A Survey on Stock Price Trend Prediction using Multi-Step Stacked LSTM

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Abstract: *Machine Learning (ML) and Deep Learning (DL) methods have been successfully applied to stock price trend forecasting. Although finance practitioners and academics have advocated for the benefits of using fundamental analysis (FA) and technical analyses (TA) together, ML research has been focused on using TA-based indicators almost exclusively. The main target for prediction by ML researchers has been forecasting of next day's price for a market index or a firm's stock. This work aimed to investigate the impact on ML-based stock price forecasting by using various inputs and also by accounting for the states of the stock market. In this research work, a framework is proposed for the effective prediction of stock price trends. The framework enables the selection of the best performing model with relevant inputs which can also factor insensitivity of the stock's price to various states of the market. Proposed framework predicts the next day's price movement as a buy-sell decision and achieves around 73% accuracy. The framework proposes a DL-based framework: "Multi-step Stacked - Long Short Term Memory" (MS-LSTM) for predicting future stock trends and prices.*

Keywords*—Prediction, Machine learning, Multi-step Stacked, LSTM, Deep Learning*

I. INTRODUCTION

"Efficient Market Hypothesis (EMH) states that in proficient markets, this is not achievable. However, if this is correct, the financial investment sector would cease to exist. Many finance experts agree with the EMH, which states that the market is made up of rational investors who have included all available information into the current price of a company (i.e., the market is efficient) and so cannot predict future share prices.

A well-functioning stock market is considered critical to a country's economic prosperity. The stock market performs two important functions. First, it allows firms to raise funds from the general public, which they can use to expand and fund their operations. Second, it gives the general people the opportunity to participate in the company's revenues. The stock market's nature is non-linear, complicated, volatile, and sensitive to external inputs, making it difficult to anticipate. With the increasing rise of stock trading marketplaces, more investors are focusing on developing a systematic strategy to predict stock market movements and stock prices.The profits that can be gained by selling and buying the stock at profitable positions are the focus of future price or trend predictions.

The stock price forecasting task is classified as Fundamental Analysis (FA), Technical Analysis (TA), and Time Series Forecasting[1]. The underlying principle is that as the firm expands, the stock value will rise as well.In the long run, this will benefit the investment. So, the financial analyst applies Fundamental Analysis (FA). The components of FA are depicted in Figure 1.1.

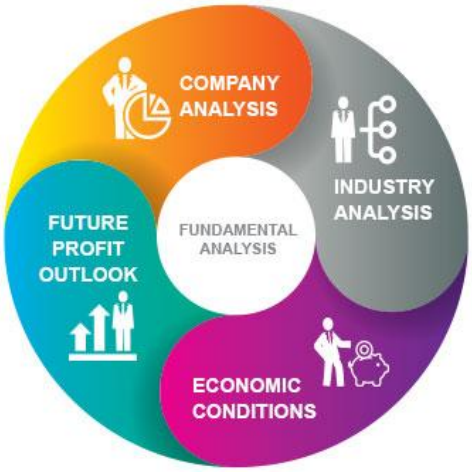

Fig 1.1 Components of fundamental analysis

II. RELATED WORK:

As per Cavalcante et al. [14], the stock price forecasting problem hastraditionally been approached from two camps: Statistical Techniques and ML Techniques. Statistical techniques operate from the assumption that the underlyingrelationship between the stock prices and their drivers is linear. However,financial time-series (such as stock price data) are non-linear and noisy,therefore making ML methods, which can handle such data characteristics, thebetter forecaster of the two approaches[14, 15]. Fueled byadvancements in computing power over recent years, the use of computing in making tradingdecisions has increased commensurately [14, 15]. Although ML techniques have been "widely accepted to studying andevaluating stock market behavior"[18], there is not an identified set of indicators and methodology that can be used to consistently forecast stockpriceseffectively[16].

De Souza et al. [22] investigated the profitability of TA as applied to the stock markets. Authors searched for evidence that fundamental analysis and technical analysis complement each other. An automated trading system is developed to simulate transactions in this portfolio using technical analysis techniques. The average reshowedshowed that the system exceeded the value invested. The sample portfolio from Russia and India showed very strong returns. The work utilized two types of moving average: SMA, EMA over a varying number of days.

Authors [23] proposed the deep LSTM Neural Network (NN) with embedded layer and the LSTM-NN network with automatic encoder to forecast the stock as traditional NN

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algorithms may incorrectly predict the stock market. The accuracy achieved with LSTM –NN with embedded layer is better. The maximum accuracy achieved is 57.2%.

The study [23] proposes a novel technical analysis method for forecastingthe sting of the stock market to increase the decision support quality and profitability of investors. The techniques utilize trend-based classification, indicator selection, and stock market trading signal forecasting.

Xiong et al. [26]used economic variables and LSTM to predict the volatility of the S&P index with the Google trend. Yu [26] applied the deep NN and LSTM to forecast the trading data of the Amazon stock. The highest prediction accuracy achieved is 54%. It is mentioned that the effect of the deep NN was better than LSTM.

Authors [27] used the improved CNN and SVM to forecast the stock index and exchange rate in the American, European, and Hongkongmarkets. The result showed that the hybrid model had the highest accuracy.

Authors [29] utilized RNN to forecast the prices of the three stocks. When using economic variables as input and the historical data, he found that the forecast price fitted the actual price better.

III. PROPOSED WORK

In this paper, a DL-based framework is proposed and implemented for predicting future prices and trends.The architecture of the proposed framework and DL network has been presented

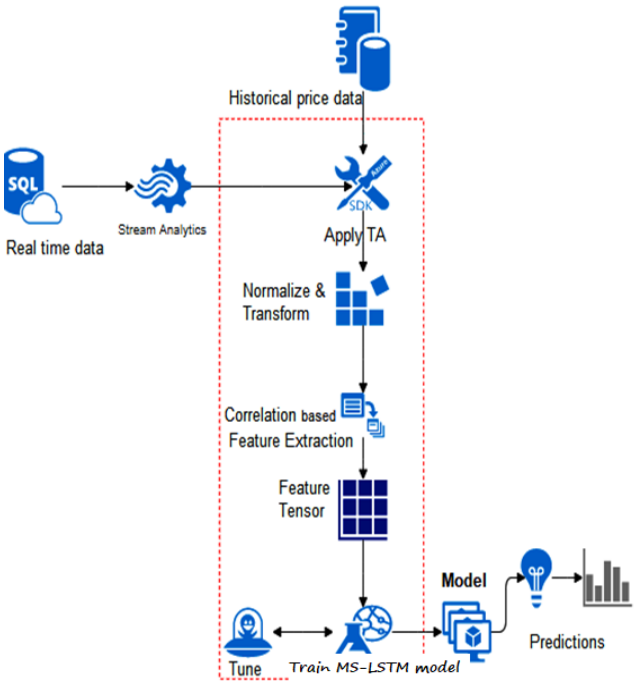

Fig. 3.1 Proposed Multi-step Stacked LSTM framework for stock price trend prediction

IV. EXPECTED RESULT

This work examined the efficiency of applying FA and TA to the stock prices. We analyzed whether stock traders could attain more profits than suggested by the recent research of Pang X. et al. (2018) on the deep learning model and others. This work demonstrated the concept of deriving adaptive TA based on historical prices and volume.

V. CONCLUSION

The appropriate STIs were determined supplied as tensors to the model. Finally, the model presents an efficient approach that aids investors in making good investment decisions and profits. EDLA presents decision indicator (BUY (1) or SELL (0)) to the investor as well as trend-based analysis to decide whether to hold stocks for the long or short term.

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