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# Stock Price Prediction using Long Short-Term Memory

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**Abstract:** *Implementing a stock price prediction model with the help of machine learning is our main approach in this project. In the fields like, stock price prediction, weather forecasting and others where prediction is important, machine learning is effectively implanted and also provided results with higher accuracy. Main objective behind the system is prediction of stock prices which will help new comers or less experienced peoples in investment and getting a return on their investments. The present study provides profound insights into the dynamic nature of stock markets, offering practical guidance and augmenting the existing theoretical underpinnings for newcomers and investors. Leveraging Deep Learning and Machine Learning models, the research focuses on forecasting future stock prices through the analysis of time-series data. By collecting historical stock data from reputable financial websites, a sequential model and LSTM (Long Short-Term Memory) neural network model are employed for training and predicting stock prices. Proposed system does the prediction based on machine learning, deep learning, Mathematical function, and other external factors such as news, disasters, wars etc. 'Intraday/Swing' and 'Long-term' are the two types of stocks. In intraday/swing, the stock is held for minimum of 1 day and maximum for 2 or 3 days. So, for the sequential predictions LSTM is most powerful. LSTM works on past stored data and information and makes an output.*

**Keywords:** ML, DL, LSTM, Trade open, Trade close, Trade High, Trade Low

## I. INTRODUCTION

Stock price prediction using LSTM (Long Short-Term Memory) is a popular approach that leverages deep learning techniques to forecast future stock prices based on historical price and volume data. LSTM is a type of recurrent neural network (RNN) architecture specifically designed to capture long-term dependencies in sequential data.LSTM models have gained attention in stock market prediction due to their ability to learn from the temporal patterns and relationships present in the historical data. By analyzing past price movements, volume trends, and other relevant features, LSTM models can potentially uncover complex patterns and make predictions about future stock price movements.

The key advantage of LSTM is its capability to address the vanishing gradient problem often encountered in traditional RNNs. By incorporating memory cells and gating mechanisms, LSTM can retain and selectively utilize information over long periods, enabling it to capture and learn from historical data over extended time intervals.Nevertheless, stock price prediction using LSTM has garnered significant interest from researchers and practitioners in the finance domain, as it holds the potential to assist investors, traders, and financial analysts in making more informed decisions based on anticipated price movements.

### 1.1 Study of Existing System:

In the existing system, comprising new comers, investors, institutions there a significant challenge. The absence of accuracy at each stage and reliance on traditional systems are major drawbacks. The existing system lacks assurance regarding accurate predicted prices. Additionally, difficulties arise in methods based on their accuracy.

**Drawbacks:**

1. Existing systems often struggle to consistently generate accurate forecasts due to the inherent complexity and unpredictability of the stock market.

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2. Sensitive to changes in market conditions and may not adapt well to new or unforeseen circumstances.
3. Dynamics of the stock market can vary over time, and models that perform well on historical data may not generalize effectively to future market conditions.
4. The stock market is highly competitive and efficient, making it difficult to gain a sustainable advantage solely through prediction algorithms.

It is crucial to consider these drawbacks and challenges when developing or relying on existing systems for stock price prediction. Improving prediction accuracy requires ongoing research, incorporating new data sources, addressing market dynamics, and considering the limitations and uncertainties inherent in the stock market.

## II. LITERATURE SURVEY

**Paper Name:** Stock Ranking Prediction Using List-Wise Approach and Node Embedding Technique (2021)
**Author Names:** SUMAN SAHA, JUNBIN GAO, AND RICHARD GERLACH
**Description:** Stock market prediction is an act of trying to determine the future value of a stock other financial instrument traded on a financial exchange. Stock ranking performance can be improved by incorporating the stock relation information in the prediction task. This paper explains the stock price prediction using machine learning. Stock relation information is given as the input to the machine learning model. The team used graph-based approach for stock ranking. The programming language is used to predict the stock market using machine learning is Python.

**Paper Name:** Stock Prediction Based on Genetic Algorithm Feature Selection and Long Short-Term Memory Neural Network (2021)
**Author Names:** SHILE CHEN AND
CHANGJUN ZHOU
**Description:** China has described with collective efforts that on day 14th of December 2021, there are many indicators which helps in predicting the stock price. Different factor affects the price of stock of different industry and regions. So, to overcome these we will require a single but multi-dimensional factor. This paper explains about use of genetic algorithm (GA) for feature selection and developing an optimized LSTM. Important factors are ranked using GA and then optimal combination of factors is obtained from trial-and-error method. At last combination of LSTM model and optimal factors is used for our purpose of predicting the stock price.

