AI-Driven Sales Forecasting & Anomaly Detection using Power BI

PowerBi project

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Business Problem

Retail organizations often rely on **reactive reporting**, which only explains past performance.

This creates challenges:

- No visibility into **future sales trends**
- Difficulty detecting **unusual sales patterns**
- Delayed business decision-making

Goal:

Use AI-powered analytics in Power BI to enable predictive and proactive decision-making.

Dataset Overview

Dataset Type: Retail sales transactions
Key Fields:

- Date
- Product Category
- Quantity
- Price per Unit
- Total Amount
- Customer Demographics

Purpose:
Analyze historical sales, detect patterns, and generate future forecasts.

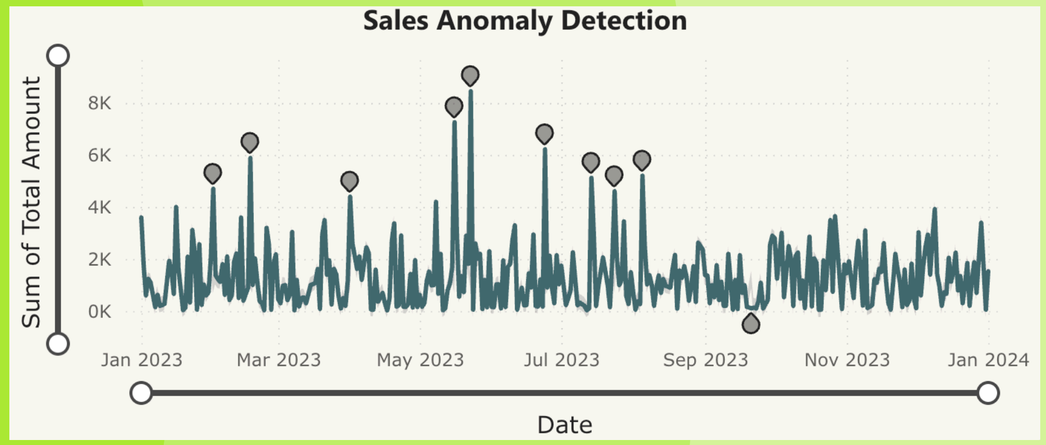
Steps Taken

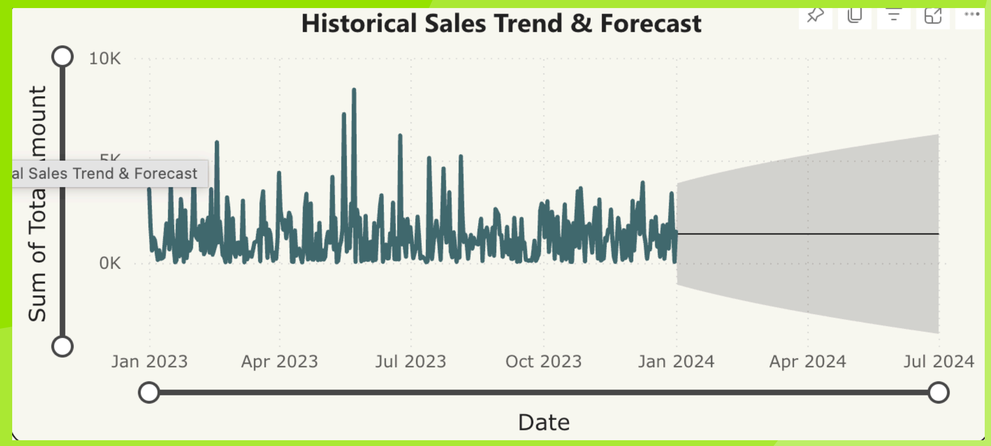
1. **Data Fetching**
   Imported dataset into **Power BI Desktop**.
2. **Data Cleaning**
   Corrected data types
   Removed inconsistencies
   Created date hierarchy
3. **Data Modeling**
   Created measures and KPIs
   Built relationships and aggregations
4. **Data Visualization**
   Line charts for trends & forecasting
   AI anomaly detection visuals
   KPI cards and Smart Narratives

Tools Used

Power BI Desktop — Data visualization & AI analytics
DAX (Data Analysis Expressions) — Measures & KPIs
AI Forecasting & Anomaly Detection — Predictive insights
Smart Narratives — Automated business summaries

Findings (Questions → Insights → Visuals)





Recommendations

- Increase **inventory before peak seasons**
- Focus **marketing on high-performing categories**
- Investigate **sudden sales drops** to reduce risk
- Use **AI forecasting dashboards** for continuous planning

Dashboard Screenshots

Sales Forecasting & Anomaly Detection using AI

Go to Forecast

Filters

Total Sales
456.00K
Sum of Total...

