Feed-Forward Deep Learning Model for Data Analysis and Prediction

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Abstract

Stock Market is a volatile market. Predicting the behaviour of stock is a difficult and challenging task. Investor from different sectors invests the money in stock market for the sake of high return but involves high risk. Feed forward deep learning model can be helpful to minimize the certain risk process by forecasting the behaviour of market by analyzing the data from previous years. The stock price of the company is analyzed to view the future behaviour and price using the neural network. The factors taken are maximum price, closing price and minimum price of stock.

Forecasting the stock price using deep learning model is a new concept in the stock market of Nepal. It will surely motivate investors and traders to invest their money with less risk and high returns.

Keywords

Deep learning, Neural network, Tensorflow, Stock Market, Feed-forward, Artificial Intelligence, time series forecasting, data analysis

I. INTRODUCTION

The performance behaviour of stock market can be predicted with the evolution of Artificial Intelligence. Different enterprises and large company's uses machine learning and deep learning algorithms to compute the future behaviour of stock exchanges. This trend of using AI in financial market is increasing although the financial and stock markets are totally random. The traditional approach of predicting stock market is becoming obsolete. However, there is a challenge for AI to make reliable and efficient prediction with fewer errors. In older days, investors had to continuously monitor the changes in stock price by sitting in stock exchanges and stock trader houses to identify the behaviour of stock market but today , with the invent of AI and deep learning, machine learning and AI experts sit infront of computer screen to measure the performance behaviour of stock market.

Many stock exchanges such as NYSE, NASDAQ, LSE, SSE and many more trade stock in different parts of the world. NEPSE is a Nepal stock exchange to for trading shares in Nepal. NEPSE list different public companies such as ADBL, BNT, ALICL,NICA and many more. In this paper, agricultural development bank (ADBL) is chosen to view their predictive performance using the model developed. ADBL is one of the financial public company listed in NEPSE. Artificial intelligence is the capability of machine to imitate intelligent human behaviour. Deep learning is the subset of Artificial intelligence and machine learning that uses neural network for decision making and prediction. In this paper, Feed forward neural network is developed to train the datasets of ADBL company listed in NEPSE. This feedforward neural network model is capable to focus on the right feature by themselves and solve the dimensionality problem that occurs in other machine learning algorithms.

II. OBJECTIVES

The objectives for this research are:

- To build a feed-forward neural network model
- To observe the prediction behaviour over different time interval.
- To determine the accuracy of developed model.

III. LITERATURE REVIEW

Stock market prediction and exploration is the latest trend in market. Researchers are very much concerned about computing the prediction with more and more efficient and accurate algorithms. Different research had been conducted in the past which are adding the bricks in building the more reliable model. In [1] the researchers have used Artificial Neural Networks (ANN) and statistical technique ARIMA on almost 3 year's data to predict KSE-100 index. In [2], the researchers have used historical data to predict the position of stock market and they proved that historical data has strong predictive ability. In [3], the researchers proposed a deep learning method for event driven stock market prediction. First, events are extracted from news text, and represented as dense vectors, trained using a novel neural tensor network. Second, a deep convolutional neural network is used to model both short-term and long-term in- fluences of events on stock price movements. Researcher compare PCA plus Deep Neural Network (DNN)

with state of the art method 2-Directional 2-Dimensional Principal Component Analysis (2D) 2PCA plus Radial Basis Function Neural Network (RBFNN). [4]It is found that the proposed method is performing better than the existing method RBFNN.

IV. RESEARCH METHODOLOGY

A. System Model

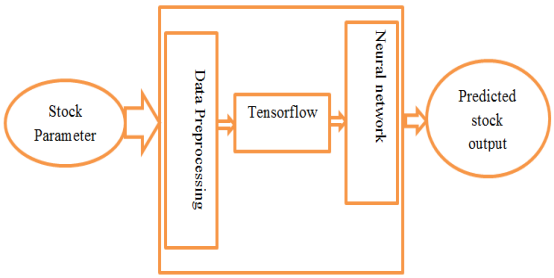

Figure1: System Model

B. Process Description

1) Importing dataset
2) Data Preprocessing with noisy data removal and data cleaning
3) Preparing dataset for training and testing set
4) Data Scaling
5) Applying Tensorflow as a backend
6) Feeding data to feedforward neural network with input layer, 4 hidden layers and a output layer.
7) Optimizing and fitting neural network
8) Computing mean squared error and accuracy of model.

C. Neural Network Architecture

Neural Network is a graph of data and mathematical operation. Tensorflow is a better framework for neural network used for prediction. Placeholder are used to store input and target data in graph. It contains network input. In our case, ADBL closing price at time T=t. Variable is a flexible container. The weight and bias value used in network model are represented as a variable in order to adapt during training. This model consist of one input layer, 4 hidden layer and one output layer. The input size is n=1087. The first hidden layer consist of 2200 neurons, almost double the size of inputs. The second hidden layer consists of 1100 neurons, the third hidden layer consist of 550 neurons and final hidden layer consist of 275 neurons. The subsequent hidden layers are always the half of size.

Placeholder and variables are combined into a system of sequential matrix multiplication. Feedforward indicates that the batch of data solely flows from left to right.

