# Stockwise: A survey on stock price prediction models

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***Abstract*** *- **Stock prices are difficult to predict because they can change a lot and are affected by various factors. People, especially investors, care a lot about predicting them accurately. By properly predicting stock prices, it is very useful to those investors who invest in the stock market to get profit. There are plenty of machine learning and deep learning models available for prediction. Some of the models predict very accurately, and others do not. So, the selection of a prediction model is an important factor for predicting the stock price. This paper mainly focuses on comparing different prediction models based on performance measure.***

## I. INTRODUCTION

A long time ago, economists tried to predict stock prices using simple methods. As technology and math advanced, we realized that using math models, like time series models, can help us to make better predictions. Time series models are best in prediction due to their ability to use historical data in a straightforward manner. But stocks are complex and they're more like a roller coaster, fluctuating in a wavy pattern rather than following simplicity. The future is unknown and uncertain, but there are ways to predict future events and reap the rewards safely. One such opportunity is the application of machine learning and deep learning for stock market prediction. The stock market is turbulent, yet using artificial intelligence to make calculated predictions is possible and advisable before investing. It is an overview of machine learning and deep learning as predictive analytics tools in the stock market. Here, we can use both old and new methods to predict stock prices. We can also validate their performance through testing them using actual stock data and compare the performance. The fancy LSTM neural network turned out to be the best at predicting prices

prediction, the paper highlights the influence of factors like physical aspects, investor emotions, and market rumours. In its exploration of various algorithms, including Simple Average, Linear Regression, ARIMA, and LSTM, the

accurately, better than the simpler time series model. We can use different methods, and the fancy LSTM neural network did the best at guessing where the ride is heading. It consists of the applications of machine learning technologies in the stock market prediction, including linear regression, KNN, CNN, random forest and long–short term memory.

There is a table included in this paper that compares the RMSE values of prediction models in each paper to find out which one is the best.

## II. MOTIVATION

The motivation behind this work lies in providing guidance on choosing the best model for stock price prediction.It holds an important role for common people due to its potential impact on investment decisions and overall financial well- being. Regular updates on stock price predictions help investors make better decisions. For common investors, predicting stock prices reduces risk in the stock market. Nowadays, there are so many machine learning and deep learning models available. From those, selecting a model that predicts stock prices more accurately is a big task. Through this survey, we convey which are the best machine learning and deep learning models by evaluating the performance ratios of those models.

## III. LITERATURE REVIEW

This paper [1] delves into the challenging task of predicting stock market movements using Recurrent Neural Network RNN) with Long Short-Term Memory (LSTM). Acknowledging the intricate nature of stock market

document introduces the Root Mean Square Error (RMSE) as an evaluation parameter. Notably, the paper suggests that the improved LSTM version of RNN outperforms other methods, emphasizing its effectiveness in forecasting stock market trends. The document also sheds light on the crucial

steps involved in collecting and preprocessing historical stock market data, offering insights into the LSTM architecture and methodology employed for prediction. It encapsulates the paper's key findings and conclusions. It underscores the significance of LSTM, particularly its improved version, in achieving accurate stock market forecasts. By presenting RMSE values for different algorithms, such as Moving Average, Linear Regression, ARIMA, and LSTM, the document systematically compares their predictive performances. Ultimately, the paper concludes that the LSTM model stands out as the most accurate in forecasting stock markets. It advocates for the adoption of machine learning techniques, specifically LSTM, as a valuable tool for enhancing prediction accuracy and facilitating more informed investment decisions in the dynamic realm of stock markets.

This paper [2] focuses on the application of machine learning and deep learning algorithms for stock price prediction, with a specific emphasis on forecasting the stock price of Reliance Industries Limited. The primary models employed in the study include the ARIMA model for predicting stock prices up to 2 years, Random Forest for next day prediction, and LSTM for predicting stock prices based on the previous 60 days' data. The training data encompass parameters such as open, close, low, high, volume, and adjusted close. Additionally, the paper includes a comprehensive literature review on the use of machine learning techniques in stock price prediction, providing context to the chosen methodologies. The results of the models are not only presented in the paper but also made accessible through a dedicated website built using HTML, CSS, and bootstrap. Each algorithm has its web page on the site, offering detailed information about the algorithm, datasets used, model construction specifics, and the obtained results. The paper concludes by asserting that machine learning and deep learning approaches yield accurate and promising results in stock price prediction, and recommends incorporating factors like sentiment analysis to enhance the models' predictive accuracy. In summary, the paper combines practical applications of machine learning and deep learning models with a comprehensive literature review, providing a holistic view of their effectiveness in predicting stock prices. The integration of a user-friendly website for disseminating model results enhances accessibility and transparency, contributing to the overall credibility of the study's findings.

