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A MINOR PROJECT PROPOSAL ON

STOCKHAWK : COMPREHENSIVE STOCK TRACKER,PREDICTION AND ALERT PLATFORM

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ABSTRACT

This project focuses on developing a comprehensive system for tracking the stock market, predicting future price movements, and notifying users when their predefined goals align with market conditions. By leveraging external APIs for real-time stock data and historical trends, the system employs advanced machine learning algorithms, including LSTM, for price forecasting. It ensures scalability and reliability, with MongoDB managing time-series data and PostgreSQL handling user-related information. The system offers a user-friendly interface for tracking stocks, setting goals, and receiving customized alerts, empowering users to make informed investment decisions efficiently.

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LIST OF ABBREVIATIONS

API : Application Programming Interface

LSTM : Long Short Term Memory

ANN : Artificial Neural Network

RNN : Recurrent Neural Network

CHAPTER 1

INTRODUCTION

1.1 Background

The stock market is a crucial part of the global economy, where people and businesses invest to grow their wealth. However, it can be unpredictable and fast-moving, making it difficult for investors to keep up with changes and make the right decisions at the right time. Monitoring market trends, predicting price changes, and identifying the best opportunities require a lot of effort and expertise. By using advanced algorithms, technology can simplify these tasks, helping investors track and understand market patterns more easily and alerting the users when to invest and sell the stocks will help the users to connect with market adequately.

1.2 Problem Statement

While there are tools available to analyze the stock market, many of them have limitations. They often lack real-time updates, fail to provide personalized notifications, and do not predict future price movements effectively. These issues make it harder for users to make timely and well-informed decisions.The main problem in predicting share market is that the share market is a chaos system. There are many variables that could affect the share market directly or indirectly. There are no significant relations between the variables and the price. We cannot draw any mathematical relation among the variables. There are no laws of predicting the share price using these variables. This gap highlights the necessity for a comprehensive, user-centric platform that not only tracks stock market activity but also empowers users with actionable insights and timely alerts.

1.3 Motivation

The motivation for this project stems from the need to create a comprehensive tool that empowers users by providing real-time market data, customized notifications, and predictive analytics. This ensures that users can make informed choices and achieve their investment goals with greater ease.

1.4 Objectives of the Study

The primary objectives of this program are:

1. To estimate future price movements using LSTM algorithm.
2. To alert users when their target prices align with projections.
3. To streamline market tracking by delivering real-time information and personalized insights, enabling users to make smarter investment decisions.
4. To study the risks and challenges of AI in stock market prediction.

CHAPTER 2

RELATED THEORY

2.1 Related Theory:

Stock market analysis relies on a combination of theoretical frameworks and advanced computational techniques. StockHawk incorporates these principles to provide users with a comprehensive tool for monitoring and predicting stock market movements. Below is a discussion of foundational theories in stock market analysis and how they relate to StockHawk's features and objectives.

1. Time-Series Forecasting

Time-series forecasting is a statistical technique used to analyze and predict future values based on historical data. In stock market analysis, it helps identify trends, seasonality, and cyclic patterns in stock prices.

Application in StockHawk:

StockHawk uses time-series forecasting to estimate future price movements. By leveraging historical stock data and applying algorithms such as), LSTM - exponential smoothing, and neural networks, the platform generates accurate predictions of future price trends. These predictions empower users to anticipate changes in the market and make informed decisions about buying, selling, or holding their investments.

Objective Alignment:

To estimate future price movements using advanced algorithms: StockHawk's forecasting capabilities enable users to plan their strategies based on data-driven insights.

2. Pattern Recognition

Pattern recognition involves identifying recurring structures or behaviors in data. In stock market analysis, it is used to detect trends, support and resistance levels, and technical indicators such as head-and-shoulders patterns or moving averages.

Application in StockHawk:

StockHawk integrates pattern recognition techniques to track stock market patterns ef-

fectively. Machine learning models and technical analysis tools help identify significant market signals, allowing users to understand the broader market dynamics and make timely decisions.

Objective Alignment:

To track stock market patterns effectively: By recognizing key patterns, StockHawk simplifies complex market data into actionable insights.

3. Real-Time Data Processing and Alerts

In today's fast-paced markets, real-time information is crucial. Technologies like data streaming, API integration, and low-latency systems enable platforms to deliver updates almost instantly.

Application in StockHawk:

StockHawk provides real-time data and personalized alerts. By continuously monitoring market conditions, it notifies users when their target prices match projections. This feature ensures that users never miss critical opportunities, enhancing their ability to act promptly.

