

Stock Price Prediction Using Support Vector Machine (SVM) and Long Short-Term Memory (LSTM) Algorithms

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Abstract

Day by day many researches are being held over the globe to predict the accurate share price and benefit all the investors in the share market. The prediction model basically uses the artificial neural network. In the recent market and ongoing year there are huge improvements in executing the SVM Algorithm for stock price Prediction. There are many other algorithms which are being used for Stock price Prediction. In this Research Paper SVM algorithm and LSTM algorithm is going to be used for predicting the Stock price and increasing the prediction Accuracy. The main focus of this research paper is to predict the Stock price using the Artificial Intelligence using the algorithm lie SVM and LSTM. After Predicting the Stock Price, the accuracy ratio of two algorithms is compared. Hence, the SVM algorithm is supervised machine learning algorithm which can be cast-off for both classification and regression challenges. Recurrent Neural Network (RNN) is the most commanding and Robust type of artificial neural network. LSTM falls under the Recurrent Neural Network. The Web based application will be developed to predict the stock price and generate the accuracy of two algorithms. The past dataset of organization will be taken for predicting the stock price of future

Keywords - Stock Price Prediction, Artificial Neural Network (ANN), RNN, SVM, LSTM, Backpropagation

1. Introduction

The Stock Price Prediction is the hot topic among the finance and business trading. The Stock Market doesn't have the trend of operating in same pattern, as the stock market is unpredictable and vibrant in nature. In the present context many researches are going on regarding this topic, many researches are being held to predict the accurate stock price prediction to gain the numerous profits without any risk. Therefore, day by day different kind of analysis are being held such as statics analysis, technical analysis, fundamental analysis and many more.

Implementing the Artificial Intelligence to Predict the Stock price itself is the amazing creation of the human beings. Where using the several kinds of algorithm like SVM and RNN algorithm for improving the accuracy rate is itself a challenging one. The prediction of Stock price of an organization by human beings analyzing the previous dataset of company are less accurate the predicting it by implementing the Artificial Intelligence.

1.1 Background

Day by day investing in the share market is increasing rapidly as the investing in the share is the most beneficial business in the present society. The stock market was primarily traded before the invention of the computers and Artificial Intelligence (AI). Therefore, the investors are in search of the Tools that will help investing in the accurate business and gain the huge number of profit and reduce the risk of losing the money. As the investing in share market is increasing rapidly the trading and investing are in hike level. Different kind of tools are being developed as the different kind of research are being held like Statistics analysis, Technical analysis, Fundamental Analysis, Time Series analysis, chaos theory and many more are implemented to predict the stock market price.

Although different kind of theory is used the none of these theories is predicting the correct Stock Price as the predictive model has a smaller number of accuracy rate to predict the Stock. However, these kinds of theory don't perform well but the Artificial Neural Network (ANN) should perform the highest

accuracy and predict the correct Stock market price. Therefore, the several kinds of algorithm are being used for predict the stock market. Many researches are going on using the Backpropagation Neural network where the past data of stock price is obtained from different kind of Internet sources.

1.2 Problem Context

Going through many research papers related the stock price prediction I found that the accuracy rate of prediction is varies according to the variation of company data set. The prediction is accurate sometimes and sometime the prediction accuracy is too far from the mean point. And the major problem is predicting the high scale data are though. As the Supervised learning SVM Algorithm will be used to predict the Stock price and LSTM Algorithm will also be used for prediction and at last the accuracy between the two algorithms will compared for the accurate rate of prediction.

1.3 Rational

The research is important to the investors who are willing to invest in the share market without any risk and gain the profit. As, mitigating the risk the two algorithms are being choose for developing the share price predicting application. The algorithm will be filtered for the 100% accuracy rate.

1.4 Targeted User

The research paper mainly targets the investor who are willing to invest in the share market. Those investors who are willing to invest and earn a profit without any risk. As, this application is developed to predict the stock price based on their past and present dataset of the company. The predicted price help investor to invest in the right stock and gain the huge profit.

