Sales Forecasting Using SARIMA

Aim

- Help businesses forecast future sales using historical data.

- Predict future demand to avoid stockouts or overstock.

- Support decision-making in inventory, marketing, and finance.

- Handle seasonal trends and unexpected changes in sales.

Stakeholders

- Business owners

- Marketing teams

- Inventory managers

- Data analysts and students

3- Methodology

Agile methodology was used to allow iterative development and flexibility in refining the SARIMA model based on continuous testing and evaluation. This approach made it easier to improve model accuracy and user interaction step by step.

SARIMA is the core forecasting technique used. It enables modeling of both trend and seasonal patterns in time series data.

4- Requirements

Functional

User inputs time range for prediction.

Model outputs forecasted values with visualizations (e.g., line charts).

Non-functional

Forecast accuracy ≥ 90% (based on RMSE or MAPE).

Easy and clean user interface.

5-diagrams

Class diagram

SalesForecastingSystem
+historicalData: DataFrame +forecastResults: DataFrame
+trainModel() +predictSales(dateRange) : : DataFrame +generateVisualization()

"uses"

"updates"

SARIMAModel
-order:(p,d,q) -seasonalOrder:(P,D,Q,s) +fit(data) +forecast(steps) : : DataFrame

UserInterface
+inputDateRange() +displayChart() +exportReport()
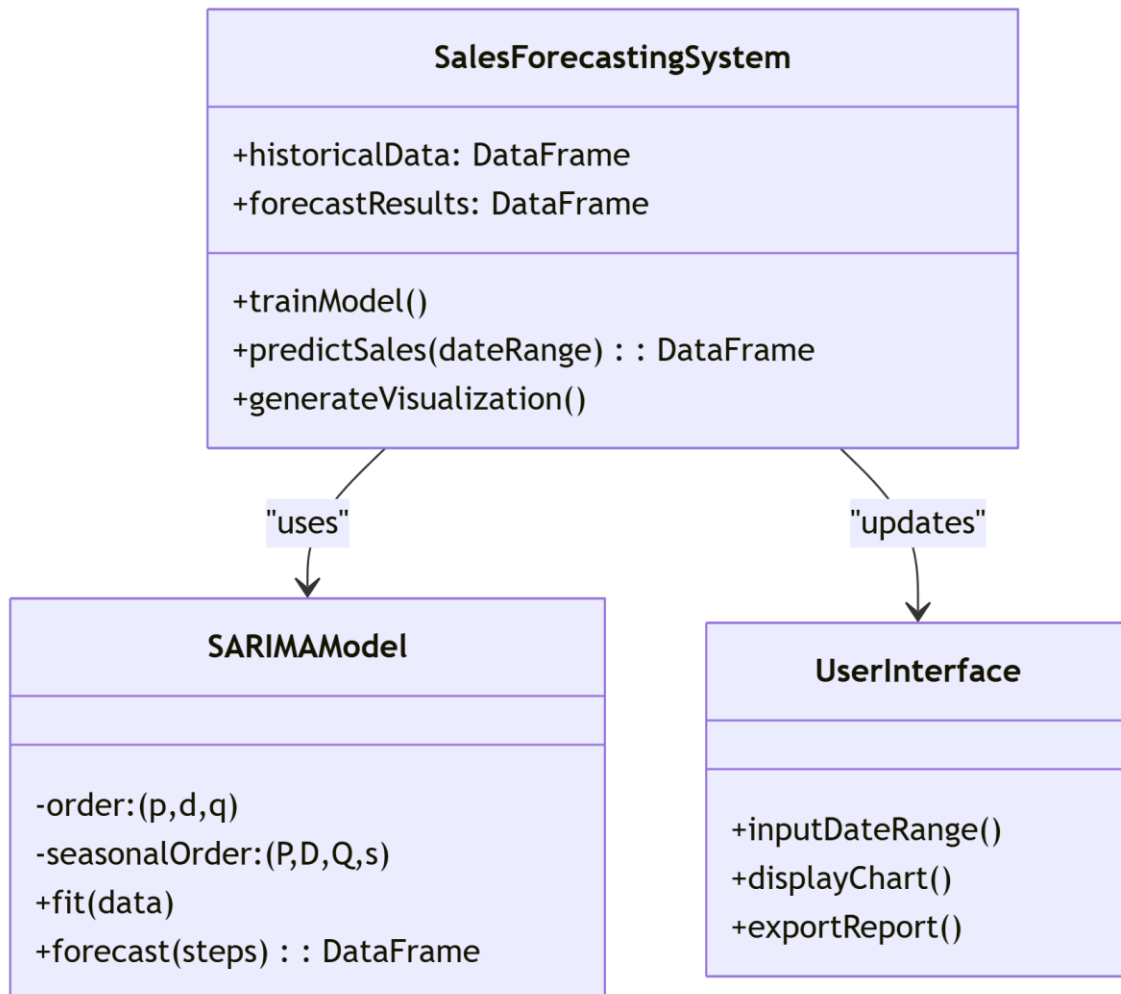
Sequence Diagram (Forecast Workflow)

User → UserInterface: Input Date Range

UserInterface → SalesForecastingSystem: Request Forecast(dateRange)

SalesForecastingSystem → SARIMAModel: predictSales(dateRange)

