

1. Introduction

The Retail Sales Analysis project aims to analyze transactional sales data using SQL to extract meaningful business insights. The analysis focuses on understanding **sales trends, customer behavior, product category performance, and operational patterns**. The results of this study support **data-driven decision-making** for business growth and efficiency.

2. Dataset Description

The dataset consists of transaction-level retail sales records with the following key attributes:

- Transaction details: transaction ID, sale date, sale time
- Customer details: customer ID, gender, age
- Product details: category, quantity sold, price per unit
- Financial metrics: cost of goods sold (COGS), total sale value

This structure enables multi-dimensional analysis across **time, customers, products, and revenue**.

3. Data Preparation and Cleaning

Before analysis, the data was validated for quality and consistency.

Key Actions:

- Identified records with missing values in critical columns
- Removed incomplete records to ensure analytical accuracy

Outcome:

The dataset was transformed into a **clean and reliable dataset**, minimizing the risk of incorrect aggregations or misleading insights.

4. Exploratory Analysis

Initial exploration was conducted to understand the scale of the business:

- Total number of sales transactions
- Total number of unique customers
- Total number of product categories

This step provided a **high-level overview of business volume and diversity**.

5. Business Analysis & Findings

Sales Performance

- Sales activity varies significantly across different dates and months.
- Certain months consistently outperform others, indicating **seasonal demand patterns**.

Category Analysis

- Some product categories generate higher total revenue, while others attract more customers.
- Category-level insights help prioritize **inventory planning and marketing efforts**.

Customer Demographics

- Average customer age differs by category, indicating **distinct target audiences**.
- A small group of customers contributes disproportionately to total sales, highlighting **high-value customers**.

Gender-Based Insights

- Purchase behavior varies by gender across product categories.
- These insights support **gender-focused promotions and product positioning**.

Time-Based (Shift) Analysis

- Sales volume differs across Morning, Afternoon, and Evening shifts.
- Peak order periods can be identified for **staffing and operational optimization**.

6. Advanced Insights

- Identification of the **best-selling month for each year** using advanced SQL techniques.
- Ranking of customers based on total sales to identify **top-performing customers**.
- Measurement of customer reach through **unique customer count per category**.

These insights enable **forecasting, customer segmentation, and strategic planning**.

7. Key Insights Summary

- Sales show clear **seasonality trends**.
 - A small customer segment drives a large portion of revenue.
 - Different categories serve different business goals (volume vs. value).
 - Time-of-day analysis reveals operational efficiency opportunities.
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8. Limitations

- Monetary values stored as floating-point numbers may lead to rounding inaccuracies.
 - Missing data was removed instead of being treated through imputation.
 - Profit analysis was not included directly in the dataset.
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9. Recommendations

- Introduce profit metrics (Revenue – COGS) for deeper financial analysis.
 - Optimize staffing based on peak sales shifts.
 - Develop loyalty programs targeting top customers.
 - Use demographic insights for personalized marketing.
 - Improve data modeling using precise data types and indexing.
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10. Conclusion

This Retail Sales Analysis project demonstrates an **end-to-end SQL analytics workflow**, from data cleaning to advanced business analysis. The findings provide actionable insights that can support **strategic decision-making, operational improvements, and customer-focused initiatives**.

The project is well-suited for **portfolio presentation, interviews, and real-world business analytics applications**.