ALGOTRADEX: AN ALGORITHMIC TRADING PLATFORM

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Abstract : Stock market trading requires continuous monitoring and quick decision making. Manual trading is often influenced by human emotions and delayed reactions, which can lead to financial losses. This paper presents AlgoTradeX, an intelligent algorithmic trading platform designed to automate stock analysis and trading. The system uses historical market data to compute technical indicators such as Relative Strength Index (RSI) and Moving Average and incorporates fundamental analysis using key financial metrics to improve decision-making. For price updates and trade execution, the platform relies on delayed market data (near real-time with a short lag), ensuring practical and reliable operation without requiring direct exchange feeds. In addition to stock trading, the system supports mutual fund investments through a Systematic Investment Plan (SIP) module, enabling portfolio diversification. The platform also integrates a news analysis feature that retrieves the latest stock-related news using an external API, providing qualitative insights into market trends and company performance. The system is implemented using Flask for the web interface, Firebase for database management, and the Yahoo Finance API for data retrieval. The proposed system improves trading efficiency, reduces manual effort, and provides a structured, data-driven investment approach.

***Index Terms* - Algorithmic Trading, Stock Prediction, RSI, Moving Average, Automation, Firebase, Flask.**

I. INTRODUCTION

The rapid growth of financial markets and the increasing availability of market data have made algorithmic trading an essential tool for modern investors. Traditional trading methods rely heavily on manual analysis, which is time-consuming and often prone to human errors and emotional bias. With advancements in data science and automation, intelligent trading systems can analyze large volumes of data and execute trades more efficiently and accurately.

AlgoTradeX is developed to address these challenges by providing an automated and user-friendly platform that integrates stock analysis, portfolio tracking, and investment planning. The system leverages technical indicators and analytical models to assist users in making informed financial decisions. It combines historical data for analysis with delayed market data (with a short time lag) for price updates and trade execution, ensuring practical and reliable performance. In addition to quantitative analysis, the platform integrates a news analysis feature that provides users with the latest stock-related news. This helps users understand market sentiment and external factors affecting stock prices, thereby supporting more informed and balanced investment decisions.

II. LITERATURE REVIEW

Recent research in algorithmic trading highlights the growing use of artificial intelligence, machine learning, and data-driven techniques to improve trading performance and decision-making. Several studies focus on integrating technical indicators with advanced models to enhance prediction accuracy and profitability. Machine learning and reinforcement learning approaches have been widely explored for developing adaptive trading systems. Studies such as [1], [6], [8], and [10] demonstrate that intelligent models can learn from market data, adapt to changing conditions, and generate more accurate trading signals. Similarly, neural network-based approaches, including ensemble models as discussed in [9], improve prediction reliability by combining multiple learning methods.Simulation-based and educational systems, such as those presented in [2] and [3], provide controlled environments to test trading strategies without financial risk. These systems are useful for understanding market behavior and evaluating algorithm performance before real-world implementation.

Several works, including [4] and [11], focus on the architecture and design of algorithmic trading systems, emphasizing the importance of automation, speed, and efficient data processing in modern financial markets. Additionally, data science-driven approaches, as highlighted in [7], stress the role of real-time analytics and dynamic models in optimizing trading outcomes. Overall, existing research primarily addresses specific aspects of algorithmic trading, such as prediction models, simulation frameworks, or system architecture. However, there is limited focus on developing a unified platform that integrates stock analysis, signal generation, portfolio analysis, and investment planning. This limitation motivates the development of the proposed AlgoTradeX system.

III. PROPOSED SYSTEM

AlgoTradeX is an intelligent algorithmic trading platform designed to automate stock market analysis and trading decisions. The system integrates data collection, analysis, and execution into a single platform to improve efficiency and reduce human intervention.The platform consists of multiple modules, including a web-based user interface, backend processing system, analysis engine, and database. The web application is developed using Flask, allowing users to interact with the system, view stock data, and manage their investments.The system collects stock market data using the Yahoo Finance API. It uses historical data for analysis and delayed market data (with a short time lag) for price updates and trade execution.

Technical analysis is performed using indicators such as Relative Strength Index (RSI) and Moving Average crossover, while fundamental analysis evaluates financial parameters like P/E ratio, return on equity, and profit margins.A decision-making module processes these inputs to generate Buy, Sell, or Hold signals. The system also supports automated trading, where trades are executed based on predefined conditions such as stop-loss and target price.

All user data, including transactions and holdings, is stored in Firebase. In addition to quantitative analysis, the system includes a news analysis module that fetches the latest stock-related news using an external API. This feature provides users with qualitative insights into market trends, company developments, and external factors influencing stock prices. Furthermore, the platform supports mutual fund investments through a Systematic Investment Plan (SIP) module, enabling users to invest periodically and diversify their portfolio. The overall system architecture of AlgoTradeX is shown in Fig. 1.

