



## Stock Price Prediction using Recurrent Neural Network and Long Short-Term Memory

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### Abstract

Stock markets and stock markets have a

forecasting an important area of research. Existing huge impact on our world. A rise or fall in stock prices determines whether an investor will make a profit. Current forecasting methods use both dynamic and linear algorithms, but the focus is on predicting the stock price of a single company based on the daily open /close prices. The proposed method uses an independent approach. Instead of adapting the data to a particular model, use a deep learning architecture to identify the potential dynamics present in the data. This paper uses two different deep learning architectures for Tata Beverages from Tata Global Beverages Limited, the National Stock Exchange of India, with minimal error. Use recurrent neural networks to predict future value in the short term. Model performance was quantified using percent error.

**Keywords—** *Recurrent Neural Network, Time Stamp, Long Short-Term Memory, Stock Price Prediction.*

### I. INTRODUCTION

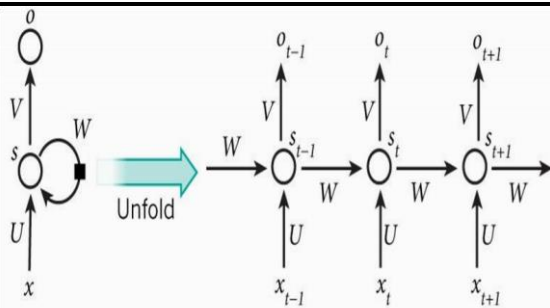
Forecasts can be defined as forecasts for one or more future events by analyzing historical data. It spans many areas, including business and industry, business, environmental science, and finance. Forecasting problems can be categorized as short-term forecasts (seconds, minutes, days, weeks, or months). Mediumterm forecast (1-2 year forecast) Long-term forecast (2-year forecast)

Many forecast problems are related to time analysis. Time series data can be defined as a time

series of observations of selected variables. In this paper, the variable is the stock price. It is either univariate or multivariate. Univariate data contains only information about one particular stock, and multivariate data contains stock prices of multiple companies at different points in time. Analyzing time series data helps identify patterns, trends, and time periods or cycles that exist in the data. For the stock market, knowing the bullish or bearish mode early can help invest money wisely. can also analyze the patterns to identify the 4,444

series of observations of selected variables. In this paper, the variable is the stock price. It is either univariate or multivariate. Univariate data contains only information about one particular stock, and multivariate data contains stock prices of multiple companies at different points in time. Analyzing time series data helps identify patterns, trends, and time periods or cycles that exist in the data. For the stock market, knowing the bullish or bearish mode early can help invest money wisely. can also analyze the patterns to identify the 4,444 stock price forecasting methods can be categorized as follows. Fundamental analysis, Technical analysis and Time series forecast.

Fundamental analysis is a type of investment analysis that estimates a company's stock price by analyzing the company's sales, profits, and so on. And economic factors. This method is great for making long-term forecasts. Technical analysis uses past prices of stocks to determine future prices. Moving average is a widely used algorithm for technical analysis. This can be thought of as an unweighted average of the past n data points. This method is suitable for short-term forecasting. The third method is to analyze the time series data. There are basically two classes in an algorithm .Linear model and Nonlinear model



A recurrent neural network and the unfolding in time of the computation involved in its forward computation. Source: Nature

**Figure 1. Recurrent Neural Network**

There are many complex financial indicators and stock market fluctuations are very rapid. However, as technology advances, it is more likely that you will build a stable fortune in the stock market, which will also help professionals find the most meaningful indicators for making better forecasts. Predicting market value is very important for maximizing the rate of return on purchases of stock options while controlling risk. Recurrent neural networks (RNNs) have proven to be one of the most powerful models for processing sequential data. Long Short Term Memory is one of the most successful RNN architectures. LSTM introduces memory cells, which are processing units that replace traditional artificial neurons in the hidden layers of networks. These memory cells allow the network to effectively allocate memory and inputs over time, making it suitable for dynamically recording data structures over time with high predictive power. This paper is organized as follows: Section [2] describes the existing model and its shortcomings, Section[3] describes the methodology of the proposed model, Section [4] informs about the results and discussions, and Section [5] contains conclusions.

## 2. Previous Models and Drawbacks

Earlier models for analyzing Wall Street include fundamental analysis, which measures past performance and company credibility, and statistical analysis which responds to stock price fluctuations. Commonly used algorithms to predict trends are the genetic algorithm (GA) and the artificial neural network (ANN), neither of which can determine the correlation between the LSTD and the stock price. ANN cannot predict the state of the exploding gradient. The weights are either too high or too low, which slows down the convergence.

## II. METHODOLOGY

### 3.1 DATASET

Tata Beverages Record from Tata Global Beverages Limited on the Indian National Stock Exchange. The dataset contains information such as open, close, close, high, total trading volume, and sales. For the calculation, select the company X dataset, train the model with the previous year's values, and test the trained model with the test dataset. extracted company data from the available

data and preprocessed it to determine the stock price. This task is based on a recurrent neural network application with long-term and short-term memory and uses 1257 values to determine 20 future values. The library used in the proposed model is

### 3.2 PACKAGE

#### NumPy.

Supports mathematical and scientific operations, facilitating the manipulation of multidimensional arrays and matrices.

#### Panda

Provides high performance using Python's easy- to-use data structures and analytical data.

#### Keras

Keras provides basic considerations and components for creating and transferring ML arrays with high iteration rates. Get the most out of TensorFlow's scalability and cross-platform capabilities. Keras' core data structures are layers and models.