1.5 Aim and Objectives

The main aim of this research paper is to develop the application that predicts the Stock price of the organization from the past history for the investors who are willing to invest in share market without any risk. The Supervised learning Support Vector machine algorithm and Recurrent Neural Network (LSTM) algorithm is being used for developing the application. By gaining the highest accuracy rate the prime aim will be full field. The python language will be selected to develop the application. The objective of this research paper is to get detail knowledge (Kautish et al, 2016, 2018, 2019) about SVM, RNN, LSTM algorithm. The application will be developed to predict the stock price

- The main aim of this paper is to develop the application that predict the Share market price and get highest prediction accuracy.
- To perform the Technical analysis which involves the market future profitability on the basis of its current business environment and financial performance.
- To develop the platform for predicting the Share market price.
- To compare the accuracy of the two algorithms.
- To Prepare the Best GUI for the Results.

1.6 Project Deliverables

The Financial performance and Stock price dataset will be taken and analyzed and SVM and LSTM algorithm will be used to develop the application which will predict the Stock price of organization.

A Web-based application (Rani and Kautish, 2018) (Kaur and & Kautish, 2019) will be developed using the Python programming and libraries. The different graphical chart will be generated to show the predicted price data.

1.7 Nature of Challenges

As, the research was though for me because in order to do this research many research papers should be gathered and study for long period. The journal consists many high-end languages. As, this was my first research paper, it was very hard to maintain the sections and write the bunch of words. I have no experience in writing this kind of research paper. Understanding the several algorithms and researching journal was also very hectic.

2. Algorithm used

In this research paper the prediction of the stock price is done in Support Vector Machine (SVM) and Long Short Term Memory (LSTM) a part of Recurrent Neural Network.

2.1 Support Vector Machine (SVM) Algorithm

SVM is Supervised learning algorithm which is defined as discriminative classifier that properly segregated the hyperplane between the two dimensions. The Outputs are the ideal hyperplane which form the new examples. The SVM is taken as the most preferable algorithms available for the time series prediction. This algorithm can be applied in both regression and classification. The data are plotted in the space of n dimensions.

2.2 Hyperplanes

Those decision Boundaries which that merits to categorize the data points. The dimension is constructed on the basis of feature of the numbers.

Thus, the SVM algorithm is best for time series prediction it will be very useful to predict the stock price analyzing the past stock data and prediction the future stock price.

2.3 Long Short-Term Memory (LSTM) Algorithm

The LSTM is the extended version of RNN that can specially hold the learning of the long-term dependency. The algorithm was founded on 1997 by the Hochreiter & Schmidhuber. This algorithm was designed to overcome the problem of long-term dependency. Storing and remembering the data (Kautish et al, 2008, 2012, 2013, 2020) for long span of time is the default feature of LSTM. The available neurons in LSTM are the memory cell which can store the information for the long period of the time span. (Raghav Nandakumar, 2018). The LSTM Memory cell are categorized into three components as the figure 5 shown above which consists Forget Gate, Input Gate & Output Gate.

Input Gate: The input gate basically retrieves the inputs and verify why to store the information in the cell. The input gate checks the condition of the newly input information's.

Output Gate: This gate decide what information should be forwarded depending on the input and cell state.

Forget gate: The Forget gate helps to update the information of the cell with recent information. The outputs close to 1 should be retained and 0 should be neglected.

Thus, the LSTM networks can resolve the long material about the past trends in stock.

