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# AI Based Stock Price Tracker

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**Abstract:** *The Stock Price Prediction Application helps users forecast stock trends using machine learning (LSTM/GRU models) and real-time news sentiment analysis. By analyzing historical stock data, it predicts future prices, while sentiment scores from news headlines offer insights into market mood. The applications's simple interface, built with Streamlit, lets users enter stock symbols, view predictions, and compare them to historical trends. It also provides trading signals (buy/sell/hold) based on predictions and sentiment. Designed for both beginners and experts, the applications combines technical analysis and market sentiment to support smarter, data-driven investment decisions. No coding skills are required to use this tool.*

**Keywords:** Stock Price Prediction, Machine Learning (LSTM/GRU), Sentiment Analysis, Financial Forecasting, Trading Signals, Streamlit Application

## I. INTRODUCTION

The stock market's inherent volatility and sensitivity to global events make accurate price prediction a complex yet critical challenge for investors. Traditional forecasting methods often rely on historical price trends but overlook the impact of real-time market sentiment derived from news and social media. To address this gap, this project introduces a Stock Price Prediction Application that synergizes machine learning (ML) and natural language processing (NLP) to deliver robust predictions and actionable insights.

The application employs Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU) models, renowned for their efficacy in analyzing time-series data, to forecast stock prices using historical trading data from Yahoo Finance. Complementing this, a sentiment analysis module processes recent news headlines related to the stock, leveraging the VADER sentiment analyzer enhanced with domain-specific financial keywords to quantify market sentiment. This dual approach—technical analysis and sentiment evaluation—enables the generation of trading signals (buy/sell/hold) tailored to current market conditions.

Built on Streamlit, the application prioritizes accessibility, offering an intuitive interface for users to input stock tickers, visualize predictions, and interpret results without requiring coding expertise. By bridging advanced ML techniques with real-world usability, this project aims to democratize data-driven decision-making in finance, empowering both novice and seasoned investors to navigate the stock market with greater confidence and precision

### Objectives

- Implement Predictive Models: Develop and deploy LSTM model and GRU model to accurately predict future stock prices based on historical data.
- Conduct Sentiment Analysis: Analyze recent news headlines using Natural Language Processing to determine the overall market sentiment affecting stock prices.
- Generate Trading Signals: Provide users with actionable trading recommendations (buy, sell, hold) based on the predicted stock prices and sentiment scores.
- Create an Intuitive User Interface: Design a user-friendly web application that allows users to easily input stock tickers and view predictions and analyses.
- Integrate Real-time Data: Fetch and display real-time stock data and news articles to ensure that predictions and sentiment analyses are based on the most current information available.


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**Scope**

User Authentication: The application will feature secure user registration and login functionalities to ensure personalized access to stock predictions and insights.

Stock Price Prediction: Utilizing advanced machine learning models like LSTM and GRU, the applications will predict future stock prices based on historical data and user-selected parameters.

Sentiment Analysis and Visualization: The application will analyze real-time news sentiment and provide interactive visualizations of stock trends, including trading signals for informed decision-making.

## II. LITERATURE SURVEY

[1] Tian Ye (ICIM, 2021) developed a hybrid prediction model that uses wavelet transformation to decompose stock prices into reconstructed and error sequences. ARIMA was applied to the main trend, and Support Vector Regression (SVR) handled the residuals. The model achieved a Mean Squared Error (MSE) of 0.57 on Chinese stock data, demonstrating the effectiveness of combining linear and nonlinear models.

[2] Rafael Ramos et al. (IJCNN, 2021) proposed a feature extraction approach using Restricted Boltzmann Machines (RBMs) for historical stock data. After dimensionality reduction, Support Vector Machines (SVM) were used for classification. Tested on Brazil's BM&F BOVESPA market, the model achieved an accuracy range of 54% to 66%, highlighting the impact of deep feature learning.

[3] Xinxin Jiang et al. (IJCNN, 2020) presented a cross-domain attention-based deep learning model that incorporated data from the US, China, and India. The attention mechanism improved the model's ability to capture inter-market dependencies. Metrics such as F1 score and AUC showed high performance before and after financial crises, indicating robustness in volatile conditions.

[4] Chen, Zhou, and Dan (ICCEAI, 2021) focused on improving LSTM and GRU model accuracy for the Chinese stock market. Their preprocessing involved standardization, trend filtering, and Independent Component Analysis (ICA), which helped reduce overfitting and improve prediction reliability.

