**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:**

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| --- | --- | --- | --- | --- |
| **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, and external factors impact sales trends. | Marketing Manger | Data on promotions and external events must be included. | Insights on which marketing 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.