**Paper Name:** Stock Price Trend Prediction using MRCM-CNN (2021)
**Author Names:** Jufang Duan, Xiangyang Xu
**Description:** China had put efforts to find out the correlation in market price fluctuation in year of 2020 that, it is always great to find out that if the stock price next is going up or going down compared to today closing price. Investors and retailers are using different technologies like ARIMA to ANN for the accurate predictions. A new method MRCM-CNN which consist of time series reconstruction and deep neural network. Also, spearman's rank correlation (dependency measurement), segmentation and clustering. A CNN was developed on time series for predicting next day stock price selection. A new method MRCM-CNN which consist of time series reconstruction and deep neural network. Also, spearman's rank correlation (dependency measurement), segmentation and clustering. A CNN was developed on time series for predicting next day's stock price selection.

## III. PROPOSED METHODOLOGY

### 3.1 System Architecture

Collection of data for an organization is the first step and then the data is split into training and testing dataset. For our purpose, we are using 75% of data for training and remaining 25% for testing.Attributes required for the algorithm and model training are selected in pre-processing and the remaining attributes are neglected or removed. Trade open, Trade high, Trade close, Trade low and Trade volume are the required and important attributes and hence they are selected for further algorithms. Normalization is performed in pre-processing for getting values in a particular range.

The process of feature extraction aims to reduce the dimensionality of the data while retaining essential information that is necessary for the subsequent analysis or modelling. By extracting meaningful features, the subsequent learning

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algorithms can work more efficiently and effectively. Ex. Close Price, Open Price, High and Low Price.Split the dataset into training and testing sets. It is important to maintain the temporal order of the data, ensuring that the training set includes earlier data and the testing set includes more recent data. Generally, 20% of data is used for testing.Define the sequence length, which determines the number of past times steps the LSTM model will consider for making predictions. Generate input-output sequences by sliding a window of size equal to the defined sequence length over the pre-processed data.Design the LSTM model architecture, including the number of LSTM layers, the number of LSTM units (neurons) in each layer, and optional regularization techniques such as dropout or recurrent dropout.LSTM has 3 types of gates as following:

A) Input Gate: Data added is regulated by input gate. Input is filtered using the forget gate. Outputs from the tanh and sigmoid function are multiplied and they are added to the cell state.

I_t=σ (W_ix*x_t 〖+ W〗 _hh*h_(t-1) +b_i) + tanh (w_cx 〖*x〗 _t+w_ch* h_(t-1) + b_i)

B) Forget Gate: Unnecessary data from cell state is removed using forget cell from.

F_t=σ 〖(W〗 _fx* x_t 〖+ W〗 _fh* h_(t-1) 〖+ b〗 _f)

C) Output Gate: A vector is created by applying the tanh function on the cell state and then putting all the possible values into the created vector. Necessary data from previous cell is filtered by the help of sigmoid function on previous cell hidden state and the current cell input

Ot = σ (Wox * Xt + Whh * ht-1 + Woc * Ct-1 + bi)

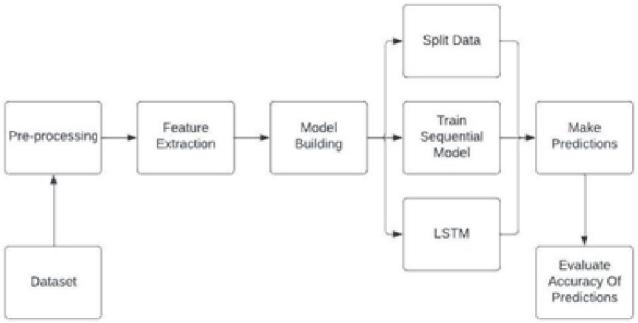


Fig 3.1: System Architecture

Stock prices are predicted using LSTM algorithm in this system. At first the training data is passed through the system and the model is trained. Later in the testing phase, predicted values are the compared with the actual values.For evaluation MSE (Mean Squared Error), RMSE (Root Mean Squared Error) and Accuracy values are used for the comparison.

### 3.2 Proposed System

Our project aims to address the shortcomings of the current system by introducing a robust solution. Through the implementation of Deep Learning, Machine Learningwe establish a secure and accurate system that predicts the stock price. Leveraging Deep Learning and Machine Learning stock price prediction can be more effective. Furthermore, new comers will also get the advantage from this system.

#### 3.2.1 Project Modules

**1. Data Collection Module**

The Data Collection module in a stock price prediction project using LSTM neural network focuses on gathering historical stock market data to be used for model training and prediction.

**2. Data Pre-processing Module**

The data preprocessing module involves cleaning and transforming the collected data. Tasks include handling missing values, removing outliers, normalizing the data, and preparing it for input into the LSTM model

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The Data Pre-processing module in a stock price prediction project using LSTM neural network focuses on preparing the collected historical stock market data for training the LSTM model.

