Data Source: [French bakery daily sales](https://www.kaggle.com/datasets/matthieugimbert/french-bakery-daily-sales)

**Project Description**

This project analyzes the daily sales of a French bakery to derive actionable business insights by leveraging SQL in a real-world retail context. It involves setting up a database, cleaning and preparing the dataset, and conducting exploratory data analysis (EDA) to evaluate sales performance. The project aims to uncover customer preferences, identify sales trends, and recommend strategies to optimize business operations, supporting strategic decision-making and driving the bakery's growth.

**Objectives:**

1. **Database Setup:** Set up the database and table.
2. **Data Preparation(Data Cleaning):** Perform data cleaning and preparation.
3. **Exploratory Data Analysis:** Analyze bakery sales performance.
4. **Business Insights & Recommendation:** Generate business insights and recommendations.

**Project Structure:**

1. **Database Setup**
   1. Create a creating a database named Bakery\_db.
   2. Create a table named Bakery\_Sales.
   3. Importing dataset from .csv file.
2. **Data Preparation**
   1. Remove unnecessary columns (e.g., Column 1).
   2. Rename Quantity and Article columns for uniformity and clarity.
   3. Remove null values (none found upon checking).
   4. Eliminate duplicate records.
   5. Exclude records unrelated to typical bakery offerings.
   6. Remove records with negative values.
   7. Clean unnecessary characters from the dataset.
   8. Standardize text cases for consistency.
   9. Adjust column data types as needed.
   10. Create new columns to enhance analysis.
3. **Exploratory Data Analysis**

**A. Sales Performance**

1. **Top 10 Performing Products Based on Revenue:**This identifies the top 10 products with the highest revenue, providing insights into which products generate the most income.

**Insights:** Traditional baguette is considered the highest revenue with almost 4x of total revenue compared to rank 2.

1. **Top 10 Performing Products Based on Quantity:**This highlights the top 10 products with the highest sales volume, showing the most popular products in terms of quantity sold.

**Insights:** Traditional baguette is considered the highest sales volume with almost 3x of total quantity sold compared to rank 2.

1. **Top 10 Least Sold Products Based on Revenue:**This showcases the top 10 products with the lowest revenue, indicating the underperforming products in terms of sales value.

**Insights:** Pain Noir is considered the lowest revenue product, also some products including cake, trois chocolat, douceur d hiver part of the list.

1. **Sales Per Category:**This breakdown analyzes sales performance by product category, showing which categories contribute the most to total revenue.

**Insights:** Bread and pastries are considered as the main contributor of the total revenue of the bakery. The beverages are considered as the least contributor.

1. **Sales Per Year:**This provides an overview of total sales by year, helping to track yearly trends and growth in revenue.

**Insights:** The 2.62% increase in sales for the same months (January to September) from 2021 to 2022 suggests that the annual sales for 2022 may surpass those of the previous year, 2021.

1. **Peak Category Performance by Time of Day:**This Identifies the top-performing product categories during different times of the day, showcasing the categories with the highest revenue and quantity sold during each time period.

**Insights:** In both the morning and evening, bread is the best-selling product in terms of total quantity sold and total revenue. In the afternoon, pastries top the ranking based on total revenue, indicating that the price of pastries gives them an edge, while bread remains the best-selling product based on total quantity sold. This suggests that bread is the most valuable product category in the bakery.

1. **Seasonal Performance:**This evaluates the performance across different seasons, helping to identify which categories perform best in each season.

**Insight:** Both pastries and bread dominate throughout the seasons, consistently performing well across different times of the year.