Objective Alignment:

To alert users when their target prices align with projections: Real-time alerts are tailored to each user's goals, keeping them informed and prepared to act. To streamline market tracking by delivering real-time information and personalized insights: The platform's ability to process and display real-time data ensures users can rely on up-to-date information for decision-making.

4. Behavioral Finance and Decision-Making Support

Behavioral finance examines the psychological influences on investors' decisions, such as fear, greed, and overconfidence. Recognizing these biases helps design systems that guide users toward rational decision-making.

Application in StockHawk:

By offering clear, data-driven insights and removing the noise of irrelevant information, StockHawk supports users in making smarter investment choices. Personalized insights help users overcome emotional biases and focus on objective analysis.

Objective Alignment:

To streamline market tracking by delivering real-time information and personalized insights: StockHawk's intuitive interface and insights reduce cognitive overload, making complex information more accessible and actionable.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

Stock market tracking and prediction tools have become essential for investors seeking to make informed decisions in a fast-moving and unpredictable market. Numerous platforms exist that claim to help users predict price movements and track trends, but each has its own strengths and weaknesses. This section reviews the existing tools and highlights their limitations, explaining how StockHawk addresses these gaps.

3.1.1 Traditional Stock Market Tracking Tools

Traditional stock market tracking tools, such as Yahoo Finance, Google Finance, and Bloomberg, provide basic functionalities like real-time stock price tracking, historical data analysis, and financial news. These platforms typically focus on displaying data and offering some basic charting features.

3.1.2 Machine Learning and AI-Based Tools

More advanced platforms like TrendSpider and Kavout use machine learning and AI algorithms to predict future stock prices. These platforms attempt to automate the analysis of stock trends by applying deep learning models to large datasets.

3.2 Challenges of AI in Stock Price Prediction

1. **The complexity of the stock market and unpredictable external factors**
   The stock market is a complex system that is impacted by a wide range of factors, including economic data, political developments, and even calamities. AI can analyze a lot of data and spot trends that humans would overlook. However, it can't always foresee unforeseen circumstances that have a significant impact on the market.
2. **Risk of overreliance on AI predictions**

Another issue is the potential for overconfidence in AI predictions. Owners should keep in mind that AI is not flawless, even if it can provide them with helpful information and assist them in making better financial decisions. Never rely solely on one source of information while making financial decisions, and always consider multiple sources of data.

3. **Need for continuous human monitoring and intervention**

   Finally, people must keep an eye on things and intervene as necessary. Many aspects of stock market research can be handled by AI, but humans must still monitor the system and intervene as needed. This can make it more likely that the AI's predictions will be accurate and that any errors will be swiftly identified and fixed.

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 Functional Requirements

These are the specific behaviors and functionalities in the system implemented to meet user needs.

1. **User Management**:
    - Allow users to register, log in, and manage their profiles.
    - Provide role-based access control (e.g., admin vs. regular users).
2. **Goal Management**:
    - Enable users to set stock price goals.
    - Store and retrieve user-defined goals.
3. **Prediction System**:
    - Use machine learning models to predict future stock prices.
    - Display prediction results with accuracy metrics.
4. **Notifications**:
    - Notify users when their goal prices are reached or significant market changes occur.
    - Provide real-time notifications via push notifications or email.
5. **Visualization**:
    - Display interactive charts for historical and predicted stock trends.
    - Provide dashboards for tracking multiple stocks.
6. **API Integration**:
    - Integrate with external APIs to fetch stock market data.
    - Ensure seamless handling of API responses for real-time updates.

4.2 Non-Functional Requirements

These are the qualities and constraints the system follows to ensure usability, reliability, and performance.

1. **Performance**:
    - Handle real-time stock data updates with minimal latency.
2. **Scalability**:
    - Scale services independently to manage increasing users or API data load.
3. **Reliability**:
    - Ensure system uptime with minimal disruptions.
    - Handle API failures gracefully and retry fetching data when necessary.
4. **Usability**:
    - Provide an intuitive and user-friendly interface for all features.
5. **Security**:
    - Encrypt sensitive user data (e.g., passwords, financial information).
    - Implement secure authentication mechanisms (e.g., OAuth, JWT).
6. **Data Integrity**
    - Ensure accuracy and consistency of stock data, user goals, and predictions
7. **Maintainability**:
    - Maintain comprehensive documentation for future enhancements.

