Stakeholders

This section identifies the key stakeholders involved in the Sales Forecasting and Optimization project and their roles:

- **Business Owners & Managers:** Utilize sales forecasts to make strategic decisions regarding marketing and inventory management.
- **Sales & Marketing Teams:** Rely on predictions to enhance marketing campaigns and plan promotional activities.
- **Data Scientists & Engineers:** Develop and refine the forecasting model, ensuring accuracy and efficiency.
- **IT & DevOps Teams:** Oversee the deployment, maintenance, and security of the forecasting system.
- **End Users (Store Managers, Analysts):** Use the tool to understand sales trends and make operational decisions.

User Stories & Use Cases

User Stories:

- As a Sales Manager, I want to receive accurate sales forecasts so that I can optimize inventory and avoid overstock or stockouts.
- As a Marketing Manager, I want to analyze the impact of promotions and discounts on sales trends so that I can adjust marketing strategies effectively.
- As a Business Analyst, I want to visualize historical and predicted sales trends through interactive dashboards so that I can generate reports for decision-making.
- As a Store Owner, I want to access daily and weekly sales predictions so that I can make informed purchasing decisions.
- As a Data Scientist, I want to track model performance and retrain it when accuracy drops so that forecasts remain reliable over time.

Use Cases:

Use Case	Description	Actors	Preconditions	Outcome
Sales Forecasting	The system generates future sales predictions based on historical data.	Sales Manager, Store Owner	Historical sales data must be available and cleaned	Forecasted sales figures for different time periods.
Marketing Strategy Optimization	Users analyse how promotions, discounts,	Marketing Manger	Data on promotions and external	Insights on which marketing

	and external factors impact sales trends.		events must be included.	strategies drive sales.
Interactive Data Visualization	Users explore sales data trends using an interactive dashboard.	Business Analyst	The dashboard must be deployed and linked to the forecasting model.	Clear visual insights on sales patterns.
Model Retraining & Monitoring	The system detects performance drops and allows retraining when necessary.	Data Scientist	A monitoring setup must track model performance over time.	Improved accuracy with updated sales predictions.

Functional Requirements

- **Data Collection & Processing:**
  - The system must ingest historical sales data, including date, product details, and external factors (e.g., promotions, holidays).
  - The system must clean and preprocess the dataset, handling missing values and outliers.
  - The system must engineer time-based features to improve forecasting accuracy.

- **Forecasting Model:**
  - The system must implement multiple forecasting models (e.g., ARIMA, Prophet, XGBoost, LSTM).
  - The model must provide daily, weekly, and monthly sales forecasts.
  - The system must evaluate models using performance metrics (RMSE, MAE, MAPE).
  - The model must support retraining based on new data.

- **Visualization & Reporting:**
  - The system must generate line charts, heatmaps, and bar graphs for sales trends.
  - The system must provide an interactive dashboard for exploring forecasts.
  - The system must generate downloadable reports summarizing sales trends and predictions.

- **Deployment & Accessibility:**

    - The model must be deployed as a web-based application (Flask/Streamlit).
    - Users must be able to input parameters (e.g., date range, product category) to receive custom forecasts.
    - The system must log model performance metrics for monitoring.

Non-Functional Requirements

- **Performance & Scalability:**

    - The system should generate forecasts within 5 seconds for a given query.
    - The system should be able to handle large datasets (millions of sales records).
    - The system should support at least 50 concurrent users accessing forecasts.

- **2. Security & Data Privacy:**

    - The system should follow data encryption standards to protect sensitive sales data.
    - The system should restrict access based on user roles (e.g., only managers can download full reports).

- **3. Usability & Accessibility:**

    - The web interface should be intuitive and easy to navigate.
    - The system should support both desktop and mobile devices.
    - The dashboard should be interactive with filtering options.

- **4. Maintainability & Reliability:**

    - The model should be retrainable on a scheduled basis (e.g., weekly updates).
    - The system should have error handling for missing data or incorrect inputs.
    - The forecasting API should have 99.5% uptime to ensure availability.