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AI Based Visualizing and Forecasting Stocks

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***Abstract*— The prediction of a stock market direction may serve as an early recommendation system for short- term investors and as an early financial distress warning is the most important factor in selecting any forecasting method. Research efforts in improving the accuracy of forecasting models are increasing since thelast decade. The appropriate stock selections thatare suitable for investment is a very difficult task. The key factor for each investor is to earn maximum profits on their investments.**

The stock market is a complex and dynamic system influenced by a myriad of factors, making it a challenging domain for investors and analysts. AI technologies, including machine learning, deep learning, and natural language processing, have been deployed to process vast volumes of financial data and extract meaningful insights. AI models require vastamounts of data, including historical stock prices, trading volumes, news sentiment, and economic indicators. Data preprocessing techniques are used to clean, normalize, and prepare the data for analysis. AI- powered data visualization tools enable users to gain a better understanding of stock market trends and patterns.

***Keywords*— Data Preprocessing, Data Visualization, Machine Learning, Stock prediction**

I.INTRODUCTION

The stock market serves as a complex and dynamic system, influenced by an intricate interplay of diverse factors ranging from economic indicators to geopolitical events. Consequently, accurately predicting stock market directions has become increasingly imperative for investors seeking to optimize their investment strategies.In this context, AI technologies have emerged as powerfultools capable of processing extensive financial data and extracting valuable insights.

In this era of rapid technological advancement, where data is king, AI-driven stock analysis brings to the forefront the fusion of data science, predictive analytics, and financial expertise. This introduction provides a glimpse into the transformative potential of AI-based visualizing and forecasting for stocks, setting the stage for a deeper explorationof this dynamic field. The digital age has ushered in an era of unprecedented data generation and accessibility. Financial markets are no exception, with vast amounts of data, including historical price movements, trading volumes, news articles, earnings reports, and social media sentiment. This wealth of information presents a unique challenge and opportunity for AIto sift through this data and uncover insights that were previously hidden. Data visualization techniques powered by AI play a pivotal role in helping investors and analysts gain a deeper understanding of market trends. These techniques encompass a wide range of visuals, from traditional candlestickcharts and trend lines to more advanced tools like heatmaps, providing a visual narrative of stock movements and market sentiment.

Investments in the financial market are very popular because their returns are comparatively high than banks and other risk-free securities. According to behavioral finance, people are riskaverse. However, nowadays returns in risk-free security are very low so people are willing to take risks to get a good returnon investments. In particular, Equity markets are places where people and companies come to buy and sell securities. The relative strength Index(RSI) is a momentum indicator used in technical analysis. RSI measures the speed and magnitude of a security's recent price change to evaluate overvalued or undervalued conditions in the price of that security. The RSI can do more than point to overbought and oversold securities. It can also indicate securities that may be primed for a trend reversal or corrective pullback in price. It can signal when to buy and sell. Traditionally, an RSI reading of 70 or above indicates an overbought situation. A reading of 30 or below indicates an oversold condition. As a momentum indicator, the relative strength index compares a security's strength on days when prices go up to its

strength on days when prices go down. Relating the result of this comparison to price action can give traders an idea of how security may perform. RSI, make better informed trading decisions.

Trading strategy is one of the significant tool in the market that can help identify profitable investments. Thisstrategy is a part of technical analysis. Technical analysisis useful for the purpose of forecasting future prices and identifying price movements and trends. Technical indicators are known as the financial method in which developer applies mathematical and statistical formulas to the price of securities. There are several technical indicators like Trend Indicators, Volume Indicators, Momentum Indicators, and Volatility indicators. In this paper, we work on the Relative Strength Index (RSI) indicators. The RSI is the momentum indicator.

