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Predicting stock prices through deep learning techniques

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Abstract. Stock price movements are linked to lots of factors, whether it is a statement by a celebrity or an event of the magnitude of Covid-19. This paper will mainly focus on CNN (Convolutional neural network) and RNN (recurrent neural network), which are two ways to do research on stock prediction. It will discuss the challenges and limitations associated with using neural networks for stock prediction, including data preprocessing, model training, and generalization to different market conditions. The results of this study will provide insights into the potential of CNNs and RNNs for stock prediction.

Keywords: deep learning, stock prediction

1. Introduction

CNN analyzes stock movements by dividing historical stock prices into different time periods, so it can also be made into images to make the analysis more efficient. In addition, CNN will use these charts to learn and estimate the future stock trend. Unlike CNN, RNN learns and predicts stock price trend with different data points, which are collected mainly based on the time interval of each segment. In addition to the data from these data points, we can also input the news and events that may be related to the stock trend during this period, and RNN will predict the future stock based on the data from the data points and the impact of the related news and events [1]. Even though both CNN and RNN have very strong learning power, CNN's stock price chart, and RNN can collect relevant external information, even so, they cannot predict the stock price movement very accurately, there are too many factors involved in the stock movement. Consequently, stock prediction using CNN and RNN is still a difficult job and increasing the accuracy of the predictions takes a lot of work. Combining various approaches, like combining CNN and RNN to get better results, is one way to increase accuracy [1]. Another option is to employ more sophisticated methods, such as reinforcement learning and attention mechanisms, which can help to recognize more intricate patterns in the data and increase the precision of predictions. Furthermore, it is crucial to train the models on a sizable and varied dataset and to evaluate their success using the right evaluation metrics [1]. Although there are difficulties, using CNN and RNN for stock prediction has the potential to offer insightful information to traders and investors, and it is a current area of study in the fields of machine learning and finance.

2. Methods used in stock prediction

RNN and CNN are two types of neural networks for machine learning, this machine learning approach is also used in stock forecasting, mainly in terms of past stock prices and events that may be linked to the stock market for them to learn from. RNN and CNN, are very innovative neural networks, CNN and

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RNN can give machines the ability to learn so that they can make predictions about future stock price movements from past data [1,2]. In order to find the reliable models, we will have many values to verify them, such as the F1 score, which is used to verify the models by recission and recall. Based on these indicators we can find the most reliable model among the generated models. However, it is still a very challenging task to verify the future trend of the stock. The advantages of NN in stock price forecasting are that NN uses Non-Linear Modeling in price forecasting, which means that NN captures more subtle changes than traditional models [2]. The adaptability of NN is also incomparable to traditional models, as it generates changes in the prediction based on the addition of new data, and NN learns from historical data, which makes it more advantageous in stock price prediction. In the work we have been done with the neural networks, originally invented by Yann LeCun in the 1980s and 1990s, CNNs were primarily used in computerized image processing and have since been developed as a cutting-edge technique for image classification, object detection, and other computer vision tasks [2]. RNNs were developed in the 1980s and 1990s by several researchers, including Sepp Hochreiter and Jürgen Schmidhuber. they were designed to process continuous data, such as speech, natural language, and time series data. And these neural networks are now primarily used in computer deep learning. Deep learning is a comparatively new development in which neural networks with many layers are trained. This method has resulted in significant advances in fields such as computer vision, natural language processing, and speech recognition [2]. Overall, the use of RNN and CNN in stock forecasting is a promising application of machine learning, as it can help to capture the complex and non-linear relationships between past stock prices and other relevant factors. By training the neural network on a large dataset of historical stock data and other relevant data points, the model can learn to identify patterns and trends that can be used to make accurate predictions about future stock prices. One advantage of using NN in stock price forecasting is the ability to capture subtle changes and adapt to new data, which can improve the accuracy of the predictions over time. Additionally, deep learning methods such as RNNs and CNNs have shown significant advancements in other fields such as computer vision and natural language processing, which suggest that they have a high potential for solving complex problems in various domains [3]. However, it is important to note that verifying the reliability of the models generated by NN is a challenging task and requires careful evaluation using various metrics such as F1 score, precision, and recall. Despite these challenges, the potential benefits of using NN in stock forecasting make it a promising area of research and development.