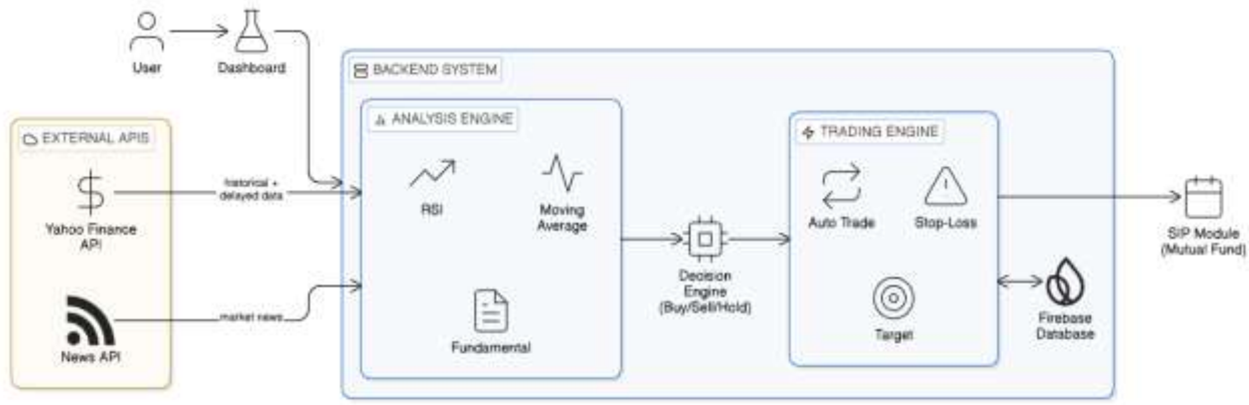

Fig. 1. system architecture of algotradex

IV. METHODOLOGY

The proposed system follows a structured methodology to automate stock analysis and trading. It consists of multiple stages including data collection, preprocessing, analysis, decision-making, and execution. The system integrates both quantitative and qualitative approaches to improve investment decisions.

4.1 Data Collection

The system collects stock market data using the Yahoo Finance API. Two types of data are utilized:

- Historical Data: Used for calculating technical indicators and analyzing trends.
- Delayed Market Data: Used for updating stock prices and executing trades, with a short time lag.

The collected data includes closing prices, price history, and financial information required for analysis.

4.2 Data Preprocessing

The collected data is cleaned and prepared before analysis. Missing or invalid values are handled, and relevant features such as closing prices are extracted. The data is then converted into a structured format suitable for applying analytical models.

4.3 Technical Analysis

The system applies technical indicators to identify trading opportunities:

- **Relative Strength Index (RSI)**

  Detects overbought and oversold conditions:
  - RSI > 70 → Sell
  - RSI < 30 → Buy
  - Otherwise → Hold
- **Moving Average Crossover**

  Identifies trend changes:
  - Short-term average crossing above long-term → Buy
  - Short-term average crossing below long-term → Sell

These indicators help in understanding market trends and predicting price movements.

4.4 Fundamental Analysis

The system evaluates financial parameters such as:

- Price-to-Earnings (P/E) Ratio
- Return on Equity (ROE)
- Profit Margin

Based on these values, the system generates a Buy, Sell, or Hold recommendation to support decision-making.

4.5 News Analysis Module

In addition to numerical analysis, the system integrates a news analysis feature using an external News API. It retrieves the latest stock-related news based on company names or stock symbols. The news includes headlines, sources, and timestamps, providing users with insights into market sentiment, company developments, and external factors that may influence stock prices. This qualitative information helps users make more informed investment decisions.

4.6 Decision-Making Module

The outputs from technical analysis, fundamental analysis, and supporting news insights are combined to generate a final decision:

- **Buy**: When indicators suggest favorable conditions
- **Sell**: When indicators indicate risk or negative trends
- **Hold**: When no strong signal is present

This multi-factor approach improves the reliability of trading decisions.

4.7 Trade Execution

The system supports both manual and automated trading:

- **Manual Trading**: Users can buy or sell stocks through the interface
- **Automated Trading**: Trades are executed automatically based on predefined conditions such as:
  - Stop-loss
  - Target price
  - Signal confirmation

The system uses delayed market data for execution.

4.8 Portfolio Analysis

Portfolio analysis examines the composition and performance of investments through portfolio trend, stock allocation, market capitalization distribution, and sector distribution. It offers a structured understanding of asset spread, diversification level, and exposure patterns to support better investment planning and decision-making.

4.9 SIP Investment Module

The system includes a Systematic Investment Plan (SIP) feature for mutual funds. It allows users to invest a fixed amount at regular intervals. The system calculates units based on NAV and updates holdings accordingly, supporting long-term investment and diversification. The methodology integrates data collection, technical and fundamental analysis, news-based insights, and automated execution into a continuous workflow. This approach enables efficient, accurate, and data-driven trading decisions.
The workflow of the proposed system is illustrated in Fig. 2.

