● Executive Summary

This project focuses on predicting future sales using historical retail sales data. The main goal is to help businesses make better decisions in inventory planning, demand management, and sales strategy. The project uses time series forecasting techniques and machine learning models to analyze past sales trends and predict future demand. An interactive dashboard is also created to visualize sales trends, forecast results, and business insights. This end-to-end solution helps organizations understand seasonal patterns and improve overall business performance.

● ML Model Explanation

In this project, the **Prophet Time Series Forecasting Model** is used for sales prediction. Prophet is suitable for business time series data because it can handle seasonality, trends, and holiday effects effectively.

Steps followed:

- Prepared monthly aggregated sales data
- Converted data into Prophet required format (ds = date, y = sales)
- Trained Prophet model on historical data
- Generated future predictions for upcoming periods

The model learns patterns such as:

- Monthly sales trends
- Seasonal demand variations
- Business cycle patterns

● Forecast Accuracy Metrics

To evaluate model performance, three main metrics are used:

MAE (Mean Absolute Error)
Measures average prediction error. Lower value means better accuracy.

RMSE (Root Mean Squared Error)
Penalizes large errors more strongly. Helps measure prediction reliability.

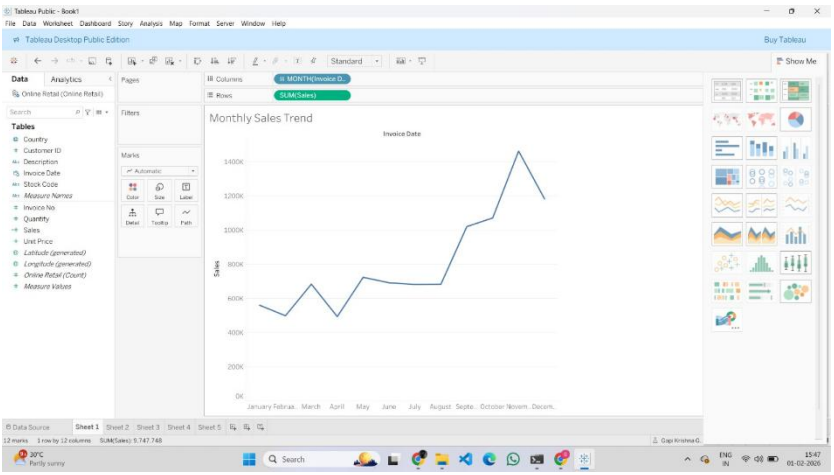
MAPE (Mean Absolute Percentage Error)
Shows error percentage, which helps understand prediction accuracy in business terms.

These metrics confirm that the model predictions are close to actual sales values and reliable for business decision-making.

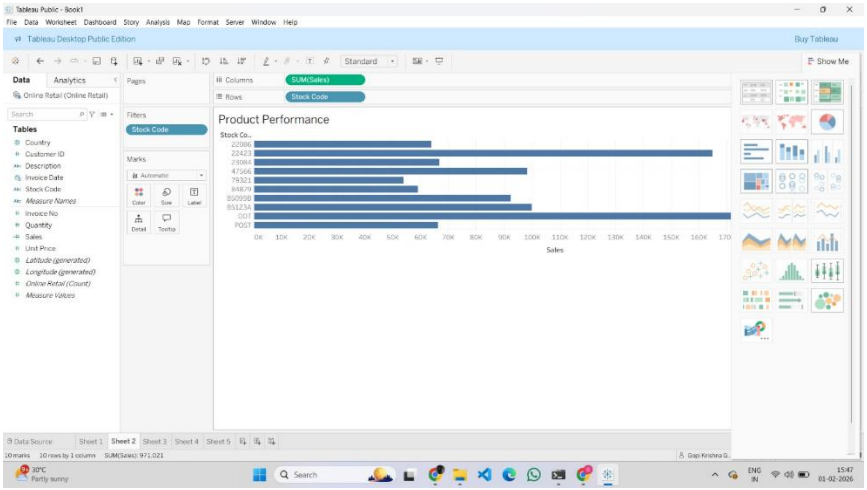
- **Dashboard Screenshots**

The dashboard visualizes key sales insights such as:

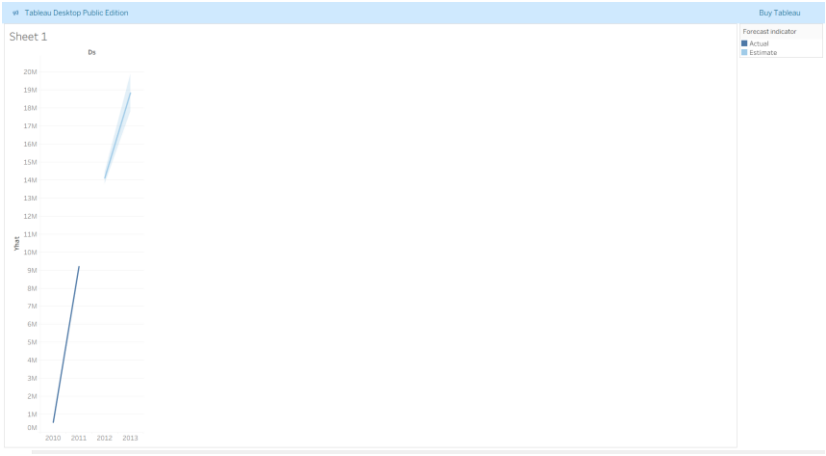
- Monthly sales trends



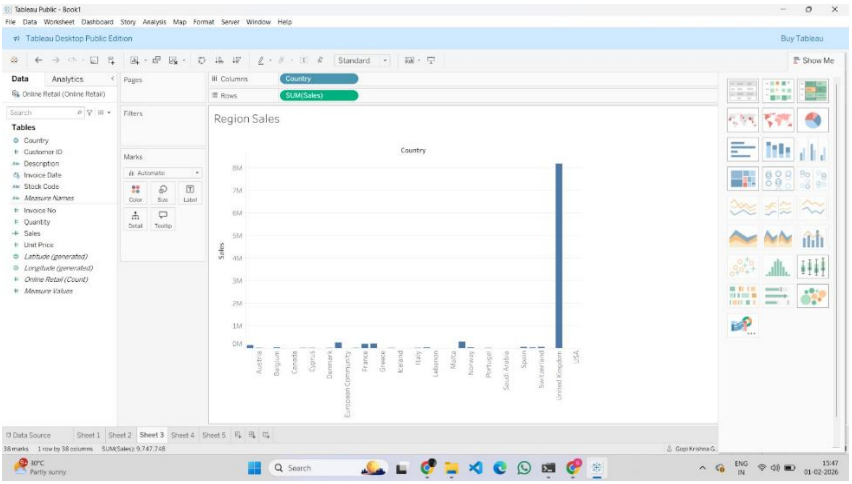
Product-level performance



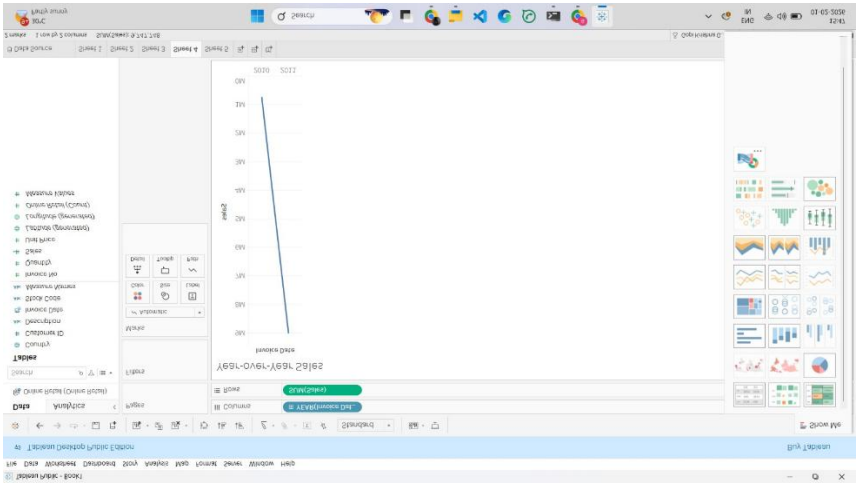
● Forecasting results



● Region-wise insights



● Year-over-year comparisons



The dashboard is created using Streamlit / BI tools and helps business users easily understand sales performance and future demand patterns.

● **Recommendations for Management**

Based on forecasting and analysis:

- Increase inventory before high-demand periods like festivals and month-end
- Focus marketing efforts on high-performing product categories
- Monitor low-performing categories and optimize pricing or promotions
- Use forecast results for supply chain planning
- Track seasonal trends to improve future sales strategies