[5] Pandey & Soni (Procedia Computer Science, 2020) applied LSTM to the Indian stock market, specifically NIFTY 50 index forecasting. Their model captured temporal dependencies in daily stock prices and outperformed ARIMA in trend prediction. This study validated the utility of LSTM in capturing non-linear patterns in Indian financial data.

[6] Sharma et al. (International Journal of Computer Applications, 2019) integrated technical indicators such as RSI, MACD, and moving averages into an LSTM-based forecasting model for Indian equities. Their results showed that combining technical indicators with deep learning improved accuracy significantly compared to raw price-based models.

[7] Gupta and Dhingra (IEEE Xplore, 2021) proposed a hybrid LSTM-GRU model trained on Indian stocks (Reliance, TCS, Infosys). By leveraging both models' memory capabilities, the hybrid model achieved lower Root Mean Square Error (RMSE) compared to standalone LSTM or GRU models, especially on volatile days.

## III. PROPOSED WORK

### 3.1 System Requirements

The development and deployment of the AI-based Journal Management System require specific hardware and software configurations to ensure efficient performance, scalability, and security.

**Hardware Requirements**

| Component | Minimum Requirements | Recommended Requirements |
|---|---|---|
| Processor | Dual-core CPU (Intel i3 or equivalent) | Quad-core CPU (Intel i5 or equivalent) |
| RAM | 8 GB | 16 GB or more |
| Storage | 10 GB of free disk space | SSD with at least 20 GB of free space |
| Graphics | Integrated graphics | Dedicated GPU (NVIDIA GTX 1050 or equivalent) |

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| Component | Minimum Requirements | Recommended Requirements |
|---|---|---|
| Operating System | Windows, macOS, or Linux | Windows, macOS, or Linux |
| Python Environment | Python 3.7 or higher with required libraries | Python 3.7 or higher with required libraries |

### 3.2 Methodology

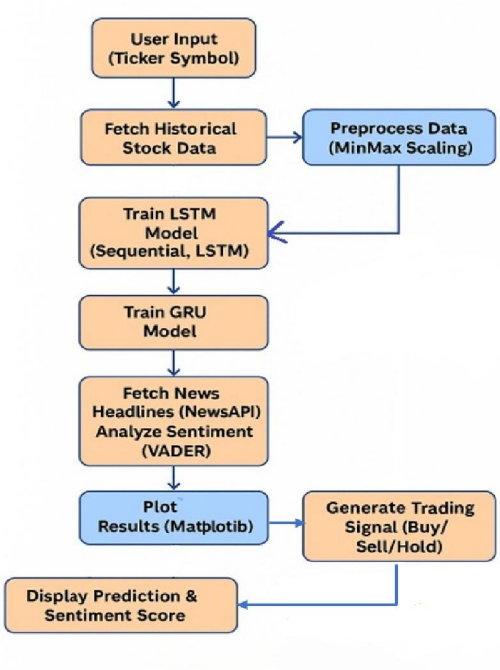


Fig: Flow Diagram

1. User Input (Ticker Symbol): The user starts by entering a stock ticker symbol (e.g., AAPL, MSFT) into the application. This ticker serves as the unique identifier for fetching relevant financial data. It acts as the key to access historical and real-time stock market information.
2. Fetch Historical Stock Data: The system retrieves historical price data (such as Open, High, Low, Close, and Volume) for the selected stock. This is done using APIs like Yahoo Finance or yFinance. The data forms the foundation for model training and predictions.
3. Preprocess Data (MinMax Scaling): The collected data is cleaned to handle missing or inconsistent values. It is then scaled using MinMaxScaler to normalize values between 0 and 1. Normalization ensures efficient and stable training of deep learning models.
4. Train LSTM Model: A Sequential LSTM (Long Short-Term Memory) model is created and trained on the normalized data. LSTM is a type of recurrent neural network well-suited for time-series forecasting. It learns patterns in stock price movements to predict future trends.
5. Train GRU Model: A GRU (Gated Recurrent Unit) model is also trained on the same dataset for comparison. GRUs are similar to LSTMs but are computationally faster and less complex. The goal is to evaluate which model performs better for stock prediction.
6. Fetch News Headlines & Analyze Sentiment: Recent news articles about the company are fetched using NewsAPI or similar services. Each headline is analyzed using VADER (Valence Aware Dictionary and sEntiment Reasoner) for sentiment scoring. This helps determine the market's mood (positive, negative, neutral) toward the stock.