CHAPTER 5

METHODOLOGY

5.1 Overview

The methodology for the stock market tracking, prediction, and notification system follows a structured approach, starting with a thorough requirement analysis to define key features such as stock tracking, goal setting, and real-time alerts. The system is designed to ensure modularity, scalability, and independent development, where each service handles specific tasks like data fetching, machine learning predictions, goal matching, and user management. Data are collected from APIs of the stock market, pre-processed, and used to train machine learning models for trend prediction. The backend processes user input, compares predictions with goals, and triggers notifications via WebSockets or push notifications. The front-end is developed with React for real-time data visualization and user interactions. Finally, the performance of the system is monitored, and periodic retraining of the model ensures the accuracy of the predictions.

5.2 Frontend (User Interface)

5.2.1 React

React is a popular JavaScript library for building user interfaces, particularly for single-page applications. Developed by Facebook, it allows developers to create reusable UI components that efficiently update and render data as the application state changes. React uses a virtual DOM to optimize performance, ensuring faster updates and a smooth user experience. It is widely used for building dynamic web and mobile apps due to its simplicity, flexibility, and scalability.

5.2.2 Ui Library

Material-UI or Tailwind CSS are utility-first CSS frameworks that allows developers to design custom user interfaces by applying utility classes directly in HTML. It promotes a highly flexible and component-based approach, enabling rapid styling and easier cus-

tomization without writing custom CSS

5.2.3 Redux

Manage global state for user settings, goal prices, and real-time stock updates.Redux is a state management library for JavaScript applications, commonly used with React. It provides a centralized store to manage application state, ensuring predictable and consistent behavior. Redux uses actions and reducers to handle state updates, making it easier to debug, test, and manage complex state changes across large applications

5.3 Backend (API and Core Logic)

The backend handles user requests, processes data, and delivers responses. It's the heart of the system.

5.3.1 Node.js with Express.js:

- Lightweight and efficient for REST API development.
- Routes handle operations like fetching stock data, updating user settings, and delivering predictions

5.3.2 Database

- PostgreSQL
    1. PostgreSQL excels at managing structured data where relationships between entities (e.g., users and their stock goals) are critical.
    2. Serve as the primary database for backend services that handle user authentication, goal management, and preferences.
- MongoDB
    1. Stock market data, such as price movements, trading volume, and historical records, are typically time-stamped.
    2. Stock data can vary depending on the API or data source. MongoDB's

schema-less design accommodates changes in data structure without requiring schema migrations.

3. MongoDB supports horizontal scaling, which is essential for handling large volumes of real-time stock market data from multiple sources.

- External APIs

  APIs to handle :

  1. User authentication.
  2. Stock Data retrieval
  3. Goal setting and alerts

5.3.3 Algorithm and Data processing

This module is crucial for predictive analysis and identifying trends.

1. **Python for Data Processing**
   - **Pandas**: Cleaning and structuring historical stock data.
   - **NumPy**: Efficient numerical calculations.
   - **Matplotlib/Seaborn**: Data Visualization during development and debugging
   - **Tensorflow**: TensorFlow stock price prediction involves using machine learning models to analyze historical market data and forecast future stock prices. It leverages neural networks and deep learning techniques for accurate predictions. This approach aids in making data-driven investment decisions.
2. **Machine Learning**
   - **Supervised Learning Models**
     - **Linear Regression** for simple trend predictions.
     - **Long Short-Term Memory**
       * **Captures Temporal Patterns**: Recognizes sequential dependencies in stock price movements.

* **Predicts Future Prices**: Forecasts trends and price movements based on historical data.
* **Detects Patterns and Anomalies**: Identifies trend reversals and irregular market activity
* **Processes Multi-Feature Data**: Integrates prices, volumes, and indicators for richer insights.
* **Solves Vanishing Gradient**: Efficiently learns from extended sequences via gating mechanism.

5.4 System Design

Data Flow Diagram (DFD) is a visual representation of how data moves through a system, illustrating the flow of information between processes, data stores, and external entities. It provides a clear overview of the system's data processing, highlighting how inputs are transformed into outputs. DFDs are typically divided into multiple levels, with higher-level diagrams offering a broad overview and lower-level diagrams detailing specific processes. They are commonly used in system design and analysis to ensure efficient data handling and to identify potential bottlenecks or inefficiencies in the system.

A sequence diagram A sequence diagram is a type of interaction diagram because it describes how—and in what order—a group of objects works together. These diagrams are used by software developers and business professionals to understand requirements for a new system or to document an existing process.