All layers used in the RNN model are implemented in Keras. Data processing transforms class vectors into binary class matrices and is useful for compiling the entire model.

#### SK Learn

How do I use to normalize a dataset to finite boundaries? The company's data fluctuates in the range and 250 to 900 on Google. To unify the data range, I used Python's sklearn library to normalize the price limit to the range 0 to 1. The normalized data is provided as inputs for a particular model for training. The model was repeatedly trained for many adjustments during the 100, 250, 500, and 1000 eras. If the current epoch loss (mean square error) is less than the previous epoch loss, the weighting matrix for that epoch is retained. After several educational processes, the model was tested on a test dataset and the model with the lowest RMSE (Root Mean Square Error) was used as the predictive model for a particular epoch. This model consists of two neural network architectures, a recurrent neural network and long-term / short-term memory. A class of neural networks that establish connections between processing units consisting of directed circles is a recurrent neural network. This is a special case of a neural network where the output of the previous level is given as an input to the current level. Traditionally, the inputs and outputs of all neural networks are independent, but if you need to predict the future, you'll need the previous values, so a hidden layer concept like this hint solves this problem. increase. Therefore, RNN requirements are essential information about the sequence.

## Data Processing

The second type of neural network is, a special type of RNN, Long Short Term Memory LSTM. This helps protect against errors that propagate over time and layer loss in the proposed model. The LSTM model maintains a constant error, so the error cannot exceed the defined value. This trains the model over 1000 steps and works independently. This is one of the biggest challenges of artificial intelligence and neural networks, as algorithms are mostly repelled by the environment. The LSTM contains the data in the form of gate cells. Information can be read or written to these cells, and the cells use gates to determine which information to keep and which to remove. These are generally sigmoid functions that are essentially similar. H. Either close or open. Because analog is distinguishable, it has some advantages over traditional backpropagation. The LSTM accepts input in 3D format [BatchSize, Timestamp, Feature]. Here, the batch size determines the number of sets of inputs for which the network weights are updated. The larger the size, the shorter the time and vice versa. Timestamps are defined as the number of dates before they are displayed to predict future values, and the function is the number of attributes needed to calculate the timestamp. In this model, the tangent hyperbolic function is used as the activation function. The derivative of the activation function is used to update the weights with the calculated error loss.

Hyperbolic Tangent Function:  $\tanh(x) = (e^x - e^{-x}) / (e^x + e^{-x})$ .

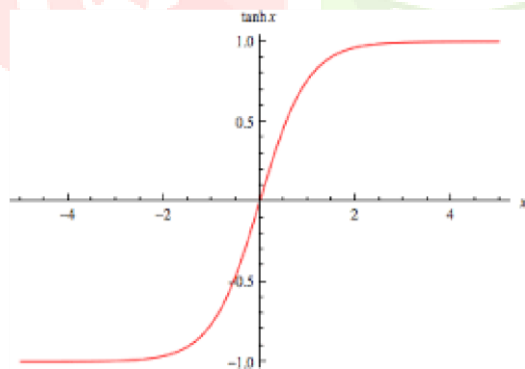


Figure 1- Range of a hyperbolic tangent function

There are outputs in the range of 0.1, most importantly continuous functions. H. Output of individual values of  $x$ . The hyperbolic tangent function and its derivatives play an important role in determining the true value of a stock by reducing the error.  $f(x) = (e^x - e^{-x}) / (e^x + e^{-x})$   $d(f(x)) / dx = 1 - (f(x))^2$  Next, the training dataset uses the MinMaxScalar function of the Python SK Learn library. And was normalized in the range 0 to 1. After each iteration, denormalization was performed and the percentage error was calculated. The error was calculated using the RMS (Root Mean Square Root Value) of the predicted value using the following formula:  $\text{error} = \sqrt{\frac{\sum (TV - PV)^2}{N}}$  where; TV = true value; PV = predicted value; N= Total No of Values.

## III. IMPLEMENTATION AND RESULTS

Machine learning has important uses for stock price forecasting. RNNs and LSTMs provide optimal forecasts for stock price forecasts. The model was trained on the NSETATA global dataset with various values for batch size, timestamp, and epoch. The effect of batch size on loss, the time required for each iteration of a particular epoch is calculated and the final output is there

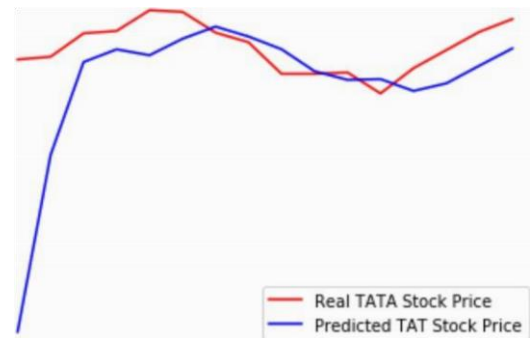


Figure 1- Final output

## IV. CONCLUSION

Propose a resource prediction model based on a recurrent neural network and long short-term memory. Both of these are used because they are good at handling time-based problems and predicting the future. We trained the model on the TATA Beverages stock dataset and predicted and tested future stocks from the model. This study showed that the model can use these two to predict the near future. It is also clear that the proposed model can accurately predict prices even in the event of sudden market changes. Inventory changes are not defined in the limited model, so the topics on the same topic are different. This analysis helps investors get more profit.

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