Average Sales
456.00
Average of Tota...

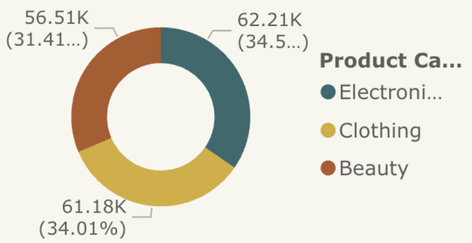
Total Quantity Sold
3K
Sum of Quantity

Average Quantity Sold
2.51
Average of...

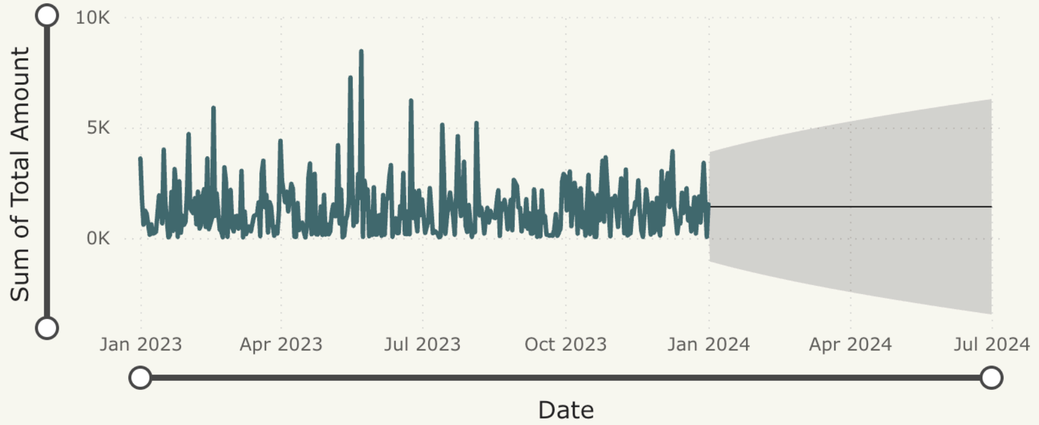
Total Transactions
1K
Count of...