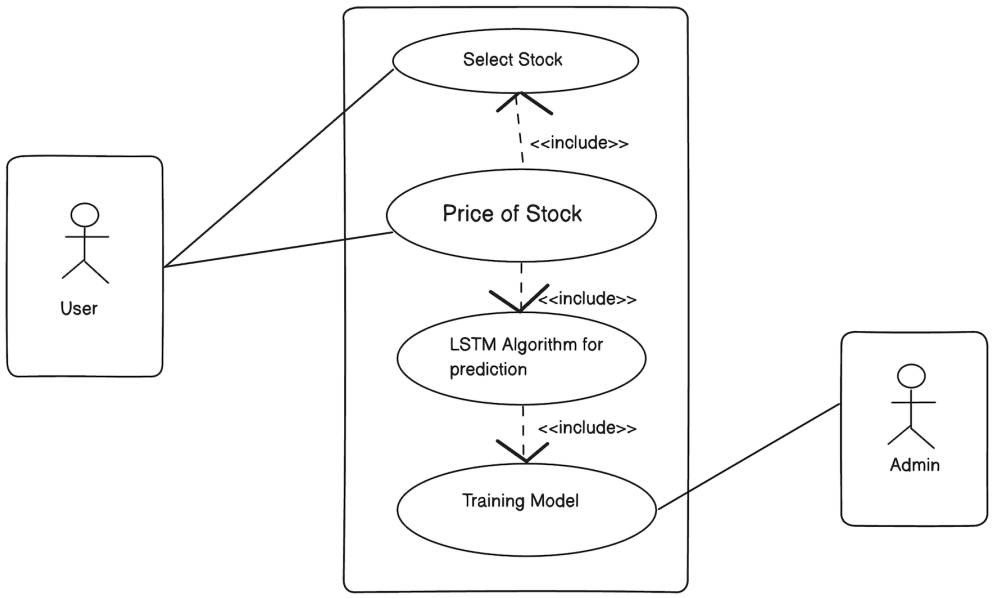

Figure 5.1: Use Case Diagram

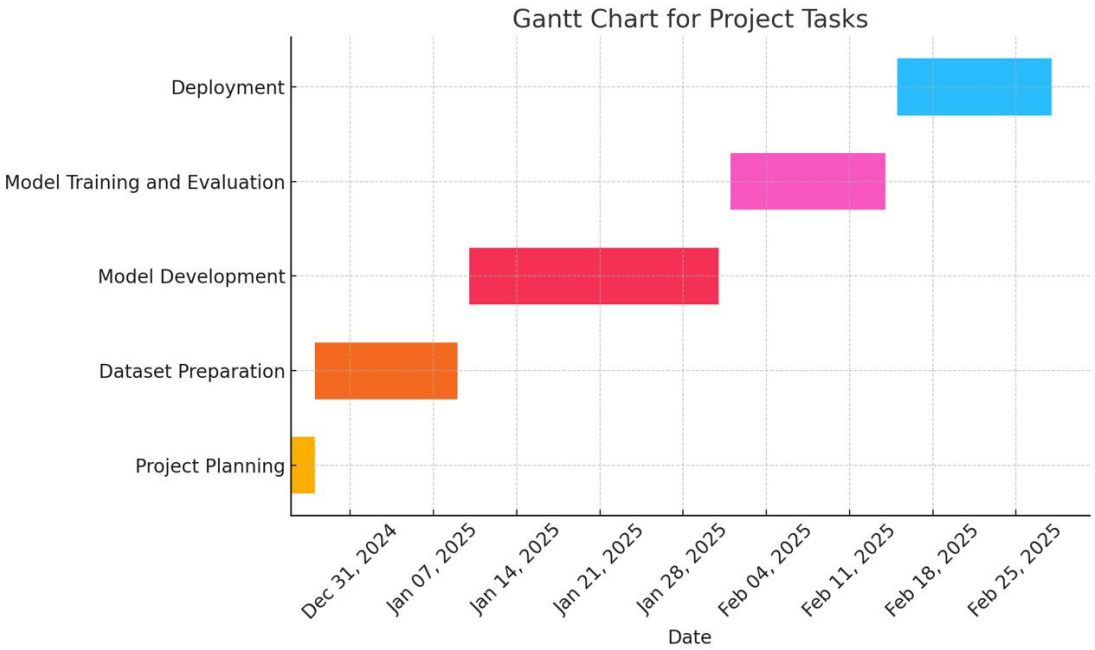

Figure 5.2: Gantt Chart

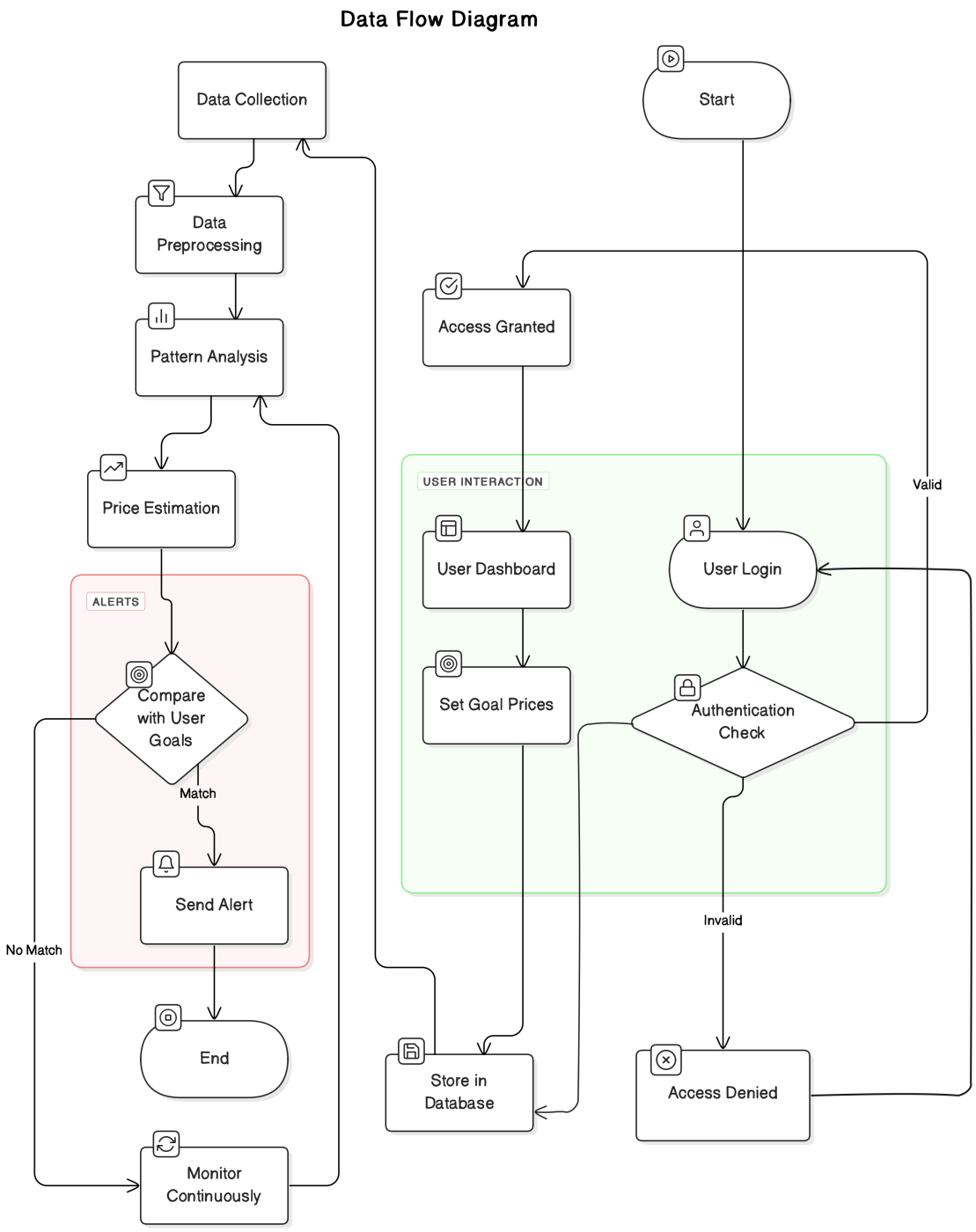

Figure 5.3: Data Flow Diagram

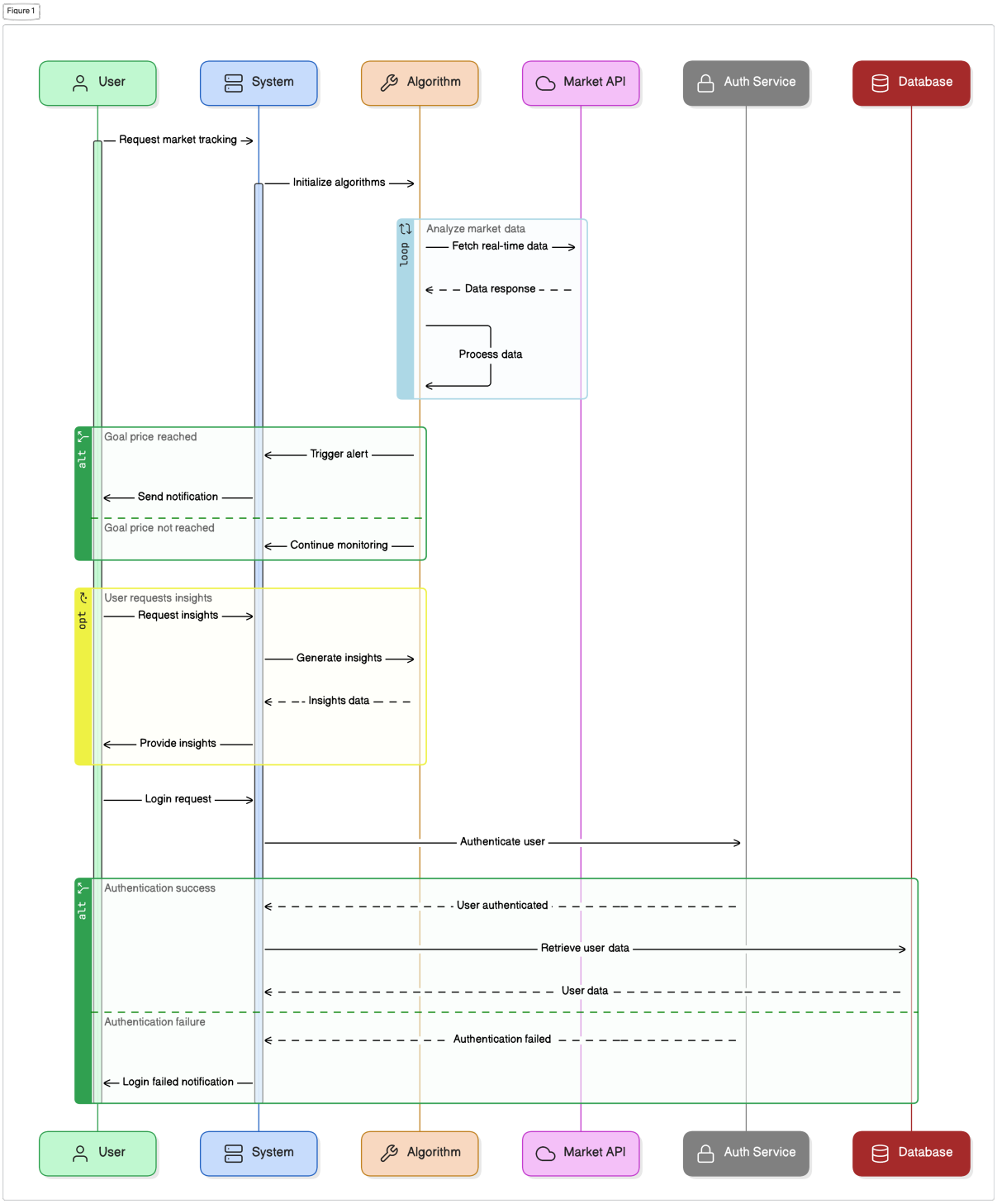

Figure 5.4: Sequence Diagram

CHAPTER 6

EXPECTED RESULTS

The expected results of this project are outlined below:

1. **Accurate stock prediction:**
    - Provide reliable forecasts of stock price movements using machine learning models.
    - Demonstrate model performance through metrics such as Mean Absolute Error (MAE) or Root Mean Squared Error (RMSE).
2. **Real-Time Stock Tracking:**
    - Successfully fetch and display live stock market data from integrated APIs.
    - Update data with minimal latency to ensure real-time accuracy.
3. **User Goal Notifications:**
    - Alert users instantly when their defined goal prices are reached.
    - Ensure notifications are delivered through selected channels, such as push notifications or email.
4. **Interactive Visualization:**
    - Display clear and intuitive graphs for stock trends, both historical and predicted.
    - Provide dashboards that allow users to monitor multiple stocks and goals simultaneously.
5. **Seamless User Experience:**
    - Ensure an intuitive, responsive interface across devices (mobile, tablet, and desktop).
    - Facilitate smooth interactions for setting goals, viewing predictions, and managing notifications.

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