**Overall Recommendation:**

The analysis of product performance, sales by category, and seasonal trends provides valuable insights into optimizing the bakery’s operations and increasing overall profitability. Here are the key recommendations based on the findings:

1. **Focus on Promoting Best-Selling Products (Traditional Baguette):** The traditional baguette generates the highest revenue and sales volume. Consider increasing its visibility and availability during peak hours and explore promotional strategies such as bundle offers (e.g., a combo of baguette and beverages) to further boost its sales.
2. **Address Underperforming Products (Pain Noir and Others):** Products like Pain Noir, Trois Chocolat, and Douceur d'Hiver show low sales and revenue. Evaluate the reasons for their underperformance, such as low customer demand or poor visibility. Consider discontinuing or rebranding these items, or experimenting with different pricing or packaging strategies to improve their appeal.
3. **Maximize Revenue from Bread and Pastries:** Bread and pastries are the main contributors to the bakery’s revenue. Ensure that these categories are always stocked and fresh, particularly during peak times such as the morning rush. Expanding the variety of bread and pastries, or introducing seasonal limited-edition items, could also help increase customer interest.
4. **Increase Beverage Sales:** Since beverages are the least contributor to total revenue, explore new ways to boost beverage sales. This could include offering attractive deals, bundling beverages with popular items like sandwiches, or introducing new beverage options that complement the bakery’s other products.
5. **Leverage Seasonal Trends:** Pastries and bread perform well throughout the seasons, indicating consistent demand. However, there may be opportunities to introduce seasonal promotions that highlight specific items (e.g., special pastries during holidays or new bread offerings for specific weather conditions). Consider running promotions or limited-time offers tied to specific seasons to drive more sales.
6. **Optimize Sales by Time of Day:** Bread is the best-selling product during both morning and evening hours, while pastries are the highest-selling in the afternoon. Ensure that these categories are always well-stocked during the relevant times. Additionally, offer promotions during slower periods (afternoon) to incentivize customers to purchase more pastries.
7. **Track and Plan for Annual Growth:** With a steady increase in sales from 2021 to 2022, the bakery should plan for continued growth. Forecasting future sales and adjusting inventory levels based on projected trends will help manage resources effectively, especially during peak seasons.

By focusing on high-performing products, optimizing less successful items, and capitalizing on customer traffic patterns and seasonal trends, the bakery can boost overall sales and improve operational efficiency.

**B. Time-Based Trends**

1. **Customer Traffic Trends by Day of the Week**This reveals sales patterns throughout the week, highlighting fluctuations in demand from Monday to Sunday.

**Insight:** Sunday records the highest number of customers, followed by Saturday, indicating peak customer traffic on weekends. Monday also sees considerable traffic, while Wednesday has the fewest receipts, reflecting a mid-week decline in customer visits. This suggests that weekends require more resources, such as additional staff, including bakers, to accommodate the higher customer volume.

1. **Customer Traffic Trends by Time of Day**

This examines the number of customer transactions throughout the day, identifying the peak periods for customer visits to the bakery.

**Insight:** Morning sees the highest customer traffic, followed by the afternoon, while the evening experiences the lowest number of customers. This indicates that the bakery is busiest during the morning hours, with a significant drop in customer visits as the day progresses.

1. **Customer Traffic Trends by Hour of the Day**This identifies peak customer traffic by hour, showing the busiest times throughout the day and highlighting the specific hours with the highest number of transactions.

**Insight:** The peak customer traffic occurs during the morning hours, particularly between 10 AM and 11 AM, with a notable drop in the evening. The highest number of transactions are seen in the morning, especially from 8 AM to 12 PM, while the afternoon and evening hours experience significantly fewer customers, indicating that the bakery's busiest hours are in the early part of the day.

