. The regional performance analysis of the diagrams and the price elasticity figures offer pinpoint data for the strategic planning of pricing, marketing, and stocking. Issues that emerged include determining patterns of significance in a massive data set and handling interactivity for a user-friendly interface. The dashboards were approved in the testing stage and more options for further tuning can be suggested depending on the outcomes.

**Key Insights:**

1. **Seasonal Demand Peaks**: Specific products, such as yogurt, exhibited predictable seasonal sales spikes.
2. **Price Sensitivity**: Beverages showed high sensitivity to price changes, guiding potential pricing strategies.
3. **Regional Standouts**: Maharashtra and Tamil Nadu are major revenue contributors, suggesting priority for targeted sales initiatives.
4. **Stock Alerts**: Continuous low stock levels indicated the need for better inventory management processes.

**Next Steps:**

In Milestone 3, our strategy is to focus more on predictive analytics in order to understand the forecast for demand due to seasonality, sales history, and changes in the prices. We plan to develop machine learning models for demand forecast and subsequently develop more graphs to convey forecast patterns.