Filter by Category
Beauty | Clothing | Electronics

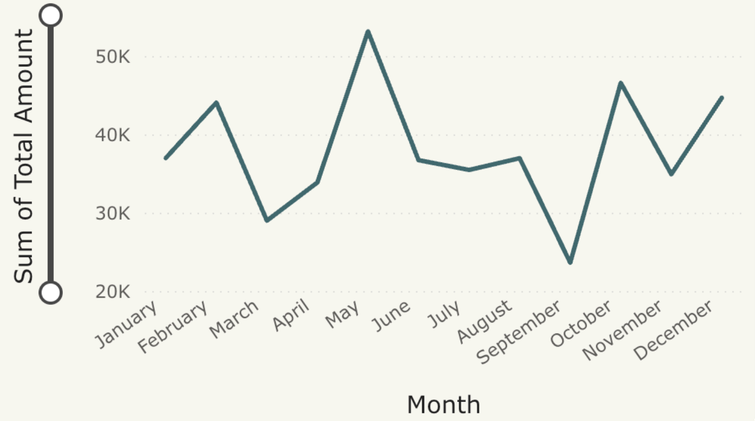
Price Per Category



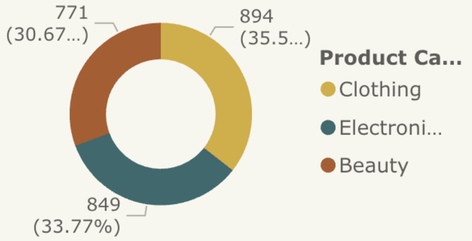
Historical Sales Trend & Forecast



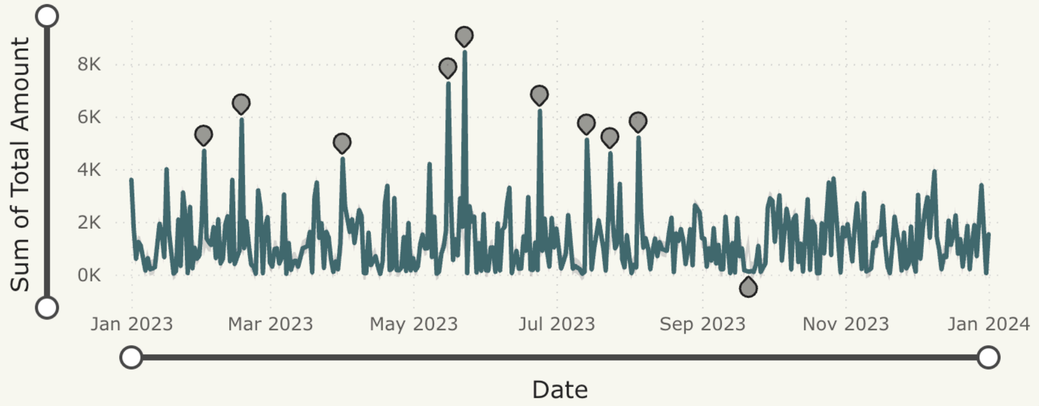
Monthly Seasonality Pattern



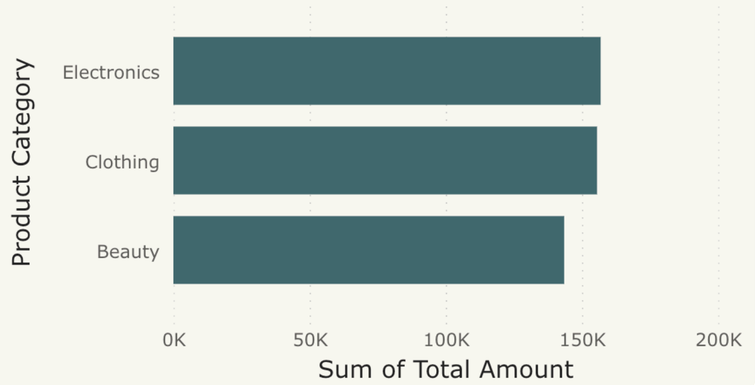
Quantity Per Category



Sales Anomaly Detection



Sales by Product Category



Sales Forecasting Analysis

Go to Insights

Filters

Average Historical Sales

456.00
Forecast Avg Sales

Min Historical Sales

25.00
Min of Total Amount

Expected Growth %

79.00
Growth %

Expected Future Trend

