AlgoB – Cryptocurrency price prediction system using LSTM

Shreyas Ingle, Naman Kumar, Vinay Bichave, Vishwadish Desale

Student, Dept. of Information Technology, Atharva College of Engineering
Student, Dept. of Information Technology, Atharva College of Engineering
Student, Dept. of Information Technology, Atharva College of Engineering
Student, Dept. of Information Technology, Atharva College of Engineering

---***---

Abstract - *With the increased availability of mobile devices and personal computers to all the people around the world, trading in stocks and cryptocurrency has become much easier than it was a decade ago. But a lot of people don't have much knowledge on how to trade, they don't know when it is the right to buy a cryptocurrency and when they should sell it. As a result, a lot of people lose money while trading and they stop doing it completely. But if you know how to trade then there's a lot of money which can be made doing this.*

Predicting the accurate cryptocurrency price has been the aim of investors since forever, Billions of dollars of trading happens every single day, and every trader hopes to earn profit from his/her investments. Once an automated price prediction system is developed, investors can take a slightly hands-off approach to trading as they won't need to invest a lot of their time in deciding when to buy or sell. Cryptocurrency prices could be accurately predicted using the LSTM (Long Short-Term Memory) model.

Key Words: **Trading, Stocks, Cryptocurrency, Prediction, Price Prediction System.**

1.INTRODUCTION

A Price prediction system uses an algorithm to analyse a cryptocurrency based on its demand, whitepaper, tokenomics, people's opinion about the cryptocurrency and current market trends and once analysed it uses the patterns and trends identified to predict the future price of the cryptocurrency.

The computer program will predict the future price based on technical analysis, advanced statistical and mathematical computations, or input from other electronic sources. The algorithm will also take the input of previous price changes and trends and extract useful data from it. Once the prediction system is developed, investors can take a slightly more hands-off approach, as they won't need to invest a lot of their time in deciding when to buy or sell.

In the field of AI (Artificial Intelligence), Machine Learning is a type of AI that can forecast future prices by analysing and identifying patterns in the present and past data. Research has shown that the model-based forecasting models have many advantages as compared to other forecasting models. The long-term price prediction achieves better result than the short-term one both in MLP and RNN. Long-term price

prediction shows high accuracy in cryptocurrency price prediction with result of accuracy in range of 60-80% [2]. They can produce results that are nearly the same as the actual results thereby improving upon the accuracy and precision of the models. Due to the volatility of cryptocurrency prices, predicting them is extremely difficult and time-consuming.

1.1 Need

Trading in cryptocurrency is something that everyone from young to old generation wants to try . In recent times as people have realized that the stock and cryptocurrency trading has given the most ROI as compared to other forms of investment. But a lot of people are unaware of how to exactly make sense of the different factors that influence the price of a cryptocurrency and hence they lose money.

Price Prediction system using deep learning helps you discover the future value of cryptocurrency and other financial assets traded on an exchange. The entire idea of a prediction system is to gain significant profits and this system helps achieve your goals.

Humans cannot predict cryptocurrency prices with high accuracy since there is a multitude of factors responsible for changes in price. Factors involved in the prediction, such as physical and psychological factors, rational and irrational behavior, current trends and so on combine to make cryptocurrency prices dynamic and volatile. And we all know that the crypto market is especially known for its high volatility. A human cannot possibly interpret all these factors but a price prediction system can make an accurate future price prediction by combining all these factors.

1.2 Scope

This prediction system can be used by average and new traders alike to help them understand how the market works and responds to different news and can also help them earn money without investing much of their time in manual predictions using the indicators provided by different trading platforms. This system isn't only applicable to cryptocurrency but also to stocks by making just some minimal changes like using a different API (Application Programming Interface) to fetch current prices and making some changes to the parameters.

This prediction system ensures a non-emotional prediction of price. Time is money and when it comes to price prediction, manual predictions take a lot of time and even then they are not accurate as they are prone to human errors and emotions. The cryptocurrency market is highly volatile, which is why a prudent trading strategy should include a correct prediction of prices, and one way to ensure that is to run and implement this price prediction system. This prediction system effectively captures the changing market conditions and can incorporate that in real time to provide accurate predictions. The accurate prediction of cryptocurrency price movement will lead to more profit investors can make.

