**Title of the project: Retail Store Analysis**

**Project Description:**

This project addresses the issues of a new grocery shop facing a sales decline. Our objective is to construct a smart model that predicts future sales patterns and pinpoints important elements influencing sales by using advanced analytics on historical sales. We seek to give clear insights for the retailer to efficiently simplify operations.

We'll sift through historical data to uncover trends and insights into customer behavior, product preferences, and external influences. The result will be a simple sales forecast model and actionable recommendations for enhancing day-to-day operations. Our goal is to provide the shop with simple tools for navigating problems, increasing sales, and ensuring long-term profitability in the competitive supermarket industry.

**Actors:**

1. Data Analysts
2. Store Managers
3. Marketing Team

**Objectives and Usecases:**

**Objectives:**

1. **Optimize Pricing Strategies:** Develop advanced pricing strategies that align with customer preferences, market trends, and the competitive landscape to maximize revenue.
2. **Adapt to Seasonal and Trend Variations:** Adjust prices dynamically to reflect seasonal fluctuations and changing trends to capture maximum sales opportunities.
3. **Understand Price Elasticity:** Conduct price elasticity analysis to identify optimal price points and understand how changes in price affect product demand.
4. **Leverage Data-Driven Insights:** Utilize data analytics to gain insights into customer behavior, preferences, and demand patterns, enabling informed pricing decisions.
5. **Machine Learning-Driven Demand Forecasting:** Develop machine learning models that accurately predict customer demand for store's products by considering variables such as seasonality, trends, historical sales data, and external factors.
6. **Price Optimization:** Employ machine learning optimization techniques to find the most profitable pricing strategies while considering constraints like inventory levels, profit margins, and competitive positioning.

**Use Cases:**

1. **User Case Name: Customer Segmentation**

**Scope:** Segment customers based on their shopping behaviour and purchase history.

**Goal:** Allows the Marketing Analyst to identify the top customers of the store and

identify the product they have been purchasing frequently from the store.

**Primary Actor:** Marketing Team

**Stakeholders and Interests:**

**Store Manager:** The store manager has an interest in this use case because improved customer segmentation can lead to more effective inventory management and marketing campaigns

**Customers:** While not direct stakeholders in this use case, customers indirectly benefit from more relevant offers and promotions tailored to their preferences.

**Preconditions:** 1. historical data of purchases are available.

   2. Data has been cleaned and pre-processed for analysis.

1. **Use Case Name: Seasonal Inventory Forecasting**

**Scope:** Develop a model to predict seasonal fluctuations in demand for different product categories.

**Goal:** Enable the Inventory Manager to optimize stock levels based on anticipated changes in customer preferences during different seasons, reducing waste and ensuring product availability.

**Primary Actor:** Store Managers

**Stakeholders and Interests:**

1. **Store Manager:** Interested in minimizing overstock and stockouts, contributing to efficient inventory management.
2. **Customers:** Benefit from a more consistently stocked store, improving their shopping experience.

**Preconditions:**

1. Transaction data and historical inventory records are available.
2. Data has been cleaned and preprocessed for analysis.
3. **Use Case Name: Customer Retention Strategy**

**Scope:** Develop a model to predict customer churn and implement strategies to retain customers.

**Goal:** Allow the Customer Relationship Manager to proactively identify customers at risk of churning, enabling the implementation of targeted retention strategies such as personalized offers and loyalty programs.

**Primary Actor:** Customer, Store Managers

**Stakeholders and Interests:**

**Store Manager:** Interested in maintaining a loyal customer base to sustain long-term profitability.

**Customers:** Benefit from personalized offers and incentives, increasing their loyalty to the store.

**Preconditions:**

Transaction data and customer interaction history are available.

Data has been cleaned and preprocessed for analysis.

1. **Use Case Name: Sales Performance Analysis**

**Scope:** Analyse historical sales data to gain insights into overall sales performance.

**Goal:** Enable the Sales Manager to assess the store's performance over a specified period, identify trends, and make data-driven decisions to enhance future sales strategies.

**Primary Actor:** Sales Manager

**Stakeholders and Interests:**

* 1. **Store Manager:** Interested in understanding the overall sales trends and performance to make informed strategic decisions.
  2. **Marketing Team:** Benefits from insights into product popularity and customer preferences for targeted promotional activities.

