



Pearson Correlation Coefficient-based performance enhancement of Vanilla Neural Network for stock trend prediction

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Received: 22 July 2020 / Accepted: 1 July 2021

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Abstract

The prediction of a volatile stock market is a challenging task. While various neural networks are integrated to address stock trend prediction problems, the weight initialization of such networks plays a crucial role. In this article, we adopt feed-forward Vanilla Neural Network (VNN) and propose a novel application of Pearson Correlation Coefficient (PCC) for weight initialization of VNN model. VNN consists of an input layer, a single hidden layer, and an output layer; the edges connecting neurons in the input layer and the hidden layer are generally initialized with random weights. While PCC is primarily used to find the correlation between two variables, we propose to apply PCC for weight initialization instead of random initialization (RI) for a VNN model to enhance the prediction performance. We also introduce the application of Absolute PCC (APCC) for weight initialization and analyze the effects of RI, PCC, and APCC values as weights for a VNN model. We conduct an empirical study using these concepts to predict the stock trend and evaluate these three weight initialization techniques on ten years of stock trading archival data of Reliance Industries, Infosys Ltd, HDFC Bank, and Dr. Reddy's Laboratories for the duration of years 2008 to 2017 for continuous as well as discrete data representations. We further evaluate the applicability of these weight initialization techniques using an ablation study on the considered features and analyze the prediction performance. The results demonstrate that the proposed weight initialization techniques, PCC and APCC, provide higher or comparable results as compared to RI, and the statistical significance of the same is carried out.

Keywords Vanilla Neural Network · Artificial Neural Network · Pearson Correlation Coefficient · Stock Trend Prediction · Weight Initialization · Ablation Study

1 Introduction

Money investment in a stock market has been one of the favorable investment strategies among a large number of people. Such investment demands knowledge of the market behavior as well as appropriate planning before trading through one or more stocks. The volatile stock market

consists of nonlinear complex patterns; future stock price or trend prediction using such noisy data are a difficult task. The market experiences fluctuations due to several influential parameters such as political conditions, various events at national as well as international levels, global economy, to name a few [1]. Hence, having a considerably potential system to predict the stock market trend with good accuracy can be an important aspect. Various fundamental analysis and technical analysis are also performed before investing in a stock market. While fundamental analysis represents an analysis of the numeric data such as earnings, profits, and ratios to determine future predictions, technical analysis focuses on utilizing historical data and modeling techniques that help to identify trends [1–3].

To forecast the future stock price as well as price movement, various experiments and analyses have been

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