**Sales forecast**

**Tools & Technologies:**

* Python (Jupyter Notebook) for time series modeling
* Microsoft Power BI for dashboard and data visualization
* Microsoft Excel for data preparation

**Objective:**

To analyze historical sales data, identify key patterns such as trends and seasonality, and forecast future sales using ARIMA. A Power BI dashboard was created for professional, interactive visualization of results.

**Methodology:**

1.Data Preprocessing

The dataset includes monthly sales records with supporting dimensions such as **City, State, Product Category, Customer Count, Marketing Spend**, and **Email**. Additional fields like **Year**, **Quarter**, and decomposition outputs (**Sales Trend** and **Seasonal Component**) were added during preprocessing to support detailed time series and business analysis.

2. Time Series Analysis

* Performed seasonal decomposition to extract:
  + Trend: Long-term growth or decline in sales.
  + Seasonality: Regular monthly/quarterly patterns.
  + Residuals: Irregular spikes or noise.

3. Forecasting Model

* Built and compared two models:
  + Manual ARIMA (1,1,1) with 78.16% accuracy.
  + Auto-ARIMA (seasonal=True, m=12) with improved accuracy of 79.58%.
* Forecast included predicted values along with confidence intervals (Lower & Upper CI).

4. Dashboard Development in Power BI

Key KPIs and Visual Insights:

* Total Sales: ₹52 Million
* Total Customers: 405
* Average Sale per Customer: ₹258.99
* Marketing ROI: 11.11 (₹1 spent returns ₹11.11)
* Forecast Accuracy: 79.58% (from Python model)

Charts included:

* Monthly Sales Trend
* Impact of Marketing on Sales
* Seasonal Sales Patterns
* Sales by Product Category
* Sales by Region (Map)
* Forecast Band for 12 Months

**Key Business Insights:**

* Clothing is the best-performing product category (₹11.1M).
* Sales show strong seasonality, with Q1 performing the best.
* The marketing ROI was calculated using the 'Marketing\_Spend' field and visualized as a KPI.
* Top-performing states include Maharashtra, Gujarat, and Delhi.
* **Highest predicted sales** were in **March and July**, aligning with past seasonal peaks.
* **Q1 2025** (Jan–Mar) is expected to perform **strongest**, following historical seasonal trends.
* Sales are predicted to stay **between ₹1.57M and ₹1.73M per month**, showing **stable growth**.
* Small dips are expected in **April and August**, just like in past years.
* The model expects no sharp spikes or drops — so **real sales may still vary** due to marketing or external events.

**Conclusion:**

The ARIMA-based forecasting model, supported by visual analytics in Power BI, enables better decision-making. The project successfully delivers predictive insight into future sales and strategic recommendations for marketing and regional focus.