The paper [3] explores using Recurrent Neural Network (RNN), specifically the Long Short Term Memory (LSTM) model, for predicting stock prices. The main goal is to forecast stock prices accurately, which is crucial for attracting investors. The document emphasizes the importance of machine learning algorithms in predicting stock market performance, pointing out the limitations of traditional models. The methodology involves training and testing the LSTM model with historical stock data, including processes like data scaling and normalization. The authors experimented with different epochs and model

adjustments to improve accuracy. The results show that the LSTM model achieved an accuracy rate of over 85% in predicting stock prices for various companies. Despite the success, the paper acknowledges challenges in assembling and sorting data. It suggests further enrichment of the dataset, exploring new models, and experimenting with different time frames for future research. The conclusion highlights the effectiveness of machine learning in predicting stock market performance but notes that forecasting stock prices remains challenging, even with sophisticated models like LSTM..In summary, the paper provides a comprehensive overview of using RNN, particularly LSTM, for stock market prediction. It emphasizes the potential of machine learning algorithms, acknowledges challenges, and suggests avenues for future research to enhance the accuracy and robustness of predictive models.

The paper [4] presents a comprehensive exploration of deep learning-based regression models for stock price prediction, focusing on the NIFTY 50 index in India. It addresses the limitations of existing literature in stock price prediction, particularly in cases where stock price time series exhibit significant randomness, leading to decreased forecast accuracies. The study proposes the use of convolutional neural networks (CNNs) and long-and-short-term memory (LSTM) networks to learn deep features from past financial time series values, aiming to improve forecast accuracies. The models are designed to forecast future values of the NIFTY 50 index with a high level of accuracy, using a multi- step prediction technique with walk-forward validation. The document also outlines the architectural details of the proposed models, highlighting the use of CNNs for reading and extracting features from sequential data, and the integration of CNNs with LSTM for forecasting sequential series. Furthermore, the document outlines the problem statement, emphasizing the objective of building a robust and accurate predictive framework using historical records of NIFTY 50 index values over a period of five and a half years. The study hypothesizes that deep learning models can extract rich feature sets from past NIFTY 50 index values and accurately forecast future index values. It also discusses related work in the field of stock price forecasting, categorizing existing propositions in the literature into three broad types: multivariate ordinary least square regression models, time series and econometric models, and machine learning, deep learning, and natural language processing algorithms. The document concludes by presenting the results of the proposed models, highlighting the accuracy and execution speed of each model. It also suggests future research directions, including the exploration of generative adversarial networks (GANs) for further improvements in forecasting accuracy. In summary, the document provides a detailed overview of the development and testing of deep learning-based regression models for stock price prediction, offering valuable insights into the application of deep learning techniques in financial time series analysis and stock price forecasting. The study's findings emphasize the potential of CNNs and LSTMs in

learning deep features from financial time series data and making accurate forecasts, while also acknowledging the trade-offs between accuracy and speed in model performance. The document sets the stage for future research in the field, particularly in exploring advanced predictive modelling techniques to enhance forecasting accuracy.

The paper [5] discusses a research paper presented at the 2023 3rd Asian Conference on Innovation in Technology (ASIANCON) in Pune, India, focusing on the "Stock Price Prediction Model Using LSTM: A Comparative Study." The study is authored by M. Kumaresan, M. John Basha, P. Manikandan, S. Annamalai, Ramesh Sekaran, and A. Suresh Kumar from the school of Computer Science and Engineering at Jain (Deemed-to-be University) in Karnataka, India. The paper addresses the challenging task of stock price prediction and the application of recurrent neural networks (RNNs) with Long Short-Term Memory (LSTM) in forecasting stock prices. The authors compare univariate and multivariate LSTM-based stock price prediction models, examining their forecasting accuracy using various assessment criteria and evaluating the impact of different hyperparameters on model performance. The paper also discusses the interpretability, limitations, and potential uses of LSTM-based stock price prediction models in financial decision-making scenarios, such as portfolio management, risk management, and trading strategies. The introduction outlines the difficulty of accurately predicting stock prices due to the complex and dynamic nature of financial markets, highlighting the limitations of traditional methods and the promising results shown by deep learning-based models, particularly LSTM, in capturing temporal patterns and seasonality in stock price data. The literature review presents a comprehensive overview of various LSTM-based models for stock price prediction, including attention-based LSTM, stacked LSTM, and multivariate LSTM, which have demonstrated enhanced prediction accuracy compared to conventional machine learning models. The proposed methodology elucidates the steps involved in using LSTM models for stock price prediction, including data gathering, preparation, network architecture, model training, evaluation, and future price prediction. The authors examine the interpretability of LSTM-based models and highlight their potential applications and limitations in real-world financial decision-making processes. The conclusion summarizes the study's findings, emphasizing the effectiveness of LSTM-based models in identifying temporal patterns and correlations in stock price data and providing recommendations for future research directions. Overall, the paper provides valuable insights into the application of LSTM-based models for stock price prediction, offering a comparative analysis of different LSTM variations and their performance on real-world stock price datasets. The study's findings contribute to advancements in the field of financial decision-making and may guide the development of more accurate models for predicting stock prices, benefiting academics, practitioners, and investors in the finance domain. The document also suggests future research directions, such as exploring alternative data preparation techniques and addressing interpretability issues in LSTM-based models, to further enhance their applicability in financial markets.