Exponential Moving Average - This is a type of indicatorwhich calculates the average very accurately because it gives higher priority to current price data. It gives a signalto buy or sell the stocks while break out happens. First comes the word what is moving average. Moving averageforms a line the lesser the closer to the price and the greater the number the farther from the price. It helps us in 2 jobs these are:

- Provide Support and Resistance
- Provide Cross Over.
- When price moves from top it provides support andwhen prices move from down then it provides Resistance.
- When 2 EMA rows cross each other then they generatethe signal to buy the stock or to sell the stock

II. LITERATURE REVIEW

A. Invention of RSI and EMA Indicator

Bhargavi. R et. al (2017) analyzed that the Relative Strength Index (RSI) effectively used to create a portfolio. They examined the performance of fundamental factors namely Earning Per Share (EPS) andPrice to Earning Ratio (P/E ratio) in the Indian Stock Market and concluded that P/E ratio more efficient than EPS.

Alhilfi (2019) studied the use of Relative StrengthIndex (RSI) plays a fundamental and effective role in rationalizing the speculation decisions of Bank of Baghdad shares listed on the Iraq Stock Exchange/in the shares of the Bank of Baghdad which listed in the Iraq Stock Exchange. The researcher investigated RSI helps inproactive predicting of price trends and what prices will be in the future.

Choudhuri (2019) proved that the returns generated by RSI were much higher than the simple buy and hold strategy.The researcher found that the probability of false signals was also limited.

Reddy and Cheerla(2019) checked that the validityof RSI in Indian stock market. They found that the RSI was the most accurate tool for predicting stock movements.

Anitha and Padmaja (2017) focused on comparing the effectiveness of different technical indicators. They concluded that technical indicators could play a useful role in the trade entry and exit points and also predict the immediate market trend.

Valarmathi and Kowsalya (2016) studied the technical analysis of five IT companies using the technical tools Relative Strength Index (RSI) and Exponential Moving Average (EMA). They found that the market trend of IT industry tendsup with gradual price fluctuation.

Vaghela and Gor (2020) worked on the combination of Elliott Wave theory and sentiment indicator to identify future market direction. They tried to reduce the complexity of Elliott Wave theory by using sentiment indicator.

Panchal and Gor (2020) converted chart pattern of technical indicators which followed mean reversion into numeric form and determined buy and sell signal of investmentwithout having to test the chart pattern. They tried to describe the hold phenomenon in the stock market.

Panchal and Gor (2020) attempted to construct a hybrid strategy of Exponential Moving Average and Parabolic Stop and Reversal, which follows Mean Reversion process. They conclude that the hybrid strategy provides better long and shortpositions in the market and good strength of trend rather than individual indicator.

B. Stock Market using Machine Learning (EMA)

The stock market is the future of the Indian economy and it is the key feature of the Indian economy that's why we work in stock price prediction by using machine learning, the practice of stock market prediction is not new but the question is that ISALL PRACTICES SUCCEDED? This is the very big questionin front of all Indians. But now our technique gives almost 95% accuracy to predict the prices of stocks in NSE and BSE exchange. Mostly there are two ways to analyze any stock pricewhich is fundamental and technical analysis. We are using an Exponential Moving average for a better prediction of stock prices. EMA is a type of technical analysis. We are using 200 EMA and 50 EMA and wait for cross over, if any cross over then we calculate Stochastic RSI on Current Candlestick then we predict the stock Price using Machine Learning Algorithmto train the model.

C. Market Prediction by RSI(Relative Strength Index)

Trading strategy is one of the significant tool in the market thatcan help identify profitable investments. This strategy is a partof technical analysis. Technical analysis is useful for the purpose of forecasting future prices and identifying price movements and trends. Technical indicators are known as the financial method in which developer applies mathematical and statistical formulas to the price of securities. There are several technical indicators like Trend Indicators, Volume Indicators, Momentum Indicators, and Volatility indicators. In this paper, we work on the Relative Strength Index (RSI) indicators. The RSI is the momentum indicator.