3. Proposed Model

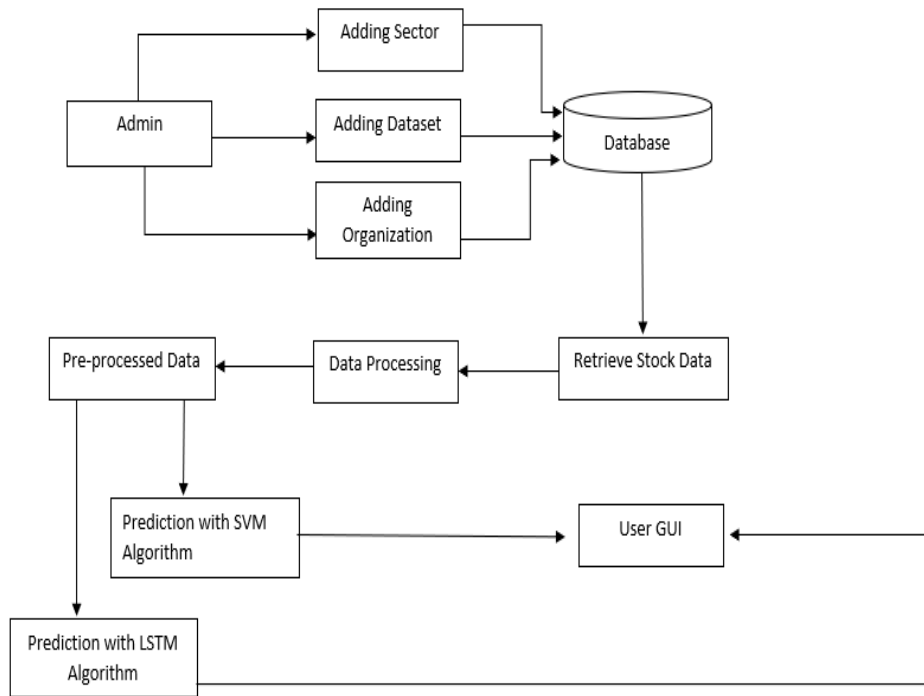


Figure 1: Proposed Methodology

4. UML Diagrams



Figure 3: use case user

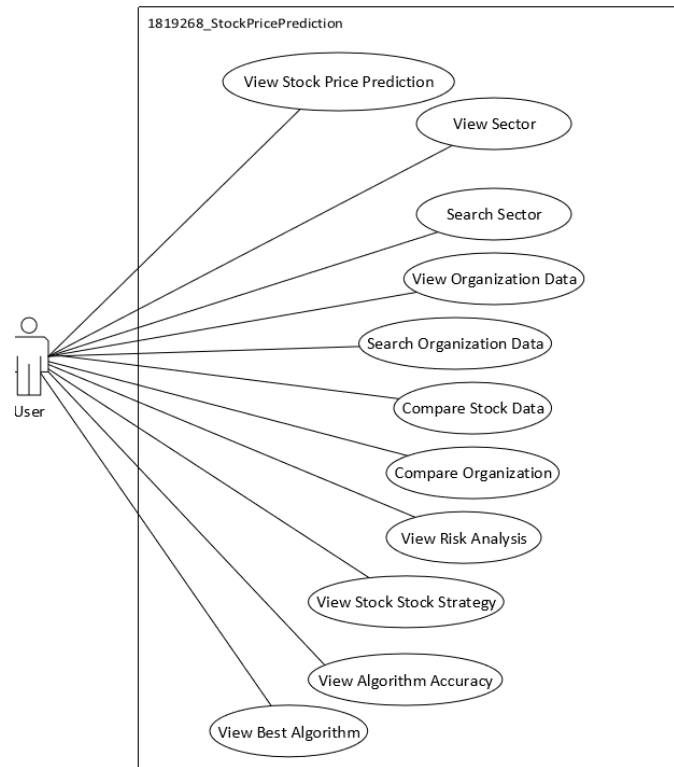


Figure 4: use case: admin

5. Results

So, looking through that problem context the researcher has developed the web-based stock predication application which predict the stock price, analyze the stock risk and Suggest the stock Strategy. Besides this there are more feature of comparing organization and stock. The web-based application is developed using the python language and Django frame work. In this application the dataset is manually added by the admin and stored in the database then after applying the algorithm s the stock price is predicted analyzing the past history data of stock.

5.1 Prediction

Prediction Result - SVM Algorithm						
Date	Open	Close	Low	High	Overall Accuracy (in %)	Stock Strategy
2019-09-09	418.00	418.10	415.20	419.60		Sell
SVM Accuracy (in %)	97	98	100	96	97.75	

Figure 5: Prediction result of SVM

Date	Open	Close	Low	High	Overall Accuracy (in %)	Stock Strategy

2019-09-09	418.00	418.10	415.20	419.60	-	Sell
SVM Accuracy (in%)	97	98	100	96	97.75	

Date	Open	Close	Low	High	Overall Accuracy (in %)	Stock Strategy
2019-09-09	412.00	411.20	411.70	415.90		Sell
LSTM Accuracy (in %)	96	94	94	98	95.5	

Figure 6: Prediction result of LSTM

Date	Open	Close	Low	High	Overall Accuracy (in %)	Stock Strategy
2019-09-09	418.00	418.10	415.20	419.60	-	Sell
LSTM Accuracy (in%)	96	94	94	98	95.5	

5.2 Accuracy Comparison

Comparing the both algorithm the accuracy of SVM is higher comparing to LSTM in overall prediction.