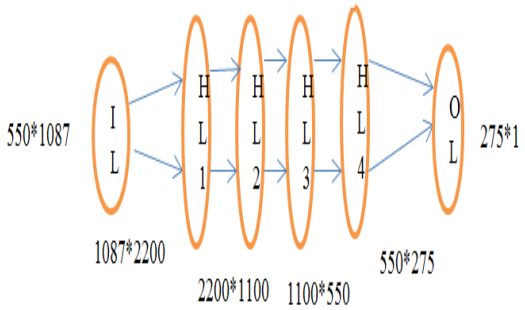

Figure 2: Feed-forward Neural Network

V. DATA COLLECTION

The data used here is secondary data. It is collected through website (www.nepalstock.com) using application program interface. Different information of Agricultural Development Bank (ADBL) are collected which include stock volume, open price, close price, maximum price, minimum price over different series of years from 2013A.D. to 2017A.D.

VI. RESULT AND ANALYSIS

A. Time Series Stock Price Visualization

Figure 3: Closing stock price of ADBL

This figure shows the graph visualization of ADBL over the different time period from 2013 to 2017. In this graph, stock price of ADBL is changing between 200 Rs to 1500 Rs over different time.

B. Prediction Behaviour at Different Time Interval

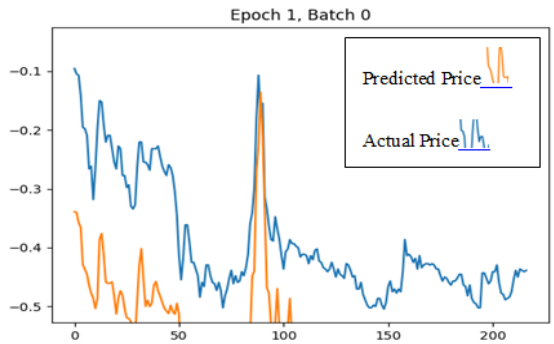

Figure 4 : Actual and Predicted stock price at Epoch 1

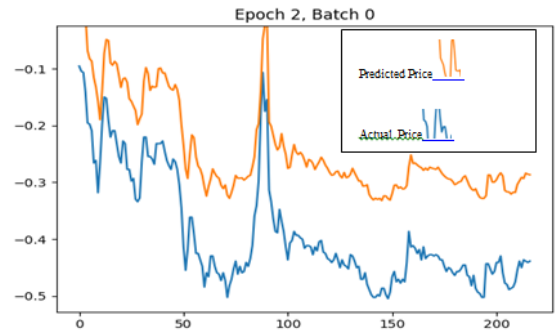

Figure 5: Actual and Predicted stock price at Epoch2

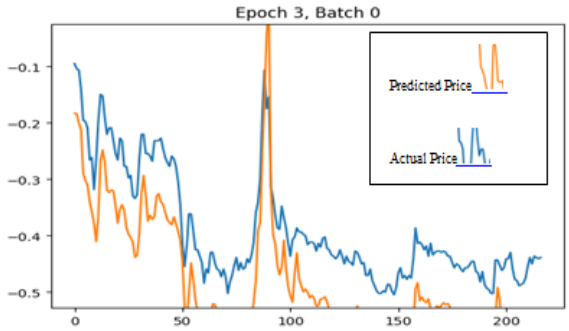

Figure 6 : Actual and Predicted stock price at Epoch 3

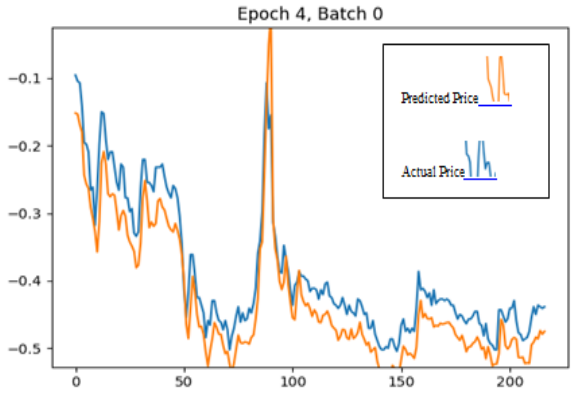

Figure 7 : Actual and Predicted stock price at Epoch 4

C. Mean Square Error and Accuracy

A) At epoch 1, the mean squared error for training set is
0.067103 and testing set is 0.0354891.
MSE Train: 0.067103 , MSE Test: 0.0354891

B) At epoch 2, the mean squared error for training set is
0.0326901 and testing set is 0.0220978.
MSE Train: 0.0326901 , MSE Test: 0.0220978

C) At epoch 3, the mean squared error for training set is
0.00927226 and testing set is 0.00958704.
MSE Train: 0.00927226 , MSE Test: 0.00958704

D) At epoch 4, the mean squared error for training set is
0.00294872 and testing set is 0.00198012.
MSE Train: 0.00294872, MSE Test: 0.00198012

VII. CONCLUSION

Finally, it has been concluded that predicting the stock price using feed forward neural network shows good performance behaviour over different time period. The stock parameters such as historical stock closing price, maximum and minimum price are taken into consideration for stock market prediction. This feed forward neural network technique gives good accuracy after measuring over different time period. According to the result, the model has an accuracy of 99.25 percent. This is the indication that feedforward neural network model is a suitable measure for stock market prediction.

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