Increasing
Future Trend

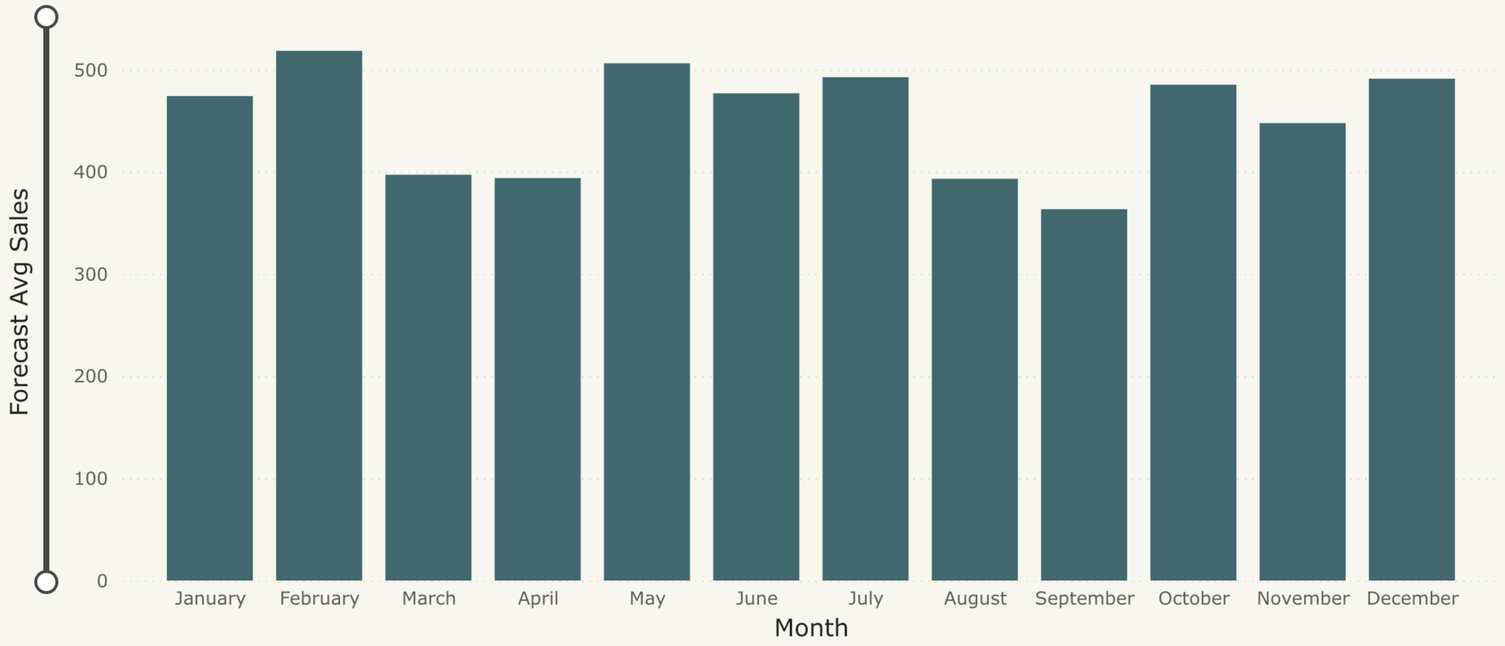
Filter by Category

Beauty | Clothing | Electronics

Max Historical Sales

2.00K
Max of Total Amount

Forecast Avg Sales by Month



Confidence Explanation

The forecast indicates the expected sales trend for the next six months
based on historical data patterns. The shaded confidence band represents
the uncertainty range, meaning actual sales are likely to fall within
this interval with 95% probability. A stable trend within the band
suggests reliable forecasting, while large deviations may indicate
external market factors or anomalies.