Prediction

To see prediction of the organization or index symbol type below.

Organization Details

ID	Stock Symbol	Organization Name	EPS	PE Ratio	NWPS	Rating	Maximum Price	Minimum Price	Closing Price	Sector	Date
7	ADBL	Agriculture Development Bank Limited	48.29	8.90	420	5	422.00	412.00	418.00	6	Aug 13, 2019

Prediction Result - SVM Algorithm

Date	Open	Close	Low	High	Overall Accuracy (in %)	Stock Strategy
2019-09-09	418.00	418.10	415.20	419.60		Sell
SVM Accuracy (in %)	97	98	100	96	97.75	

Prediction Result - LSTM Algorithm

Date	Open	Close	Low	High	Overall Accuracy (in %)	Stock Strategy
2019-09-09	412.00	411.20	411.70	415.90		Sell
LSTM Accuracy (in %)	96	94	94	98	95.5	

SVM is better algorithm than LSTM.

Figure 7: Accuracy comparison

5.3 Stock Comparison

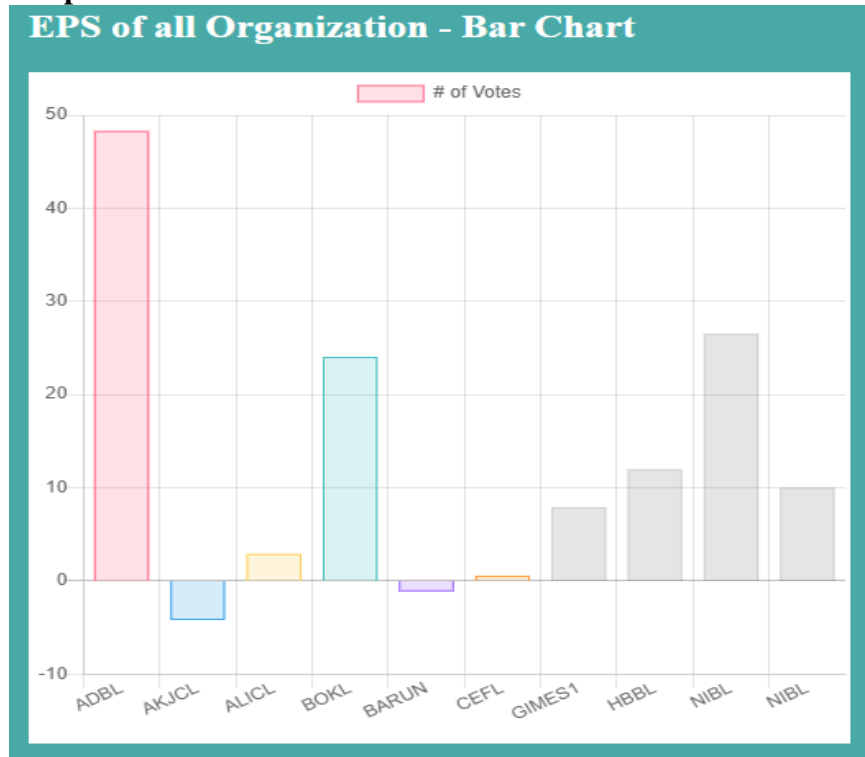


Figure 8: Comparison of Eps

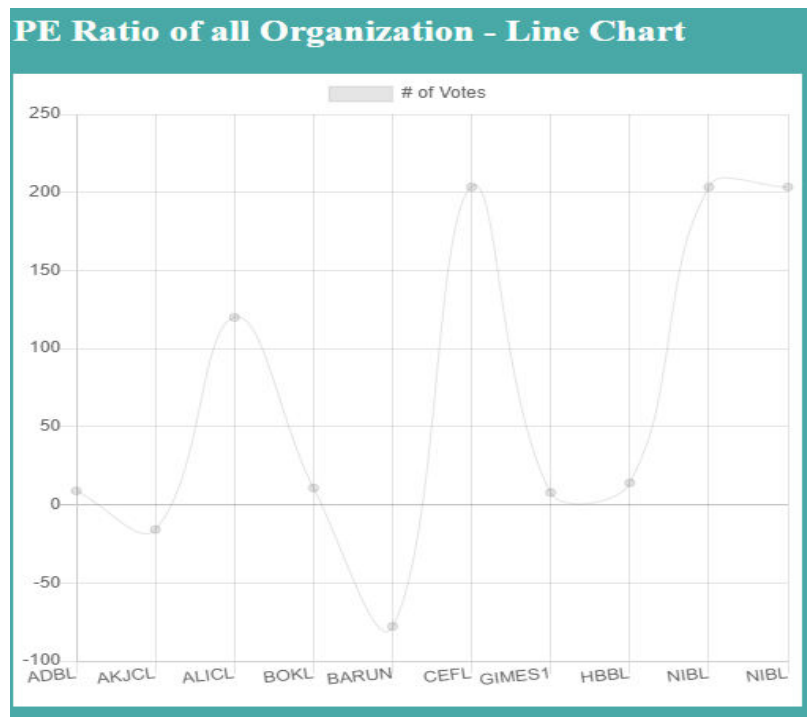


Figure 9: Comparison of Pe_Ratio

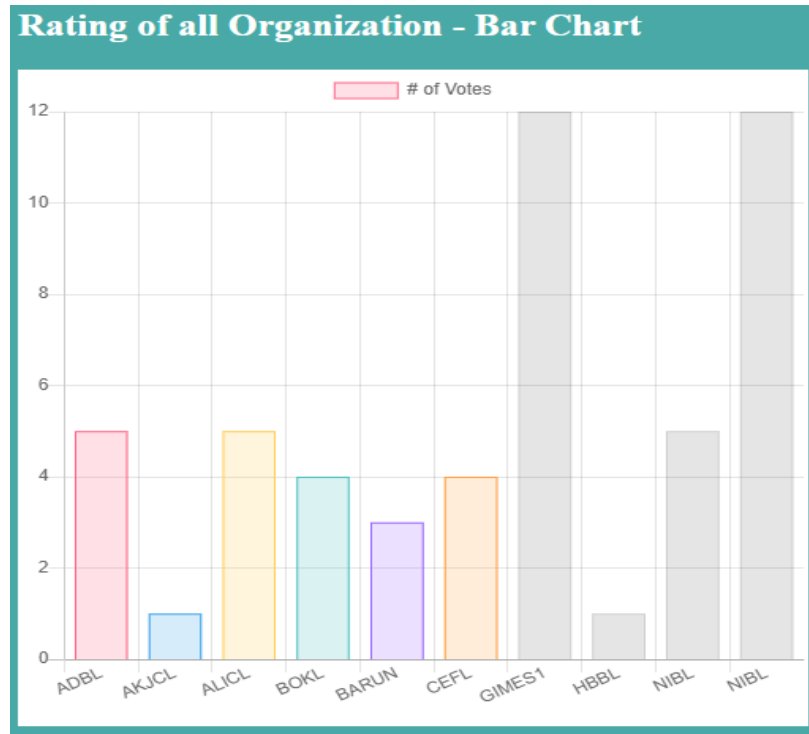


Figure 10: comparison of rating

5.4 Organization Comparison