**3. Feature Selection and Engineering Module**

In this module, relevant features are selected for stock price prediction. This can include technical indicators (e.g., moving averages, RSI), fundamental data (e.g., earnings, dividends), sentiment analysis scores, or other external factors. Feature engineering techniques may also be applied to create additional informative features

The Feature Selection and Engineering module in a stock price prediction project using LSTM neural network focuses on selecting and creating relevant features that can enhance the model's predictive capabilities.

**4. LSTM Model Architecture Module**

The LSTM Model Architecture module in a stock price prediction project using LSTM neural network focuses on designing the architecture of the LSTM model.

**5. Model Training Module**

Initialize the LSTM model architecture with the chosen number of layers, hidden units, activation functions, and additional layers (if any). Set up the optimizer algorithm and loss function for model training.

Train the LSTM model by feeding the training data into the model and updating its weights iteratively. Adjust hyperparameters, such as learning rate, batch size, and number of epochs, to optimize the training process. Monitor the training process for convergence and track the training loss.

**6. Model Evaluation Module**

Load the saved trained LSTM model along with its weights and architecture for evaluation. Ensure that the model is in the correct state to make predictions.

Utilize the loaded LSTM model to make predictions on the test dataset. Provide the necessary input features to the model and obtain the predicted stock prices or classification labels.

**3.3 Advantages of Proposed System**

1. Stock market data often exhibits non-linear patterns, and LSTM models can effectively capture and model these non-linear relationships. Unlike linear models, LSTM models can capture complex interactions between input variables and produce more accurate predictions when the relationship between variables is not linear.
2. The ability to handle large datasets is particularly beneficial in stock price prediction, as it enables the model to generalize better and adapt to changing market conditions.
3. LSTM models offer flexibility in terms of the types of features that can be used for prediction.
4. LSTM models can be trained in an end-to-end manner, meaning they can directly learn from raw input data without relying heavily on handcrafted features. This capability reduces the need for extensive feature engineering and can help uncover hidden patterns or relationships in the data that may not be apparent through traditional feature selection methods.

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## IV. RESULT ANALYSIS


Fig 4.1 Comparison Between Proposed System and Existing System

Proposed system features a user-friendly interface allowing effortless upload of stocks dataset for prediction of next day stocks price using proposed model. The model analyzes the historical dataset of stock downloaded from NSE, delivering quick and accurate results within approximately. We aim to continuously improve the project by enhancing the user interface, optimizing processing time, and further enhancing the accuracy of prediction. Incorporating user feedback and iterative development, our goal is to provide an efficient and user-friendly experience to our clients.

### COMPARISON BETWEEN EXISTING SYSTEM AND PROPOSED SYSTEM

- The system simplifies and enhances project management, providing greater flexibility and efficiency in quality assurance processes.
- Unlike the existing system, our solution is accessible online, allowing for real-time access to prediction from anywhere at any time.
- The LSTM employed in our system ensures data integrity and security, minimizing the risk of data manipulation or unauthorized access.
- Overall, our system addresses the challenges of stock price prediction in Indian stock market by leveraging machine learning and deep learning to enhance transparency, traceability, and trust among stakeholders.

## V. CONCLUSION

Identifying the directions of market by making use of Machine Learning algorithms is the main moto behind this. Machine Learning methods and prediction problems are interconnected with each other with a strong link. The prediction problems faced by humans during the prediction of stock price has been solved by some ML prediction techniques. Predicting in stock market has always provided investors with prosperous returns on their investments and also becoming useful and beneficial for businesses. It also has reduced the risk factor for the business environments. Historical data and previous business trends are useful in analyzing the risk factor. For analyzing the trend of any particular listed company stock, time series forecasting is used.

In this project, we are predicting closing stock price of any given organization, we develop a web application for predicting close stock price using LSTM algorithms for prediction. LSTM is a technique which is implemented in this project on the stocks data fetched from trusted sources. LSTM has shown improvement in the predicting of future stock price with an increased accuracy, giving positive outcomes. Machine Learning techniques have given better outcomes and hence results are promising. This has shown that Machine Learning is able to predict market movement. Model is trained using listed companies' data on NSE. Data from past days is used as input. The trends of market are not a continuous cycle and it varies based on many factors.

## VI. FUTURE SCOPE

1. We want to extend this application for predicting cryptocurrency trading.
2. Want to add sentiment analysis for better analysis.

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3. Furthermore, live data from YAHOO finance can also be integrated with our system, so no need to download stock data every time for prediction purpose.
4. Live prediction for indices like NIFTY, BANKNIFTY also be implemented.

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