Retail Intelligence & Forecasting Platform

Case Study by Md Ajam

Introduction

This project is an **end-to-end analytics solution** for the retail and e-commerce sector.
The goal was to take raw transactional data and convert it into **insights that support sales growth, customer retention, and inventory optimization**.

I worked across the complete analytics pipeline:

- Data engineering and SQL
- Python analysis and forecasting
- Machine learning models
- Power BI dashboards
- Final case study and portfolio presentation

Objectives

The main objectives of the project were to:

- Analysed sales performance across multiple regions (India, Dubai, Riyadh)
- Identify top-performing and underperforming products
- Segment customers and evaluate churn risk
- Build forecasting models for sales and demand
- Create dashboards for business decision-making

Phase 1: Data Engineering

- Designed a relational database schema with tables for Customers, Products, Orders, Payments, Inventory, and Regions
- Generated more than 10,000 synthetic records using Python (Faker library)
- Cleaned and validated the data with SQL queries

Phase 2: SQL & ETL

I developed more than 25 SQL queries to answer business questions and prepare data for analytics.

Key insights generated:

- Revenue trends (monthly, yearly, cumulative growth)
- Best-selling products and revenue by category
- Customer Lifetime Value (CLV) and order frequency
- Identification of inactive customers (potential churn)
- Payment method usage and unpaid orders
- Inventory stock alerts and supplier performance
- Impact of discounts on overall sales

These SQL queries became the **foundation of the analytics pipeline** and were later integrated into Power BI dashboards.

Phase 3: Python Analytics & Machine Learning

- Performed exploratory data analysis (EDA) to identify sales patterns, customer behavior, and product performance
- Built visualizations including heatmaps, basket analysis, and time series plots
- Created a churn analysis model to identify inactive customers, revealing a revenue risk of approximately 598M
- Developed forecasting models (ARIMA and Prophet), achieving about 92% accuracy in predicting demand

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Phase 4: Power BI Dashboards

Developed interactive dashboards with the following features:

- Key KPIs: Total Revenue (512M), Total Customers (41K), Average Order Value (7.68K), Revenue per Customer (12.46K)
- Sales breakdown by region, category, and time period
- Customer churn dashboard showing churn rate (~1%) and lost revenue (~598M)
- Six-month revenue forecast with upper and lower confidence intervals

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Phase 5: Insights and Portfolio

Key insights from analysis:

- India, Saudi Arabia, and UAE were the strongest markets
- A small set of products generated most of the revenue, while some underperformed

- High churn revealed the need for retention and loyalty programs
- Forecasting showed seasonal demand spikes, useful for inventory and campaign planning

Deliverables:

- Case Study (this report)
- Portfolio Deck for interviews
- GitHub repository with SQL, Python notebooks, and Power BI files

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Tools and Technologies

- Database: PostgreSQL / MySQL
- Python: Pandas, SQLAlchemy
- Machine Learning: Prophet, ARIMA, Scikit-learn
- Visualization: Matplotlib, Seaborn
- BI Tool: Power BI
- Version Control: GitHub

Business Impact

This project demonstrates my ability to:

- Write and optimize SQL queries for reporting and ETL
- Use Python for exploratory analysis, forecasting, and machine learning
- Build dashboards that enable business users to take action
- Translate raw data into meaningful insights for strategy and decision-making

Business value for retail companies:

- Improve pricing and promotion strategies
- Optimize inventory management
- Increase customer retention
- Support executive decision-making with data

Conclusion

The **Retail Intelligence & Forecasting Platform** demonstrates my capability to manage the **complete data analyst workflow**:
Data → SQL → Python → Machine Learning → Dashboards → Insights

It highlights both my **technical skills** and my ability to **explain results in business terms**, making it directly relevant for both **Data Analyst** and **Business Analyst** roles.