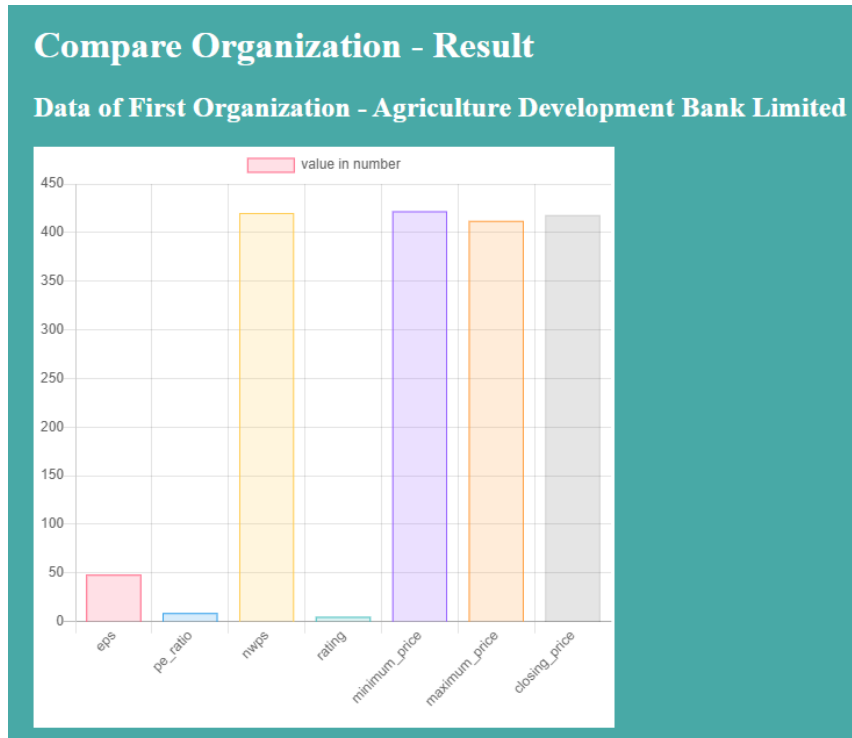


Figure 11: Comparison of organization

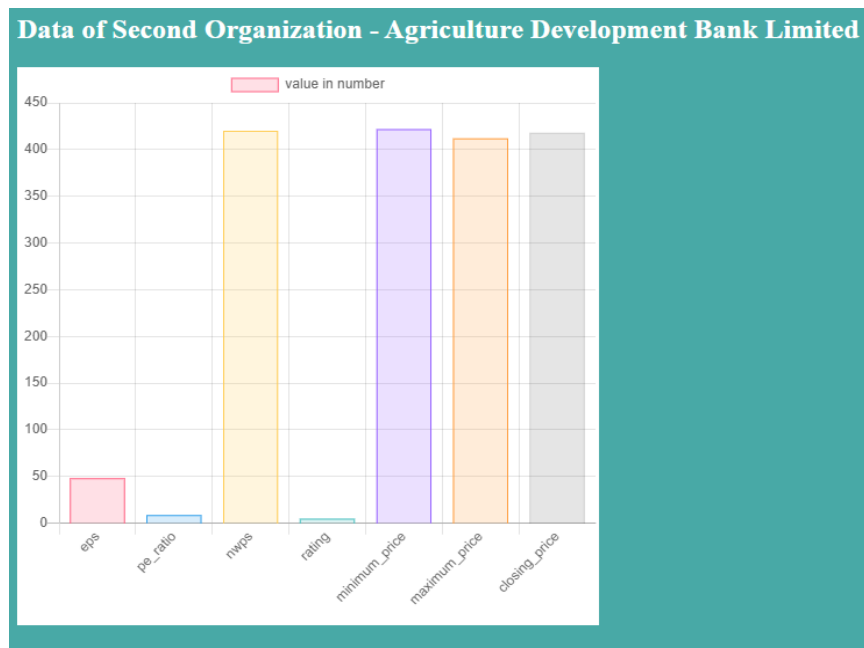


Figure 12: Comparison of organization

6. Conclusion and Future work

6.1 Conclusion

The main objectives of this research were to research in the field of stock domain and develop a web-based platform which predict the stock price using to separate algorithm SVM & LSTM. As, the objectives were successfully fulfilled as in the end of Semester and web-based application which predicts the stock price was successfully developed.

In order to develop the complete task, the agile methodology was taken as the methodology for the project. The application is developed using the Python language (version 3.6.8) and the IDE was PyCharm community edition was used. Apart from this several python libraries like PIP, Django framework, Rest framework, Virtual env, MySQL, MySQL Connector were used in order to meet the project goals and objectives. For database MySQL is used as the Database. This paper used the LSTM & SVM as the algorithm for prediction. The datasets were taken from Nepal Stock Exchange & Merolagani.com.

In summary the web-based application is developed which predicts the stock price. The accuracy of prediction is between 78to 90 in both algorithms. Comparing the both algorithm the accuracy of LSTM is higher comparing to SVM in overall prediction. Apart from Prediction several features are also there like Risk analysis, Stock Strategy, Stock comparison & Organization Comparison. Somehow the GUI is also improved. The feature, prediction and comparison can view in application.

6.2 Future Work

As, the system is founded a very useful application as per the user feedback, the following feature can be added in the future like

1. User friendly web application & mobile application
2. Real time Prediction of Stock Price
3. Trend analysis of Stock
4. Prediction of stock across the globe through the real time data.

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