III. EXISTING AND PROPOSED SYSTEM

A. Existing System

Nowadays, as the connections between worldwide economies are tightened by globalization, external perturbations to the financial markets are no longer domestic. With evolving capital markets, more and moredata is being created daily. The intrinsic value of a company's stock is the value determined by estimating the expected future cash flows of a stock and discountingthem to the present, which is known as the book value. This is distinct from the market value of the stock, that isdetermined by the company's stock price. This market value of a stock can deviate from the intrinsic value due to reasons unrelated to the company's fundamental operations, such as market sentiment. The fluctuation of stock market is violent and there are many complicated financial indicators. Only few people with extensive experience and knowledge can understand the meaning of the indicators and use them to make good prediction to get fortune. Most people have to rely solely on luck to earn money from stock trading. However, theadvancement in technology, provides an opportunity to gain steady fortune from stock market and also can help experts to find out the most informative indicators to make better prediction. The prediction of the marketvalue is 10 of paramount importance to help inmaximizing the profit of stock option purchase while keeping the risk low.

Limitations:

- Data Quality and Availability: Predictive modelsrely heavily on the quality and availability of data. Financial data, although abundant, can oftenbe noisy, incomplete, or unreliable. Missing or incorrect data can significantly impact the accuracy of predictions.
- Complexity of Financial Markets: Financial markets are influenced by a myriad of factors, including economic indicators, geopolitical events, investor sentiment, and market psychology. Capturing and incorporating all relevant information into predictive models can be challenging, if impossible.
- Non-linear Dynamics: Stock prices often exhibitnon-linear behaviour, making them difficult to predict using traditional linear models. Market trends can change rapidly and unexpectedly, leading to unpredictable fluctuations in stock prices.

B. Proposed System

Stock prediction projects utilizing the Relative Strength Index (RSI) and Exponential Moving Average (EMA) algorithms typically incorporate a combination of technical analysis techniques and machine learning methodologies. These systems gather historical stock price data, often from financial databases or APIs, and apply the RSI and EMA algorithms to identify potential buy or sell signals based on overbought or oversold conditions and trend direction.Moreover, machine learning models such as regression, classification, or time series forecasting algorithms are employed to refine predictions and capture more nuanced patterns in the data. Feature engineering techniques may be applied to extract relevant information from the raw data, while model evaluation and validation processes help assess predictive accuracy and generalization performance. Additionally, some systems may integrate sentiment analysis of news articles, social media feeds, or financial reports to incorporate external factors that could influence stock price movements. These systems are often deployed as standalone applications or integrated into trading platforms, providing users with actionable insights and decision support tools to inform their investment strategies. However, it's important to note that while these systems can offer valuable guidance, theyare not foolproof and should be used in conjunction withthorough research and risk management practices.

ADVANTAGES OF PROPOSED SYSTEM:

- Data-Driven Decision Making: By leveraging historical stock price data and technical analysis techniques like RSI and EMA, the system can identify potential buy or sell signals based on well-established indicators of market momentum and trend direction.
- Improved Prediction Accuracy: Incorporating machine learning models allows the system to refine predictions and capture nuanced patterns in the data that may not be evident through traditional technical analysis alone. This can lead to more accurate forecasts of future stock price movements.
- Enhanced Risk Management: Through model evaluation and validation processes, the system can assess predictive accuracy and generalization performance, helping investors make more informed decisions and manage risk more effectively.
- Incorporation of External Factors: By integrating sentiment analysis of news articles, social media feeds, and financial reports, the system can incorporate external factors that may influence stock price movements. This holistic approach to analysis

provides a more comprehensive view of market dynamics and potential drivers of stock price changes.

- Actionable Insights: The system can provide users with actionable insights and decision support tools to inform their investment strategies.