**Preconditions:**

* 1. Transaction data is available, including details such as date, time, and products sold.
  2. Data has been cleaned and pre-processed for analysis.

**Innovations/Novelty:**

1. **Predictive Modelling:**

The use of cutting-edge algorithms to predict customer behaviour and sales trends, providing more accurate and actionable insights compared to traditional methods.

1. **Unique Interactive Dashboard:**

The project includes an intuitive dashboard interface that empowers stakeholders, including store managers and decision-makers, to visually explore and interpret the data. This interactive feature enhances accessibility, making it easy for non-technical users to derive meaningful insights briefly. The dashboard provides real-time visualizations, allowing stakeholders to track key performance indicators, monitor the success of implemented strategies, and make informed decisions swiftly. This feature adds an extra layer of usability and engagement, setting the project apart from others by providing a seamless and visually enriched user experience.

Analysis of Regional Data:

1. **Analysis of Regional Data:**

The project has a unique power to dissect and analyse data at the regional level, recognising the varying dynamics within different geographical locations. The interactive dashboard enables stakeholders to visualise and compare regional sales performance, consumer behaviour, and market trends. This geographical segmentation not only allows for a more detailed view of the economic world, but it also allows for targeted tactics customised to distinct area tastes and demands. The project distinguishes itself as a locally adapted solution in contrast to more generalised techniques by emphasising regional data analysis.

**Industrial Relevance:**

1. **Strategic Market Adaptation:**

The project's flexibility to regional differences guarantees that the shop may strategically customize its offers and marketing tactics to match the individual demands of each location in a changing retail marketplace. This adaptable strategy boosts competitiveness and relevance in a variety of areas.

1. **Enhanced Customer Engagement:**

Customer engagement activities are culturally and demographically appropriate when solutions can be differentiated depending on regional data. This relevance builds better consumer ties, resulting in long-term profitability.

1. **Data-Driven Collaboration:**

The project-facilitated collaborative approach between Customer Relationship Managers and Marketing Teams develops a culture of data-driven decision-making across departments. This relevance is critical for developing a unified and integrated organizational strategy that maximizes the effect of client retention and marketing initiatives.

1. **Market Expansion Strategies:**

As the shop explores expanding into other markets, the project's findings aid in making educated decisions. Understanding regional variances allows the shop to customize its market entrance methods for maximum success in a variety of locales.

**Frontend and Backend Tools:**

1. Frontend: Power Bi
2. Backend: Juypter Notebook

**Dataset source, description, and link:**

https://www.kaggle.com/datasets/bhanupratapbiswas/retail-price-optimization-case-study/data

**Code: Description/Flow/ working of code:**

1. **Data Loading and Preprocessing:**

* Missing values are checked and visualized with missing\_data.
* Rows with missing values are dropped using df.dropna().

1. **Time Series Analysis**

* The 'Order Date' column is converted to datetime format.
* The monthly mean items count is calculated and visualized over time.

1. **Category-wise Sales Analysis:**

* Sales are grouped by category, and the total sales for each category are visualized using a bar plot.

1. **Box Plots and Outlier Removal:**

* Box plots are generated to visualize the distribution of numerical columns and profits across different categories.
* Outliers in the 'Profit' column are identified and removed using the Interquartile Range (IQR).

1. **Customer-Specific Analysis:**

* Sales for specific customers ('Amrish' and 'Harish') within specific categories are analysed and sorted.
* Sales and profit are aggregated for each customer, and a new metric 'Performance' is calculated as the sum of sales and profit.
* Customers are ranked based on their 'Performance,' and the top 5 and last 3 customers are printed.

1. **Correlation and Regression Analysis:**

* The correlation between 'Sales' and 'Profit' is calculated.
* Linear regression is performed to predict sales based on the 'Discount' and 'Profit' features.
* Actual vs. predicted sales are visualized using a scatter plot.
* A Decision Tree Regressor is implemented to predict sales based on 'Discount' and 'Profit.'
* Model performance is evaluated using Mean Squared Error (MSE) and Mean Absolute Error (MAE).
* Actual vs. predicted sales are visualized using a scatter plot.