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7. Plot Results (Matplotlib): The actual and predicted stock prices are plotted using Matplotlib for easy visualization. This allows users to visually compare the model's performance over time. Additional plots can show sentiment trends or model accuracy.
8. Generate Trading Signal: Based on model predictions and sentiment scores, trading decisions are generated. Rules such as "buy if positive sentiment and rising prices" are applied. The output is a simple recommendation: Buy, Sell, or Hold.
9. Display Prediction & Sentiment Score: The final prediction, trading signal, and sentiment analysis are presented in the UI. Users can view charts, predicted prices, and sentiment ratings in one place.This helps investors make informed decisions quickly and easily.

### 3.3 Implementation

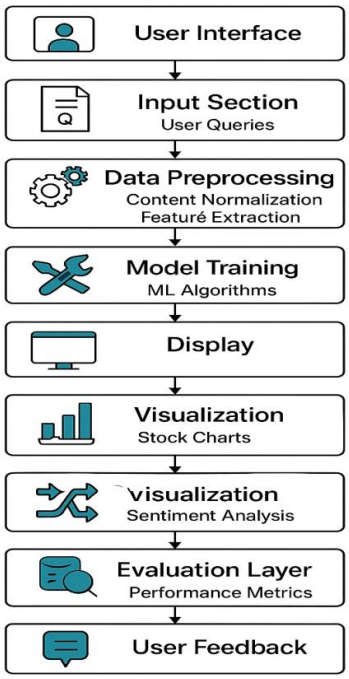


Fig : Implementation

- Data Fetching: The first step in the Stock Price Prediction Application is to get past stock data. This is done using the yFinance API, which is an easy tool to access stock information. The function fetch_historical_data(ticker, start_date, end_date) is used to get stock prices between two dates for any stock symbol. This past data is very important because it helps the model learn how stock prices moved before, so it can guess what might happen in the future.
- Data Preprocessing: After getting the data, we need to prepare it for the model. One important step is normalization, which means scaling all the prices between 0 and 1. The formula used is: Xscaled = (Xmax−Xmin) / (X−Xmin)
  This helps the model perform better because it treats all values fairly, and no big value can overpower small ones. This makes learning easier for the model.
- Creating Datasets for Time Series Prediction: For time series prediction, we need to make input and output pairs. The function create_dataset(data, time_step) does this. It takes a sequence of past prices as input, and the next price as output. It repeats this process for the full dataset. This helps the model understand the pattern in how prices change over time, which is very important for good predictions.

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**Building Machine Learning Models**

The main part of the application is the machine learning models – LSTM and GRU. These models are good at learning from data that changes over time, like stock prices. The LSTM model has different parts like input layers, LSTM layers, dropout layers (to avoid overfitting), and dense output layers. The LSTM updates its memory using this equation:

ht=σ(Wh-ht-1+Wx-xt+b).

The GRU model also controls how information flows. To check how good the model is, we use a loss function called Mean Squared

Error(MSE)： MSE= 1 / Ni = 1 Σ n (yi-y^i) 2

Making Prediction: Once the models are trained, they can predict future stock prices. They use the latest available data to guess the next price. The formula is:

y t+1=f(Xt), where f is the trained model.

Sentiment Analysis: The application also checks market mood using news headlines. It uses a tool called VADER to give a score for how positive or negative the news is. The sentiment score is:Sentiment Score=Positive−Negative

Trading Signal Generation: The application gives trading advice based on predictions and sentiment. If the predicted price is higher than the last price and sentiment is positive : BUY. If the predicted price is lower and sentiment is negative: SELL. If none of these conditions match: HOLD.

Visualization: Finally, the application shows charts to make everything easier to understand. Using Matplotlib, it draws actual stock prices and predicted prices on a graph.

## IV. RESULT AND DISCUSSION

### 4.1 Test Reports

The Stock Price Prediction Application underwent comprehensive testing to assess its functionality, reliability, and user experience. Functional testing was performed across various modules, including user authentication, stock price prediction, sentiment analysis, and trading signal generation. Each component was evaluated for accuracy and performance, ensuring that the application delivers reliable predictions and insights. User acceptance testing provided valuable feedback on the interface and usability, confirming that the application meets user expectations and operates smoothly across different devices.

### 4.2 Snapshots and User Interface Overview

4.1.1. Login Page: The Login Page serves as the initial gateway for users, allowing secure authentication and account creation. Testing confirmed that both login and signup functionalities operate seamlessly, enhancing user experience with clear prompts for entering credentials. The visually appealing design, complemented by a background image and custoCSS, creates an inviting atmosphere that encourages user engagement.