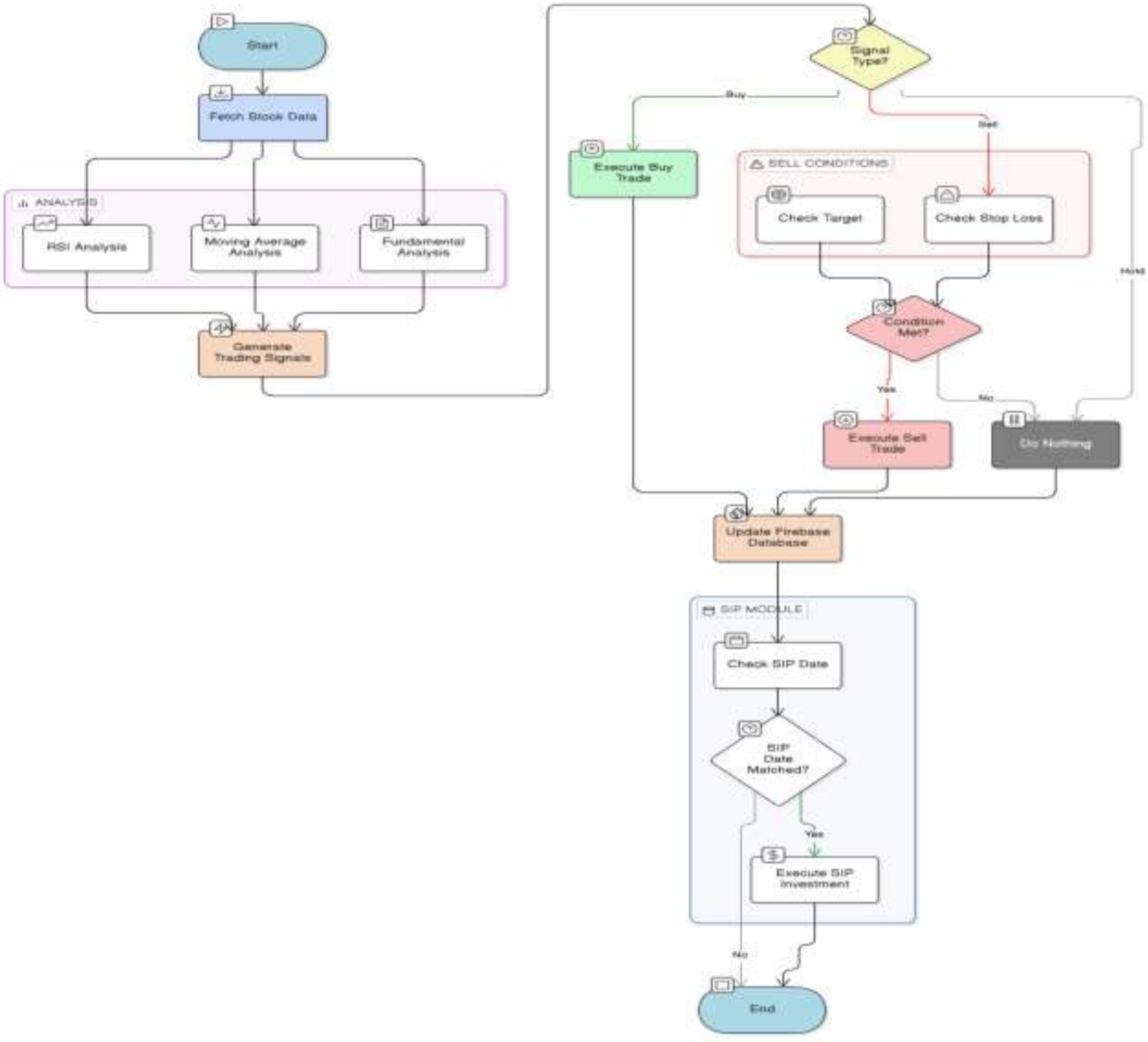

Fig. 2. flowchart of algotradex

V. ALGORITHMS

The proposed system utilizes a combination of technical, fundamental, and decision-making algorithms to analyze stock data and generate trading signals. These algorithms work together to provide accurate and reliable investment decisions.

5.1 Relative Strength Index (RSI) Algorithm

The Relative Strength Index (RSI) is a momentum-based indicator used to evaluate whether a stock is overbought or oversold.

