**Abstract**

The stock market can have a huge impact on people and the nation's economy as a whole. Investors wish to minimize the risk of loss and maximize the profits. This gives rise to the need of a good and effective prediction system which would help traders, investors and analysts by providing supportive information like the future direction of the stock market.

In this report, we present the usage of Recurrent Neural Network(RNN) with Long Short-Term Memory(LSTM) approach that uses previous 6 days stock market information to predict future trend of stock prices. LSTM avoids long-term dependence issues due to its unique storage unit structure, and it helps predict financial time series. The network is trained with various combinations of parameters and the accuracies are tabulated in terms of Mean Squared Error(MSE), Root Mean Squared Error(RMSE) and Mean Absolute Percentage Error(MAPE). In addition, the accuracies are visualised through a plot of training and testing values prediction of stock prices.

**Introduction**

A stock market is a public market for trading the company’s stocks and derivative at an approved stock price. History has shown that the price of shares and other assets is one of the fundamental factors affecting a country’s economic strength and development. Stock prediction, which aims to predict the future trend and price of stocks, is one of the most popular techniques to make profitable stock investment [1]. Determining more effective ways of stock market index prediction is important for stock market investors in order to make more informed and accurate investment decisions.

The purpose of this report is to build a forecasting system which gives better predictions by learning well from the historical data. A time series data can be deﬁned as a chronological

sequence of observations for a selected variable. In our case the variable is stock price. Recurrent neural networks have been proved to be one of the most powerful models for processing sequential data. Long Short-Term memory is one of the most successful RNNs architectures. LSTM introduces the memory cell, a unit of computation that replaces traditional artificial neurons in the hidden layer of the network. With these memory cells, networks are able to effectively associate memories and input remote in time, hence suit to grasp the structure of data dynamically over time with high prediction capacity.[3]

The remaining report is organized as follows: Section II describes the background work in the field of machine learning in regards to building time-series prediction systems. Section III provides details about the theoretical and conceptual study of the proposed algorithm. Furthermore, Section IV describes the experimental setup required to implement the architecture including the libraries used, the dataset details and required preprocessing of the data. Section V includes the test results and analysis of the application. Lastly, Section VI and Section VII conclude the performance of this application and present research areas that can be addressed.

**Background Work**

Several studies have attempted financial time series predictions. In some works, data from a single time series were used as input[4]. Certain works considered the inclusion of heterogeneous market information and macroeconomic variables. In [5], a combination of ﬁnancial time series analysis and NLP have been introduced. Support vector machines was applied to build a regression model of historical stock data and to predict the trend of stocks[2].

In recent years, with the significant development in deep learning techniques, RNN have emerged as a promising model for handling sequential data in various tasks such as natural language processing, speech recognition, and computer vision.

LSTM were introduced by Hochreiter and Schmidhuber and it aimed for a better performance by tackling the vanishing gradient issue that recurrent networks would suffer when dealing with long data sequences. It does so by keeping the error ﬂow constant through special units called ”gates”. Our work aims to use this novel approach to build a promising prediction system.

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