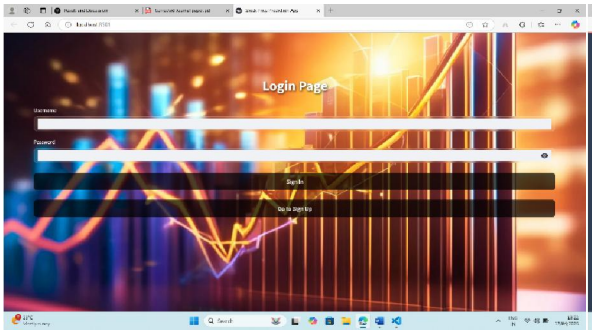


Fig 6.1 Login page

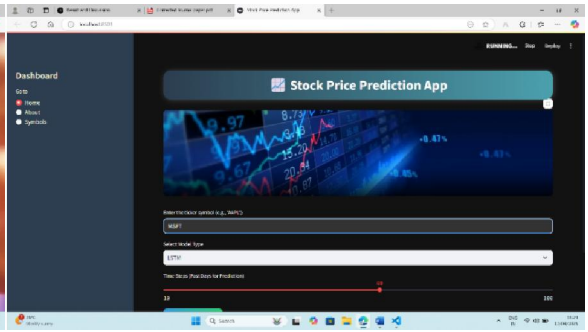


Fig 6.2 Home Page

4.1.2. Home Page: The Home Page provides a comprehensive overview of stock price predictions and market insights, with effective functionality for users to input ticker symbols and receive accurate forecasts. The integration of sentiment analysis results and trading signals adds significant value, helping users make informed investment decisions. The user-friendly layout and modern dark theme enhance engagement and overall experience.

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4.1.3. Symbols Page: The Symbols Page allows users to explore detailed stock information, including real-time data and historical trends, with accurate data retrieval from Yahoo Finance. Users appreciate the informative layout, featuring key metrics such as market cap and analyst ratings, along with candlestick charts and recent news articles. This page serves as a valuable resource for in-depth stock analysis, enhancing user engagement.

4.1.4. About Page: The About Page effectively communicates the applications's purpose, features, and benefits, providing users with essential context. Testing validated that the content is engaging and well-structured, helping users understand how to leverage the application for informed investment decisions. This page plays a vital role in user education and enhances overall engagement within the Stock Price Prediction Application.

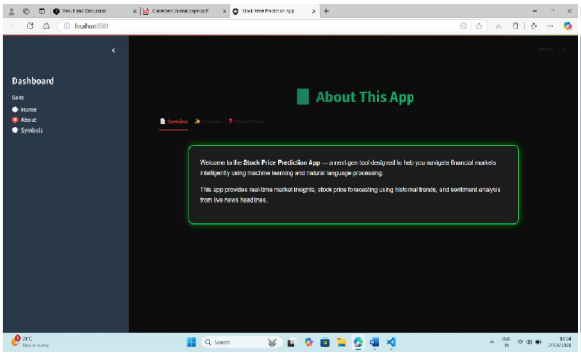


Fig 4.3 Symbols page

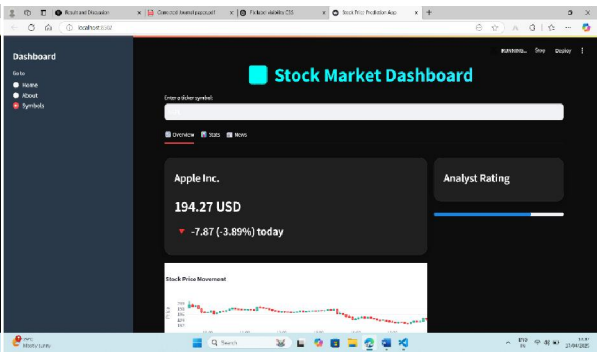


Fig 4.4 About page

## V. CONCLUSION

The Stock Price Prediction Application is an innovative tool that combines advanced Machine Learning techniques, specifically LSTM and GRU models, with Natural Language Processing to predict future stock prices and analyze market sentiment from news headlines. It offers users accurate stock price predictions, actionable trading signals, and a user-friendly interface built with Streamlit, enhancing the overall trading experience. By leveraging libraries such as TensorFlow and yFinance, the application provides a modular architecture that promotes maintainability and scalability. Future enhancements could include integrating more sophisticated models, real-time data updates, and personalized dashboards, making it a valuable resource for both novice and experienced traders seeking to make informed investment decisions in the dynamic stock market landscape.

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