2. SOFTWARE REQUIREMENT SPECIFICATION

The price prediction model will basically take the time-series sequence of past prices of a cryptocurrency and provide it as an input to the LSTM model. LSTM will then extract features from this sequence and decide which information to store in its cell state which is a long term memory of LSTM. This stored information will then be used by the model to make future predictions and it can also be updated at regular intervals to improve the model's accuracy.

The model will provide its predictions to the user within seconds and also plot this prediction on charts to increase its interpretability. The input parameters are the integer values of prices of cryptocurrency from past days to the current day, LSTM Layers, Epoch and Dropout Value. On the basis of that information our model will predict the outcome. It will do the operation on the values present in the dataset and predict the current day or the future day prediction with 75-80% accuracy.

The quality attributes of the model include - Availability : The user should be able to perform the predictions at any time they want, Correctness : The predictions made must be of high accuracy and Usability : The model should be easy to use and satisfy a maximum number of user's needs.
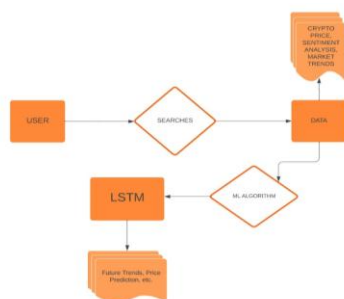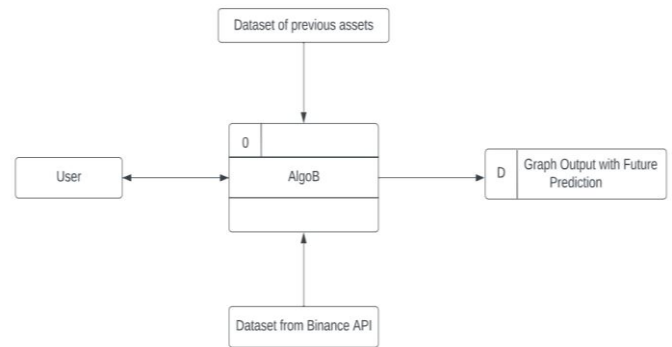

Fig – 1 : ER Diagram

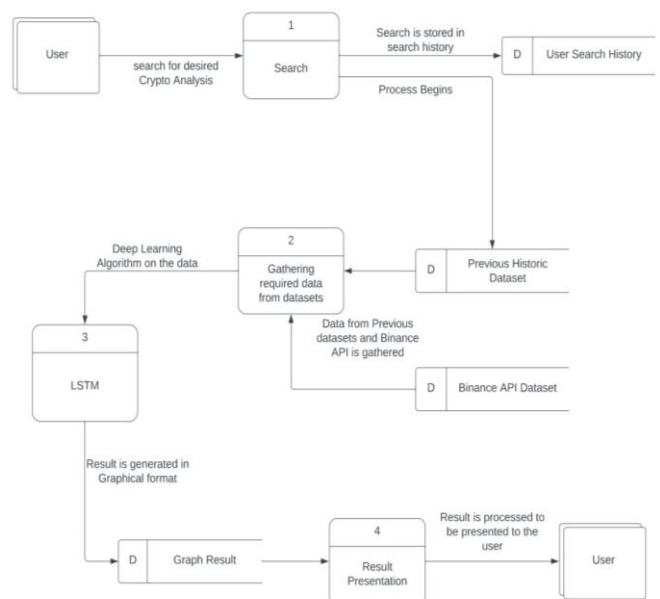**Fig – 2 :** DFD Level-0 Diagram

Fig – 3 : DFD Level-1 Diagram

3. REQUIREMENT ANALYSIS

The architectural and design requirements for the prediction model are Labelling the X and Y axis of the chart accurately, Providing the ability to zoom in and out of the chart, and a save button to save the prediction price chart. The system and integration requirements include Prediction should time as minimal time as possible and should be computationally efficient and the data transfer from and to the API should be encrypted.