SARIMAModel ⇠ SalesForecastingSystem: Forecasted Data

SalesForecastingSystem → UserInterface: Update Visualization

UserInterface ⇠ User: Display Line Chart

Activity Diagram

```
                          ┌──────────┐
                          │  Start   │
                          └────┬─────┘
                               │
                     ┌─────────▼──────────┐
                     │ Load Historical Data│
                     └─────────┬──────────┘
                               │
                         ◇ Data Preprocessed? ◇
                     No ╱                    ╲ Yes
            ┌─────────▼────────┐      ┌────────▼──────────┐
            │ Handle Missing   │      │ Tune SARIMA       │
            │ Values/Outliers  │      │ Parameters        │
            └──────────────────┘      └────────┬──────────┘
                                               │
                                      ┌────────▼──────────┐
                                      │   Train Model     │
                                      └────────┬──────────┘
                                               │
                                      ┌────────▼──────────┐
                                      │  Forecast Sales   │
                                      └────────┬──────────┘
                                               │
                                      ┌────────▼──────────┐
                                      │ Visualize Results │
                                      └────────┬──────────┘
                                               │
                                       ◇ Accuracy ≥ 90%? ◇
                                          No │        │ Yes
                                             │   ┌────▼──────┐
                                             │   │Deploy Model│
                                             │   └───────────┘
                                  (No loops back to Tune SARIMA Parameters)
```

Use case diagram

Sales Forecasting System - Use Cases

Business Owner

Inventory Manager

Marketing Team

Data Analyst

System

Generate Reports

Forecast Sales

View Historical Data

Adjust Model Parameters
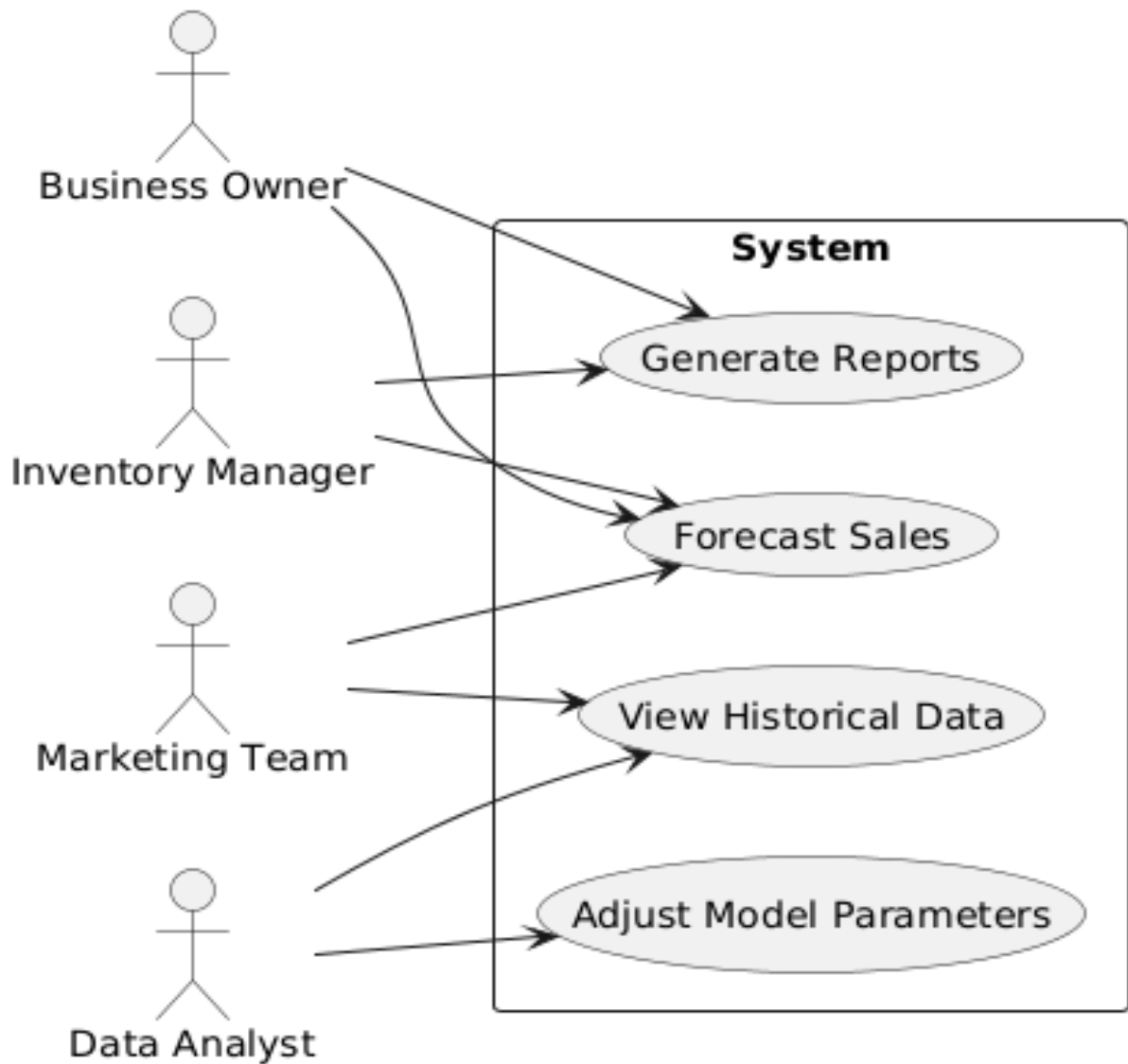
Component Diagram

Sales Forecasting System - Component Diagram

UI

Input Form	Chart Display

HTTP Requests

Backend

Data Preprocessing	SARIMA Engine

SQL Queries

Database

Sales History