**Overall Recommendation:**

The customer traffic analysis reveals key insights into when the bakery experiences peak and off-peak hours. To maximize operational efficiency and sales, it is essential to focus on the following strategies:

1. **Increase Staffing and Resources for Weekends:** Given the high customer traffic on Sundays and Saturdays, ensure that more staff members, particularly bakers and customer service personnel, are scheduled during weekends. Consider training additional staff to handle peak demand effectively and improve customer service quality.
2. **Mid-week Promotions:** With Wednesday showing a drop in traffic, running special promotions or discounts during this day could help drive traffic and smooth out the weekly demand curve. These could include exclusive deals or loyalty rewards to bring in more customers.
3. **Capitalize on Morning Traffic:** Since mornings (8 AM to 12 PM) are the busiest, focus on offering fresh, popular items like breads, pastries, sandwiches, and coffee. A combination of breakfast items and morning promotions can attract customers and drive higher sales.
4. **Targeted Afternoon and Evening Promotions:** With afternoon and evening hours being slower, consider offering limited-time promotions, meal deals, or smaller snack options to keep customers engaged throughout the day. Implementing "happy hour" discounts or bundling products for convenience could help boost sales in the less busy hours.
5. **Product Availability and Freshness:** During peak times, ensure popular products are readily available and freshly baked to avoid shortages. Product planning for the morning rush and weekend sales will help maintain customer satisfaction.

By aligning staffing, product offerings, and promotions with these insights, the bakery can effectively manage customer flow, enhance the customer experience, and increase overall sales throughout the week.

**C. Cross-Selling Opportunities**

This highlights potential cross-selling opportunities by examining product relationships based on sales patterns, helping to identify products often purchased together.

**Insights:**

1. **High Co-occurrence Products:**
   * Items like coupe, croissant, traditional baguette, and pain au chocolat appear frequently together, indicating they are often purchased together. For example, the combination of croissant and pain au chocolat (5,441 co-occurrences) or coupe with traditional baguette (6,179 co-occurrences) could be targeted for bundling promotions.
2. **Product Pairings:**
   * Croissant & Pain au Chocolat: This pairing shows up as one of the most frequent combinations, highlighting that these two products are popular choices together.
   * Traditional Baguette pairs well with multiple items (e.g., coupe, croissant, pain au chocolat), indicating that this is a staple product that can be used to recommend other complementary items in marketing efforts.
3. **Potential Cross-Sell Groups:**
   * For example, baguette, croissant, and pain au chocolat are consistently paired, suggesting that customers often purchase items from the "breakfast" or "morning pastry" category together. Bundling these items could enhance sales.
   * Products like banette, coupe, and special bread also show a high number of co-occurrences, meaning they can be cross-sold to the same group of customers.

**Overall Recommedation:**

* **Bundle Offers:** Based on the co-occurrence data, bundle the frequently bought-together products, like croissant and pain au chocolat, or traditional baguette with coupe, to increase the average order value.
* **Personalized Recommendations:** When a customer selects a product like traditional baguette, suggest items like croissant, pain au chocolat, or coupe based on the historical purchasing patterns.
* **Promotional Campaigns:** Use this data to craft special offers around the most popular product pairs, increasing customer engagement and sales.

**D. Customer Behavior**

This section provides into the average purchase behavior of customers, showing the typical spending per customer.

**Insight:** The query shows that, on average, each customer purchases 2 items per order. This indicates that most customers tend to buy a moderate number of items during their visit. The relatively low average might suggest that the typical customer is making smaller purchases, possibly opting for fewer items or focusing on specific bakery products.

**Recommendation:**

1. **Bundle Offers:** Since customers are purchasing an average of 2 items, consider offering bundled deals (e.g., buy 2 items, get a discount on the third) to encourage them to purchase more items per order.
2. **Promote Add-Ons:** Introduce upselling or cross-selling strategies at checkout. For instance, if a customer buys bread, offer a discount on complementary items such as jams or pastries.
3. **Loyalty Programs:** Implement a loyalty program to encourage customers to increase the number of items they purchase. Offering rewards or discounts for purchasing more items can lead to higher average sales per transaction.
4. **Product Placement:** Highlight high-margin or complementary products near bestsellers to encourage additional purchases.

By focusing on increasing the average number of items per order, the bakery can improve its overall sales and enhance customer satisfaction.