Retail Sales Trend Analyzer:A Streamlit-Based Application For Trend Detection, Product Insights, And Forecasting

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Abstract- *In the competitive retail industry, understanding sales patterns, seasonality, and demand forecasting is crucial for strategic planning and operational efficiency. This paper presents an interactive and lightweight web-based application, Retail Sales Trend Analyzer, developed using Streamlit. The system ingests retail sales data, visualizes trends using Plotly and Seaborn, identifies product performance, and performs time series forecasting using Facebook Prophet. Actionable business insights and downloadable reports make it a practical tool for retail managers, analysts, and decision-makers.*

Keywords*- Retail Analytics, Sales Forecasting, Time Series Analysis, Streamlit, Facebook Prophet, Data Visualization, Business Intelligence, Product Per- formance, Demand Forecasting, Interactive Dashboard*

I. INTRODUCTION

Retail businesses generate large volumes of sales data that, if properly analyzed, can reveal valuable trends and patterns. Traditional business intelligence tools of- ten lack real-time interactivity or require complex con- figurations. This project introduces a web-based tool that simplifies the analysis process using Python and Streamlit.

System Design and Architecture

The application is built using Python and Streamlit. It integrates with Pandas, Matplotlib, Plotly, Seaborn, and Prophet. Figure 1 shows the system architecture.

Data Preprocessing

The application accepts CSV input with at least Date and Sales. Extra columns like Product Category en- hance functionality. Dates are parsed and decomposed into year, month, and day for analysis.
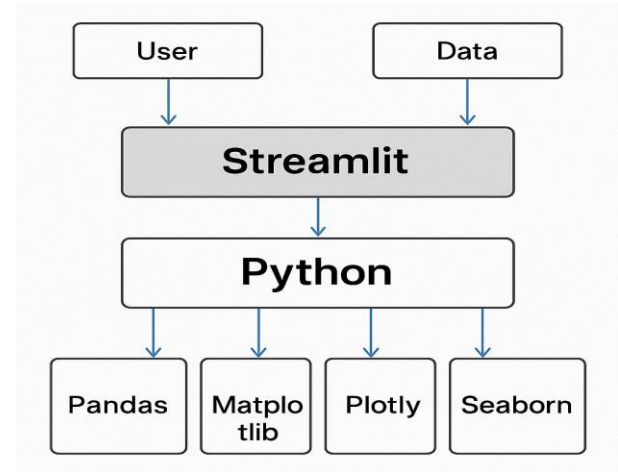

Figure 1: System Architecture

Sales Trend Analysis

Sales trends are visualized using Plotly. Figure 2 shows how this helps identify peaks and anomalies.

Seasonality and Patterns

Monthly and yearly aggregations reveal seasonality. Figure 3 helps identify high-demand periods.

Product Performance

Sales are grouped by category to show top-performing products (Figure 4).

Forecasting with Prophet

Using Facebook Prophet, the app forecasts sales (Fig- ure 5). Data is converted to Prophet's format: ds and y columns.
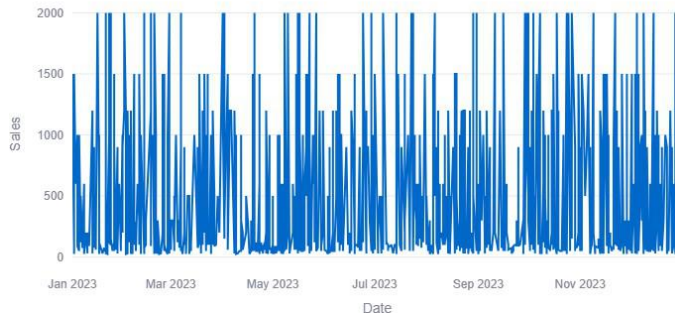
Figure 2: Sales Over Time
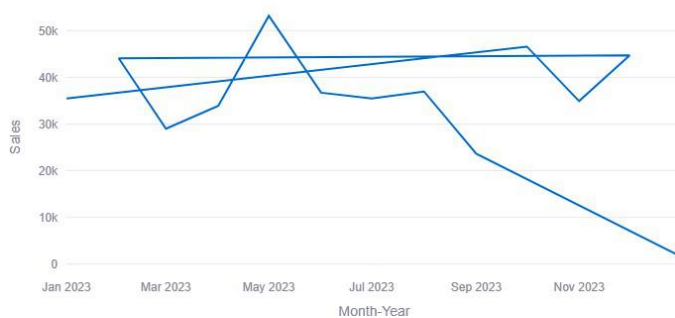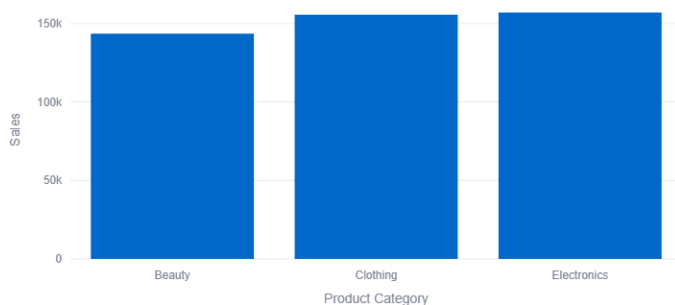

Figure 3: Monthly Seasonality

Figure 4: Product Category Performance

Insights and Recommendations

To maximize performance and profitability, it is advis- able to stock up on top-performing products in anticipa- tion of peak seasons. This ensures product availability when demand is highest, helping to avoid missed sales opportunities. Additionally, planning promotional of- fers based on trend insights can significantly enhance customer engagement and drive conversions. Keeping a close watch on underperforming products is equally important; items that consistently fall short of expecta- tions should be reevaluated and potentially phased out to optimize inventory efficiency. Finally, aligning mar- keting strategies with demand forecasts

allows for more targeted outreach, ensuring that campaigns are both timely and relevant to consumer behavior patterns.

Report Export

Users can download forecast data as CSV, enabling in- tegration with reports or dashboards.

II. CONCLUSION AND FUTURE WORK

The *Retail Sales Trend Analyzer* has proven to be a lightweight yet effective tool for identifying sales trends and generating accurate forecasts. Its simplicity and focus make it accessible while still providing valuable insights for retail decision-making.
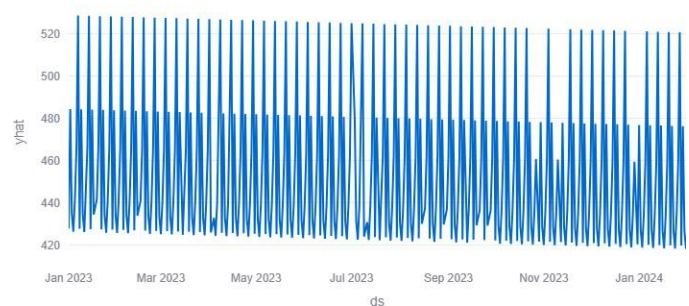

Figure 5: Future Forecast

Looking ahead, future iterations of the tool aim to in- troduce several enhancements to increase its utility and adaptability. One potential improvement is the integra- tion of live data through APIs, enabling real-time trend analysis and more responsive decision-making. Addi- tionally, the inclusion of customizable dashboards tai- lored to the needs of individual teams or departments will provide users with more relevant and actionable visualizations. Another promising direction is the im- plementation of anomaly detection and automated tag- ging, which would help users quickly identify irregular patterns or outliers in sales data, ensuring that critical insights are not overlooked.

These planned enhancements will further strengthen the tool's ability to support strategic planning and op- erational efficiency in dynamic retail environments.

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