Application of Stock Analysis Using Deep Learning

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***Abstract*—The stock market plays a very important role in the entire financial market, and one of the most attractive research issues in predicting stock price fluctuations. Since the trend of stocks is usually related to the previous stock price, this paper uses a neural network with memory capability: Recurrent neural network (RNN). In order to improve its performance, Long Short Term Memory (LSTM) architecture was used. LSTM improves the long-term dependence of traditional RNNs and effectively improves the accuracy and stability of stability.**

Keywords—stock prediction, deep learning, recurrent neural network (RNN), long short term memory (LSTM).

I. INTRODUCTION

"Prediction" is the most difficult part of any science. It is also the greatest challenge to human wisdom, but it is the goal that everyone wants to achieve. The prediction of the financial market is one of the topics that many experts and scholars have been striving to study. Financial markets are an important part of a country's economy and have a very important role in the market economy.

Many scientists and experts have put forward many stock price prediction models, using different foundations, technologies and analytical methods. The fundamental analysis includes comprehensive reasoning using external macroeconomic factors to solve the stock price changes. Since clarification relies absolutely on the intelligence of the analyst, the examination of financial variables is subjective. On the other hand, technical analysis focuses on the use of value, quantity, and other financial facts to predict stock development [1].

In recent years, due to advances in hardware, the development of artificial intelligence has been fostered, and deep learning is the main technology that countries are competing to develop. The main idea of deep learning is to calculate by neural networks. The original concept of neural networks can be traced back to the paper published by Frank Rosenblatt in 1957 on perception [2]. The greatest contribution of this article is based on neurons that define the concept of perceptron algorithms. Later invented the backpropagation algorithm [3]. However, there was no new breakthrough in the development of hardware at that time. Until now, the upgrade of the hardware architecture has triggered an upsurge of deep learning.

Stocks belong to the time series. Therefore, this paper chooses to use a recurrent neural network (RNN) with memory capability as the main architecture. The long short-term memory (LSTM) architecture solves the long-term dependence problem of traditional RNNs [4]. This article uses stock historical data as input and predicts the closing price at the next point in time.

The remainder of this article is organized as follows. Section II reviews relevant work and background knowledge. Section III introduces the neural network architecture used in this article. Section IV introduces the experimental results. Section V provides conclusions.

II. RELATED WORK

The stock historical data of this article were collected from Taiwan Stock Exchange Corporation (TWSE). In addition to the trade volume, transaction, opening price, highest price, lowest price and closing price as input data. Using the following technical analysis indicators:

A. Stochastic Oscillator(KD)

KD is a method to detect overbuying and overselling in technical analysis. Used by George C. Lane in 1950 [5].

$$\mathrm{RSV} = \frac{C_n - L_n}{H_n - L_n} \times 100\% \quad (1)$$

$$K_n = \alpha \cdot RSV_n + (1-\alpha) \cdot K_{n-1} \quad (2)$$

$$\mathrm{D_n} = \alpha \cdot \mathrm{K_n} + (1-\alpha) \cdot \mathrm{D_{n-1}} \quad (3)$$

n is the period of the transaction. This article is set on the 9th ($n = 9$). C_n is the closing price of the nth day. H_n and L_n are the highest and lowest prices in the past n days. α is the threshold. This article is set to 1/3. The KD value can be used to judge whether the current stock is overbought (K and D are over 80%) or oversold (K and D are below 20%).

B. Relative Strength Index(RSI)

RSI was invented by J. Welles Wilder [6]. RSI can determine whether it is strong to buy or sell.

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