Business Insights & Recommendations

Go to Summary

Filters

Lowest Performing Category

Beauty

Lowest Category

Top Performing Category

Electronics

Top Category

Overall Business Risk

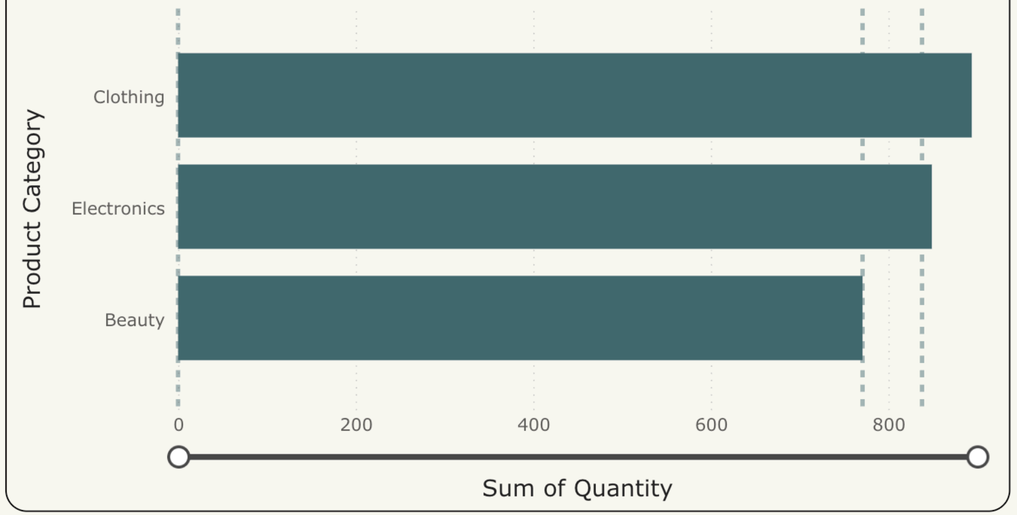
High Risk

Business Risk Level

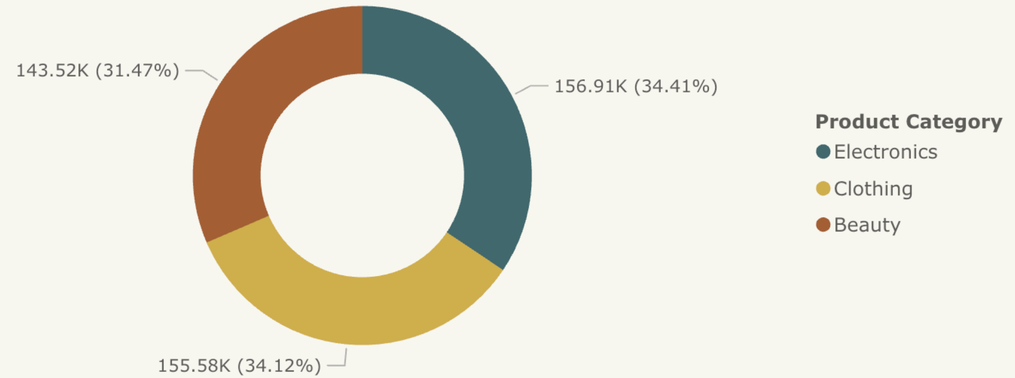
Filter by Category

Beauty | Clothing | Electronics

Sales Volume by Category



Revenue Contribution By Category



Product Category	Sum of Total Amount	Sum of Qu
Beauty	143,515.00	
Clothing	155,580.00	
Electronics	156,905.00	
Total	**456,000.00**	

Smart Narrative

Sum of Total Amount trended down, resulting in a 57.50% decrease between Sunday, January 1, 2023 and Monday, January 1, 2024.

Sum of Total Amount started trending down on Monday, December 4, 2023, falling by 11.56% (200) in 28 days.

Sum of Total Amount jumped from 100 to 2600 during its steepest incline between Friday, May 12, 2023 and Thursday, May 25, 2023.

Sum of Total Amount had several high anomalies between Wednesday, February

Key Insights:

- Sales show consistent seasonal variation with identifiable peak periods.
- Certain product categories contribute significantly higher revenue.
- Detected anomalies indicate possible promotional events or supply issues.

Recommendations:

Executive Summary / QA

1. Historical Sales Trend Analysis

The historical sales trend was analyzed using line charts over time.
The visualization shows fluctuating but generally stable sales performance with identifiable peaks and drops across different periods,

2. Seasonality Patterns in Sales

Seasonality analysis revealed that certain months consistently experience higher sales, while others show reduced demand.
This repeating pattern confirms the presence of seasonal purchasing behavior, which is critical for inventory and marketing planning

3. Forecasting Future Sales

Using Power BI's AI-based forecasting feature, future sales were predicted with a six-month outlook and 95% confidence interval.
The forecast indicates stable to moderately increasing sales, enabling proactive business

4. Detection of Sales Anomalies

AI anomaly detection highlighted unexpected spikes and sudden drops in sales values that deviate from normal patterns.
These anomalies were automatically identified using Power BI's built-in analytical visuals.

5. Possible Reasons for Detected Anomalies

Potential business causes include:

- Promotional campaigns or discounts causing sudden spikes
- Supply shortages or operational issues causing sales drops
- Seasonal festivals influencing

6. Smart Narrative Insights

Power BI Smart Narratives automatically summarized:

- Overall sales performance
- Trend direction
- Highest and lowest sales periods

7. Comparison of Actual vs Forecasted Sales

Actual sales values were compared with forecasted ranges.
Most observed values fall within the confidence interval, indicating that the forecast model aligns well with historical behavior.

8. Reliability of the Forecast Model

The forecast is considered moderately to highly reliable because:

- Sufficient historical data is available
- Clear seasonal patterns are present

9. Management Actions Based on AI Insights

Inventory Planning

Increase stock before high-demand seasonal periods and reduce excess inventory during slow months.

Marketing Strategy

Filters

Thank You