Chapter 8

Machine Learning Models for Forecasting of Individual Stocks Price Patterns

Dilip Singh Sisodia  
National Institute of Technology Raipur, India

Sagar Jadhav  
National Institute of Technology Raipur, India

ABSTRACT

Stock investors always consider potential future prices before investing in any stock for making a profit. A large number of studies are found on the prediction of stock market indices. However, the focus on individual stock closing price predictions well ahead of time is limited. In this chapter, a comparative study of machine-learning-based models is used for the prediction of the closing price of a particular stock. The proposed models are designed using back propagation neural networks (BPNN), support vector regression (SVR) with SMOReg, and linear regression (LR) for the prediction of the closing price of individual stocks. A total of 37 technical indicators (features) derived from historical closing prices of stocks are considered for predicting the future price of stock in a time window of five days. The experiment is performed on stocks listed on Bombay Stock Exchange (BSS), India. The model is trained and tested using feature values extracted from the past five-year closing price of stocks of different sectors including aviation, pharma, banking, entertainment, and IT.

INTRODUCTION

Forecasting a particular stock’s price has always been considered as a significant area of research and might be very useful for investors and traders. Therefore, stock traders always seem concerned about future price or trend of a particular stock. Effective and accurate individual stock price prediction model plays a significant role as aid tool for traders and investors (Tüfekci, 2016). The most popular approaches used by researchers to predict the stock prices are based on fundamental analysis and technical analysis. In fundamental analysis, fundamental attributes of companies including financial results, company’s as-

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sets, liabilities, and stock and growth forecasts are considered. However, this type of analysis is volatile in nature as newly released financial information, announcements, quarterly results, and other news can influence the fundamental outlook for a company. Therefore, technical analysis does not try to dig deep into a company’s business process. It assumes that the available public information does not offer a competitive trading advantage and hence does not influence much of the stock prices. Instead, it focuses on studying a company’s historical share price and on identifying patterns in the chart. The primary aim is to recognize trends in advance and to capitalize on them.

In this chapter, the technical analysis is used in which different features are calculated and analyzed to find some relation between these features and the output. These features are considered to be important indicators of stock price movement, and with these features, the model will be able to predict the closing price of the stock on next day. The software used for this research automatically calculates all the 37 features adopted from (Guo, Wang, Yang, & Miller, 2015) and (Patel, Shah, Thakkar, & Kotecha, 2015) and normalizes the data (Wang, Schäfer, & Guhr, 2015) to apply as an input to different models used for prediction. The prime objective is to build a model using back propagation neural network, support vector regression and linear regression for stock price prediction (Hung, 2016).

The rest of this chapter is organized under following sections. Section 2 of this chapter discussed the related work and literature survey of interest to this chapter and which have been used in the past for the prediction or forecasting purposes. Section 3 describes the techniques which are used in the proposed model such as BPNN, SVR, and LR. Section 4 describes the overall working of the model along with the features used and the normalization technique. Section 5 shows the results generated by the proposed model. These results have been compared using various error performance measures in tabular and graphical form. Section 6 summarizes the chapter by stating the conclusion and the scope of this chapter for future research work.

BACKGROUND

Since the advent of the stock market concept, many researchers have applied various machine learning techniques to predict the stock market indices and future stock prices. Some noteworthy contributions are k-nearest neighbor (kNN) (P. C. Chang, Fan, & Liu, 2009), neural networks (NNs) (Schierholt & Dagli, 1996), genetic algorithms (GAs)(K. Kim & Han, 2000) and (Kwon & Moon, 2007), support vector machines (SVMs) (Smola & Schölkopf, 2004), least square SVM (LS-SVM) (Ou & Wang, 2009; L. Yu, Chen, Wang, & Lai, 2009), bacterial chemotaxis Optimization (BCO) (Yudong & Lenan, 2009), rough set-based pseudo outer-product (RSPOP)(Ang & Quek, 2006), and also predict the stock price from news driven models (Gusev et al., n.d.)using sentiment analysis (Trends, Chowdhury, Routh, & Chakrabarti, 2014) and other text mining methods(Mittermayer, 2004). Hybrid techniques like independent component analysis (Lu, 2010) with neural networks, genetic complementary learning (GCL) fuzzy neural network (Tan, Quek, & Ng, 2004) and self-organizing map (SOM) with Fuzzy SVM (f-SVM) (Nguyen & Le, 2014) have also been used for prediction. In (K. Kim & Han, 2000), genetic algorithms (GA) and in (Y. M. Kim et al., 2015) nonparametric model along with artificial neural networks (ANN) have used to predict the Korean stock exchange on a daily basis. In (Afolabi & Olude, 2007) the daily stock prices have predicted by using three different approaches such as back propagation, Kohonen SOM, and a hybrid Kohonen SOM and have proved that hybrid Kohonen is better of the other two.