The paper [6] deliberates about studying and predicting stock prices for Nifty50 in the stock market using a smart computer system called Long Short-Term Memory (LSTM). They want to create a model that can accurately guess how stock prices will change based on historical data from India's National Stock Exchange (NSE) for the NIFTY 50 index over ten years. The paper talks about how important it is to predict stock prices and how they've looked at different ways to do it, like using traditional methods and newer, smarter computer models. They explain that regular methods sometimes struggle with understanding how stock prices move. Then, they get into the details of the LSTM model they used, like how it was trained and tested, and the special structure it has. The model is like a smart calculator with four layers that prevents it from making mistakes by using something called dropout layers. They trained and tested it on ten different Nifty50 stocks and found it was pretty accurate, with the best accuracy being 83.88 percent for the SBI stock.The paper has lots of graphs showing how well the model predicted the stock prices for each of the ten stocks. In the end, they say the LSTM model is good at predicting stock prices and might even get better with more work. They finish by talking about what more they could do to make the predictions even more accurate in the future.So, in a nutshell, the paper is a deep dive into how this smart computer system, the LSTM model, can be good at telling us where stock prices might go, especially for Nifty50 stocks in India.

The paper [7] presents a comprehensive study on predicting stock market trends using machine learning and deep learning algorithms. The study compares nine machine learning models and two deep learning methods to predict stock market trends for four stock market groups from the Tehran stock exchange. The input data comprises ten technical indicators from ten years of historical data, and two approaches are used for employing the data: continuous and binary. The evaluation results show that the deep learning methods, specifically RNN and LSTM, outperform the other prediction models, with a considerable difference in performance. The study also highlights the improvement of models' performance when trained with binary data instead of continuous data. The conclusion emphasizes the significance of the study as a new research paper that incorporates multiple machine learning and deep learning methods to improve the prediction task of stock groups' trend and movement. The study delves into the

nature of stock market movement and the challenges associated with predicting stock trends. It discusses the historical background of predicting stock markets and the recent advancements in using machine learning and deep learning methods to enhance prediction models. The document also provides a comprehensive overview of the various algorithms and models used in the study, including Decision Tree, Random Forest, Adaboost, XGBoost, Support Vector Classifier (SVC), Naïve Bayes, K-Nearest Neighbors (KNN), Logistic Regression, Artificial Neural Network (ANN), Recurrent Neural Network (RNN), and Long short-term memory (LSTM). The study's experimental results showcase the performance of these models in predicting stock market trends and emphasize the effectiveness of the deep learning methods, particularly RNN and LSTM. Furthermore, the study presents a detailed analysis of the classification metrics used to evaluate the performance of the models, including F1-Score, Accuracy, and Receiver Operating Characteristics-Area Under the Curve (ROC-AUC). The experimental results highlight the significant improvement in the performance of the models when trained with binary data instead of continuous data. The study concludes by emphasizing the novelty of the research and its potential as a baseline for future articles in the domain of stock market prediction. In summary, the document provides valuable insights into the application of machine learning and deep learning algorithms for predicting stock market trends. It offers a structured and comprehensive analysis of the models, experimental results, and the significance of the study in advancing the field of stock market prediction.

The paper [8] appears to be an excerpt from the 2020 7th International Conference on Information Science and Control Engineering (ICISCE). The content seems to consist of a mix of alphanumeric characters, symbols, and other non- standard text representations. However, due to the lack of context and the unconventional nature of the content, it is challenging to extract any meaningful information or discern a coherent message from the given text. It's important to note that the document seems to lack a clear structure or conventional language, making it difficult to interpret or summarize its contents. Without additional context or a clearer understanding of the document's purpose, it's challenging to provide a comprehensive summary or derive any actionable insights from the text as presented. Therefore, further clarification or context regarding the content of the document would be necessary to provide a more meaningful and accurate summary.

## IV.     COMPARISON

| TITLE | METHODS | PERFORMANCE MEASURE(RMSE) |
|---|---|---|
| Stock market prediction using RNN and LSTM [1] | LSTM | 18.899 |
| | ARIMA | 96.5 |
| | Moving Average | 6077.708 |
| | Linear Regression | 51.996 |
| Stock price prediction using machine learning and deep learning [2] | LSTM | 171.8 |
| | ARIMA | 7.27 |
| Stock price prediction using CNN and LSTM based deep learning models [4] | CNN | 0.0349 |
| | LSTM | 0.0350 |
| Stock market analysis and prediction for Nifty50 using LSTM deep learning approach [6] | LSTM | 0.0737 |

## V.     CONCLUSION

The challenge of trading without adequate knowledge is a common concern, potentially leading to financial losses. Recognizing the significance of understanding gains and losses in trading underscores the need for proper guidance. So, this survey lead us to get a proper knowledge about different machine learning and deep learning models. The recent advancements in predictive techniques and models such as the LSTM (Long Short-Term Memory), KNN (K-Nearest Neighbour), etc offer a promising approach to navigate this complexity.

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