3.1 Software Used

The software technology used for implementing the prediction model are NumPy, Pandas, TensorFlow and Matplotlib.

Table -1: Software used

NumPy	It guarantees efficient calculations with arrays and matrices.
Pandas	Pandas is mainly used for data analysis and associated manipulation of tabular data in Data Frames.
Matplotlib	It is a data visualization and plotting library for Python.
TensorFlow	TensorFlow is an open-source library which is used for deep learning applications.
Sklearn	This library contains efficient tools for machine learning (ML).
Pickletools	Helps in shrinking the size and faster loading of Pickle files.
Binance API	It is a function which allows to connect to the Binance servers via Python allowing you to automate your trading.
VS Code	It is an Integrated Development Environment (IDE).

4. METHODOLOGY

Get the dataset from the Yahoo Finance API to train the model for a particular asset. Implement the LSTM model Algorithm. Get the client API key and client secret key. Then use it to retrieve data from the Yahoo Finance API. Use the history of some hours or days then use the model to predict the future, once finished, output the predicted price in the form of a chart.

LSTM is a type of Recurrent Neural Network. RNN basically stores previous output as input and then predicts output based on it. It gives very accurate predictions working with Short term memory, but for long term, it's not that efficient. To avoid this long-term dependency of RNN, LSTM was created which by default can retain information data into its memory.

LSTM is specifically designed to work on sequential data, like time-series, speech and text. It is capable of learning long term dependencies of sequential data which makes it ideal for speech recognition and time-series predictions. RNN has a single hidden state which is passed through time, which makes it difficult to use for long-term dependencies. To efficiently solve this problem, LSTM has introduced a memory cell that can hold onto information for a longer period of time.

Memory cell in LSTM has three gates that decide what information needs to be added, removed or give output. The three gates are : The Input Gate controls what information needs to be added inside the memory cell. The information is regulated using Sigmoid function and filter the values to be stored. It is done by using two inputs 'A' (input at particular time) and 'B' (previous cell output). Then, a vector is created which gives an output from -1 to +1, which contains all the values from 'A' to 'B', The Forget Gate which removes the information that is no longer required. Again, we take two inputs 'A' and 'B' that are fed to the gate and multiplied with the weight matrices followed by addition bias. The result is then passed through an activation function which gives a binary output. If the output is 0 for a cell, then information is forgotten, if it is 1 then information is retained and The Output Gate which extracts the useful information from current cell state to be used as output. It is done slightly different than the input gate where Vector was created later, here first a vector is created using tan function using the Sigmoid function and filter the values by 'A' and 'B'. At the end, the values are multiplied to be sent as output and Input in the next cell.

4.1 Training the model

We retrieve the data set from Yahoo Finance API against the US Dollars, we even specify a time frame to have a start and an endpoint. We create a min-max scalar with the feature range of 0 and 1 to fit the data in it. Then fit the data in the scalar transform then we specify prediction days then we reshape the data as per required. Then we create a neural network using Sequential Model. Create the Sequential Model and then we add LSTM layers (i.e. Long Short-Term Memory Layers) and then Dropout layers, we have used LSTM layers because these layers are powerful and they can memorize important information and feed data back into a neural network. We prevent the overfitting of the network by using Dropout layers then we compile the model (Train the Model).

4.2 Evaluation of the model

The input parameters are the integer values of prices of cryptocurrency from past days to the current day, LSTM Layers, Dropout Value and Epoch. Epochs are the number of times the algorithm will work through the training set. Dropout reduces overfitting and improves model performance. A very high dropout rate will slow the convergence rate of the model, and ruin final performance. Too low a rate may yield few or no improvements on generalization performance. Ideally the dropout rates should be set separately for each layer and also during the several training stages. More LSTM layers may be better overall but also harder to train. The number of layers chosen depends upon the complexity of the dataset, the data generating process, and the accuracy required for the use case. The number of memory cells will depend on the number of layers. If the goal is to beat the best model, in general, you will need

more LSTM cells. However, if the goal is of coming up with a reasonable prediction, then, fewer LSTM cells will be needed.