Algorithm Steps:

1. Input historical closing price series
2. Compute price differences between consecutive days
3. Separate positive gains and negative losses
4. Calculate average gain and average loss over a fixed period (typically 14 days)
5. Compute Relative Strength (RS):

$$RS = \frac{Average\ Gain}{Average\ Loss}$$

6. Calculate RSI value:

$$RSI = 100 - \left(\frac{100}{1 + RS}\right)$$

Decision Criteria:

- RSI < 30 → Buy
- RSI > 70 → Sell
- RSI between 30 and 70 → Hold

5.2 Moving Average Crossover Algorithm

This algorithm identifies trend changes by comparing short-term and long-term moving averages.

Algorithm Steps:

1. Input historical price data
2. Calculate short-term moving average (e.g., 10-day)
3. Calculate long-term moving average (e.g., 30-day)
4. Compare current and previous values of both averages

Decision Criteria:

- Short-term MA crosses above long-term MA → Buy (Golden Cross)
- Short-term MA crosses below long-term MA → Sell (Death Cross)
- Otherwise → Hold

5.3 Fundamental Analysis Algorithm

This algorithm evaluates the financial performance of a company using key financial indicators.

Input Parameters:

- Price-to-Earnings (P/E) Ratio
- Return on Equity (ROE)
- Profit Margin

Algorithm Steps:

1. Fetch financial data for the selected stock
2. Evaluate each parameter against predefined thresholds
3. Determine overall financial strength

Decision Criteria:

- ROE ≤ 5% → Sell
- P/E > 25 → Sell
- Profit Margin < 5% → Sell
- P/E < 15 AND ROE > 15% AND Margin > 10% → Buy
- Otherwise → Hold

5.4 News Analysis Algorithm

The system incorporates a news analysis mechanism to provide qualitative insights into market conditions.

Algorithm Steps:

1. Fetch latest news using a News API based on stock symbol or company name
2. Extract relevant information such as title, source, and timestamp
3. Display news to the user for analysis

5.5 Decision-Making Algorithm (Multi-Signal Logic)

The system combines signals from different modules to make final decisions.

Algorithm Steps:

1. Collect signals from:
   - Moving Average
   - RSI

   - Fundamental Analysis
2. Apply priority-based decision logic

Decision Criteria:

- Any Signal=Sell→ Sell
- No Sell AND any signal = Buy→ Buy
- Otherwise→ Hold

5.6 Auto Trading Algorithm (Actual Code Logic)

The system includes an automated trading engine with strict conditions.

Algorithm Steps:

1. Check if auto-buy is enabled
2. Verify:
   - Maximum investment limit
   - Maximum number of trades
3. Skip stock if:
   - Already owned
   - RSI = Sell
4. Check user balance
5. Execute Buy if conditions are satisfied
6. Update holdings and balance

Decision Criteria:

- Auto-buy disabled → Skip
- Max trades reached → Disable auto-buy
- Investment limit reached → Disable auto-buy
- RSI = Sell → Skip
- Not enough balance → Skip
- All conditions satisfied → Buy

5.7 Sell Execution Algorithm

The system uses two modes for selling:

1. Stop-Loss / Target Mode

- If price ≤ stop-loss → Sell
- If price ≥ target → Sell

2. Signal-Based Sell Mode

- Sell signal must persist for a fixed time (confirmation delay)
- Prevents false signals

Decision Criteria:

- Price ≤ Stop-loss → Sell immediately
- Price ≥ Target → Sell immediately
- Sell signal detected → Start timer
- Signal persists after delay → Sell
- Signal disappears → Cancel sell

5.8 SIP Investment Algorithm

This algorithm automates mutual fund investments using a Systematic Investment Plan (SIP).

Algorithm Steps:

1. Retrieve active SIP details for users
2. Check if current date matches SIP investment day
3. Skip if already executed or balance is insufficient
4. Fetch latest NAV of the mutual fund
5. Calculate units = Amount / NAV
6. Deduct amount from user balance
7. Update mutual fund holdings
8. Record transaction to prevent duplication

Decision Criteria:

- If SIP day ≠ current day → Skip
- If already executed → Skip
- If insufficient balance → Skip
- Otherwise → Execute SIP

The system integrates multiple algorithms, including technical indicators, fundamental evaluation, and rule-based automation. The use of priority-based decision logic, and controlled auto-trading enhances reliability, reduces risk, and improves trading performance

VI. CONCLUSION AND FUTURE SCOPE

A. Conclusion

AlgoTradeX provides an automated and intelligent platform for stock analysis and trading. By integrating technical indicators, fundamental analysis, and rule-based automation, the system reduces manual effort and improves decision-making. The inclusion of features such as auto trading, portfolio analysis, SIP investment, and news analysis makes the system comprehensive and user-friendly.

B. Future Scope

The system can be further improved by integrating machine learning models for better prediction accuracy. Additional features such as risk management strategies, real-time data integration, and a mobile application can enhance usability. The platform can also be expanded to support global markets and advanced analytics.

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