IV.METHODOLOGY

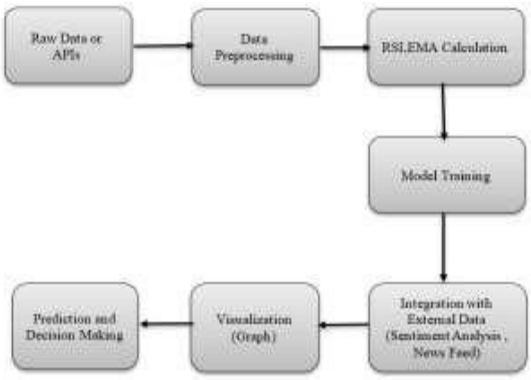
A.PROBLEM STATEMENT

Investors are familiar with the saying, “buy low, sell high” but this does not provide enough context to make proper investment decisions. Before an investor invests in any stock, he needs to be aware how the stock market behaves. Investing in a good stock but at a bad time can have disastrous results, while investment in a mediocre stock at the right time can bear profits. Financial investorsof today are facing this problem of trading as they do notproperly understand as to which stocks to buy or which stocks to sell in order to get optimum profits. Predicting long term value of the stock is relatively easy than predicting on day-to-day basis as the stocks fluctuate rapidly every hour based on world events.

B.SYSTEM OVERVIEW

In the stock prediction project, the journey begins with the collection of historical stock price data from financial databases or APIs. This data, encompassing open, high, low, close prices, and trading volume, undergoespreprocessing to eliminate outliers, address missing values, and format it suitably for analysis. Subsequently, relevant features are extracted through feature engineering, including the calculation of RSI and EMA values based on specified parameters. The RSI algorithm evaluates recent price changes to discern overbought or oversold conditions, while the EMA algorithm smooths out price data, spotlighting trends over time. Machine learning enters the scene with the implementation of regression or classification models trained on historical data and extracted features, discerning patterns to predictfuture stock prices or movements.

The model's performance is then rigorously evaluated through metrics like accuracy or Mean Absolute Error, employing techniques such as cross-validation. Integration with external data, like sentiment analysis of news articles or social media feeds, may further enrich predictions by incorporating external factors influencing stock prices. Utilizing these predictions, trading decisionssuch as buy, sell, or hold can be automated or offered as guidance to human traders. Continuous learning and adaptation through a feedback loop refine the system's accuracy and performance over time. Visualizations and reports summarize predictions, model performance, and key insights, aiding stakeholders in decision-making. Ultimately, the system may be deployed as a standalone application or integrated into trading platforms,furnishing real-time decision support to investors and traders.



System Architecture

Data Collection: Obtain historical stock price data for the desired stocks. You can use APIs like Alpha Vantage, Yahoo Finance, to fetch this data.

Data Preprocessing: Clean and preprocess the data. This involves handling missing values, adjusting for stock splits, and organizing the data into a format suitable for analysis.

Feature Engineering: Calculate the RSI and EMA indicators.

RSI measures the magnitude of recent price changes to evaluate overbought or oversold conditions, while EMA gives more weight to recent prices, making it more responsive to recent price changes.

Model Development: Develop a predictive model using the RSI, EMA, and possibly other technical indicators. You can use regression models, machine learning algorithms like decision trees, random forests, or even neural networks for thispurpose.

Training and Testing: Split your data into training and testing sets. Train your model using the training data and evaluate its performance on the testing data.

Prediction: Use your trained model to make predictions on future stock prices based on new data.

Evaluation: Evaluate the performance of your model using metrics such as accuracy, precision, recall, or Mean Squared Error (MSE).

Deployment: Once satisfied with the model's performance, youcan deploy it in a production environment where it can make real-time predictions.

This architecture outlines the flow of data and processes within the stock prediction project. It starts with data collection from financial databases or APIs, followed by preprocessing to clean and format the data. Feature engineering extracts relevantfeatures, including RSI and EMA values. Machine learning models are then trained on the data, and their performance is evaluated. Integration with external data enriches predictions, and decisions are made based on these predictions, eitherthrough automation or human guidance. Continuous learning and adaptation occur through a feedback loop, and visualizations and reports summarize insights for stakeholders.

RSI (RELATIVE STRENGTH INDEX):

The Relative Strength Index (RSI) serves as a momentumindicator within technical analysis, designed to assess thevelocity and magnitude of recent price changes for a given security.

Differentiate between gains and losses. Assign a value ofO for periods where the price remained unchanged or decreased (loss), and assign the actual price change for periods where the price increased (gain).