On the basis of these parameters our model will predict the outcome. It will do the operation on the values present in the dataset and predict the current day or the future day prediction with 75-80% accuracy. The model is evaluated against the prices in real time to predict the accuracy. By doing this it helps the traders to get the current position of that particular crypto for trade.
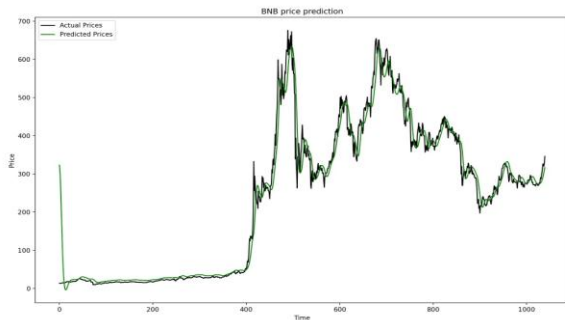

Fig – 4 : BNB Price prediction chart

5. CONCLUSION

The prediction system that we have built not only predicts the future price of a cryptocurrency but it also does it with a high accuracy. Our model is able to achieve such results by employing the use of Long-Short Term Memory Networks which are a special type of Recurrent Neural Network since remembering information for a long period of time is their specialty and not something they struggle with. The dropout value and LSTM layers both parameters have been set such that the model give an accurate prediction while consuming minimum computing resources and time. The final predictions are represented graphically using matplotlib library of python to further increase the interpretability of the prediction made.

When compared with models which employ regressions and trees models whose accuracy is about 50% our model achieves a much better accuracy of around 80%.

ACKNOWLEDGEMENT

REFERENCES

[1] A. -A. Encean and D. Zinca, "Cryptocurrency Price Prediction Using LSTM and GRU Networks," 2022 International Symposium on Electronics and Telecommunications (ISETC), Timisoara, Romania, 2022,pp.1-4, doi: 10.1109/ISETC56213.2022.10010329.

[2] R. Albariqi and E. Winarko, "Prediction of bitcoin price change using neural networks," in 2020 International Conference on Smart Technology and Applications (ICoSTA), 2020, pp. 1–4.

[3] D. Mahayana, E. Shan, and M. Fadhl'Abbas, "Deep Reinforcement Learning to Automate Cryptocurrency Trading," IEEE Xplore, Oct. 01, 2022. https://ieeexplore.ieee.org/document/10010940 (accessed Mar. 29, 2023).

[4] A. N. Sihananto, A. P. Sari, M. E. Prasetyo, M. Y. Fitroni, W. N. Gultom, and H. E. Wahanani, "Reinforcement Learning for Automatic Cryptocurrency Trading," IEEE Xplore, Oct.01,2022.https://ieeexplore.ieee.org/document/10010206 (accessed Mar. 29, 2023).

[5] Q. Wang, "Cryptocurrencies asset pricing via machine learning: Extended abstract," in 2020 IEEE 7th International Conference on Data Science and Advanced Analytics (DSAA), 2020, pp. 789–790.

[6] F. Atlan, I. Pence, and M. S. Cesmeli, "Online fiyat tahmin modeli online price forecasting model using artificial intelligence for cryptocurrencies as bitcoin, ethereum and ripple," in 2020 28th Signal Processing and Communications Applications Conference (SIU), 2020, pp. 1–4.

[7] F. Sabry, W. Labda, A. Erbad, and Q. Malluhi, "Cryptocurrencies and Artificial Intelligence: Challenges and Opportunities," IEEE Access, vol. 8, pp. 175840–175858, 2020.

[8] M. Wimalagunaratne and G. Poravi, "A predictive model for the global cryptocurrency market: A holistic approach to predicting cryptocurrency prices," in 2018 8th International Conference on Intelligent Systems, Modelling and Simulation (ISMS), 2018, pp. 78–83.