From the article" Stock Market Prediction using CNN and LSTM" by Hamdy Hamoudi and Mohamed A Elseifi. They used CNN and LSTM in predicting the stock price trend and completed the experimental data. In this article Hamdy and Mohamed advocates should focus on predicting potential returns, which are primarily derived from the top-ranked trading operations on each exchange, rather than predicting the potential return on trades [1]. In this study, Hamdy and Mohamed used various training sets to train the learning machine, mainly by training with a certain number of transactions, and then taking some of these transactions and training them again until a small number of transactions remain. The method outlined above seeks to solve the problem of missing data in the features matrix and guarantee that the model is evaluated on a representative sample of the data [1]. The logical matrix acts as a marker for missing data, which can be helpful in spotting trends and, when feasible, filling in the blanks. This kind of dataset is well suited for the rolling cross-validation approach because it enables the model to be trained on a variety of various data samples, which can help to spot overfitting and boost prediction accuracy. Normalizing the data and replacing missing values with the median are common pre-processing steps that can help to lessen the effect of outliers and ensure normalizing the data and replacing missing values with the median are standard pre-processing steps that can help to lessen the effect of outliers and make sure the model is resilient to changes in the data [3]. To guarantee consistency and comparability between the training and test sets, the pre-processing stages can be saved in separate files and then used to apply the same transformations to the test subset. Overall, these steps are a crucial component of the machine learning pipeline and have a big effect on the model's performance. Overall, the article "Stock Market Prediction using CNN and LSTM" by Hamdy Hamoudi and Mohamed A Elseifi presents a study on using deep learning models, specifically convolutional neural networks

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(CNNs) and long short-term memory (LSTM) networks, to predict the stock price trend. The authors suggest that the focus should be on predicting potential returns rather than the potential return on trades.

The authors also discuss their approach to addressing the problem of missing data in the features matrix, which involves training the learning machine on various training sets, gradually reducing the number of transactions until only a small number remain [1]. This approach helps to ensure that the model is evaluated on a representative sample of the data and is effective in spotting trends and filling in missing data. To further improve the model's performance, the authors recommend standard pre-processing steps such as normalizing the data and replacing missing values with the median [1]. These steps can help to lessen the effect of outliers and ensure that the model is resilient to changes in the data. Lastly, to ensure consistency and comparability between the training and test sets, the authors suggest saving the pre-processing stages in separate files and applying the same transformations to the test subset. Overall, these pre-processing steps are an important part of the machine learning pipeline and can have a significant impact on the model's performance.

3. Conclusion

In conclusion, stock forecasting using RNN and CNN is a promising use of machine learning. These neural networks can aid in capturing the intricate and asymmetric relationships that exist between historical stock prices and other important variables [4]. The benefit of using NN in stock price forecasting is its capacity to detect minute changes and adjust to new information, which can increase prediction accuracy over time. However, assessing the dependability of the models produced by NN is a difficult job that necessitates careful analysis using a variety of metrics. Despite these difficulties, the advantages of applying NN to stock forecasting make this field of study and growth promising. Combining various methods to improve accuracy can lead to further advancements, such as reinforcement learning and attention mechanisms [4,5]. Generally speaking, the application of RNN and CNN for stock price predictions has yielded encouraging results and has the potential to get better over time. A careful assessment of these models' accuracy and reliability is required before using them in actual applications, but it is important to remember that no model is flawless [6]. Additionally, the accuracy of predictions can be further increased and made more reliable by combining various approaches and methods. It will be intriguing to watch how fresh ideas and technological developments will be applied to the stock forecasting issue as machine learning continues to develop. A promising application of machine learning that has the potential to revolutionize the industry is the use of RNN and CNN for stock price forecasting [6-8]. While these models are capable of capturing intricate connections in the data, it is crucial to evaluate their accuracy and dependability before applying them in practical settings. Prediction accuracy can also be increased by combining different methods and approaches. It will be fascinating to see how these models can be improved with the incorporation of new concepts and technologies as machine learning develops. In general, I think that stock price forecasting using RNN and CNN has a promising future.

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