Calculate average gains and losses: Calculate the averagegain and average loss over the specified period. This is usually done by summing the gains and losses over the specified period and dividing by the period length.

Divide the average gain by the average loss to get the relative strength (RS).

Use the RS to calculate the RSI value using the formula:

$$RSI = 100 - [\ 100/1 + RS]$$

where, $Relative\ Strength\ (RS) = Average\ Gain\ Average/\ Loss$

$First\ Average\ Gain = Sum\ of\ Gains\ over\ the\ past\ n\ – periods/\ n$

$First\ Average\ Loss = Sum\ of\ Losses\ over\ the\ past\ n\ – periods\ /n$

$Average\ Gain = (previous\ Average\ Gain) \times (n - 1) + current\ Gain\ /n$

$Average\ Loss = (previous\ Average\ Loss) \times (n - 1) + current\ Loss\ /\ n$

$n = 14\ period$

EMA (EXPONENTIAL MOVING AVERAGE):

The Exponential Moving Average (EMA) belongs to the family of Moving Averages (MAs), which depict the average price of a security over a specified time period. Unlike simple moving averages, which assign equal weight to all data points within the chosen period, the EMA assigns greater significance to more recent price values.

Calculate the smoothing factor (a): Determine the smoothing factor based on the chosen period. The smoothing factor is calculated using the formula: Smoothing Factor=2 /Period+1

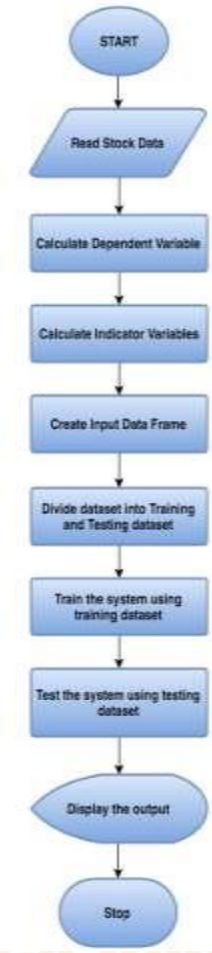
Calculate the initial EMA: Calculate the initial EMA value as the simple moving average of the first 'period' values.

$EMA_{today} = (Close_{today} — EMA_{yesterday}) \times Smoothing\ Factor + EMA_{yesterday}$

where,

- EMA_{today} is the EMA value for the current period.
- $Close_{today}$ is the closing price for the currentperiod.
- $EMA_{yesterday}$ is the EMA value for the previousperiod.
- The smoothing factor a is calculated as2/Period+1'

C.SYSTEM WORKFLOW



System Flow

Start: The process begins.

Data Collection and Preprocessing: Historical stock price datais collected from financial databases or APIs, and preprocessing is performed to clean outliers, handle missing values, and format the data for further analysis.

Feature Extraction (RSI, EMA): Relevant features like RSI andEMA are extracted from the preprocessed data.

Model Training and Evaluation: A machine learning model, such as regression or classification, is trained using the extracted features. The model's performance is evaluated usingmetrics like accuracy or Mean Absolute Error.

Prediction and Decision Making: The trained model is used to make predictions about future stock prices or movements.Based on these predictions, decisions such as buy, sell, or holdcan be made.

Visualization and Reporting: Visualizations and reports are generated to summarize the predictions, model performance, and key insights for stakeholders.

End: The process concludes.

V. CONCLUSION

Stock prediction projects that integrate technical analysis techniques such as the Relative Strength Index (RSI) andExponential Moving Average (EMA), along with machine learning methodologies, have emerged as sophisticated tools for investors and traders alike. By leveraging historical stock price data and employing advanced algorithms, these systems can discern potential buy or sell signals based on prevailing market conditionsand trend directions.

Furthermore, the incorporation of sentiment analysis from diverse sources such as news articles, social media feeds, and financial reports enriches the predictive models, providing additional insights into external factorsthat may influence stock price movements. This holistic approach enables investors to make more informed decisions, taking into account both quantitative and qualitative factors.

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