Bitcoin Price Prediction Using Deep Learning

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Abstract

Digital crypto currency Bitcoin has seen a significant rise in its market value over the last several years. The goal of this project is to use machine learning techniques to determine the Bitcoin price. To make an investment decision in bitcoin, one must have accurate forecasts due to its volatile nature. In order to construct a prediction model and give insightful analysis of future market prices, we conducted a series of experiments using several machine learning techniques. Predictions of the price of bitcoin may be made using a variety of models that each take a different approach. Predicting the daily price of Bitcoin is based on a collection of high- dimension variables such as property and network, trading and market, ttention and gold spot price, while predicating the 2-minute interval price is based on basic trading data obtained from a crypto currency exchange. Time series models are challenging to evaluate because of the difficulties in determining their precise nature. RNNs with long short-term memory cells continue to be implemented in order to overcome this issue (LSTM). As a result, we use long short-term memory (LSTM) technology to better analyze the time series model forecast of bitcoin values.

Keywords: Deep Learning, Recurrent Neural Network, Long Short time Memory, Bitcoin, Blockchain Technology

I. INTRODUCTION

For sequential data, recurrent neural networks (RNN) are the best algorithm, and Siri and Google's voice search use them. Because of its internal memory, it is ideal for handling machine learning issues requiring sequential data, making it an ideal method. It's one of the deep learning algorithms that gets amazing results. In this article, we'll show you how to use data from the last eightyears to accurately forecast the price of Bitcoin. Bitcoin has a lot of history, which makes it difficult to forecast which history will be repeated, much like the rest of history. More than a review of previous patterns is needed to forecast the future. Using Python and RNNs, we created a basic model to help us better understand how time series function.

What is Bitcoin?

To put it another way, Bitcoin is an innovative method of making and receiving payments. For digital payments or merely as an investment, it is a crypto currency that is accepted across the globe. Bitcoin is a decentralized currency, which means that no one owns it. It was created in 2008 by a person or group of persons using the pseudonym Satoshi Nakamoto. Because Bitcoin transactions are decentralised and not connected to a certain jurisdiction, the transaction fees between individuals in various countries are minimal. Investors may use a variety of platforms to make investments. A digital wallet, like to a digital bank account, is where bitcoins are kept. The timestamp datafor all transactions is kept in a Blockchain. A block is the collective noun for all of the records that make up a blockchain. A pointer to the preceding block of data may be found in each block. The data on the blockchain is encrypted. A pointer to the precedingblock of data may be found in each block. In a

blockchain, every data is encrypted before it is stored. Only the wallet ID of the user is made visible during transactions. New digital money system Bitcoin (BTC) operates without any kind of central authority. Instead, a peer-to-peer network of users linked to the Internet processes payments. The block chain is a public distributed ledger for Bitcoin transactions that is maintained by the network's nodes. The overall market capitalization value of Bitcoin is the highest of any cryptocurrency. In a competition in which users volunteer their processing power to verify and record transactions onto the blockchain, they are given tokens as a prize for their efforts.

Blockchain Technology: The whole Bitcoin network depends on the block chain, which is a shared public ledger. The block chain contains all verified transactions. So that new transactions may be authenticated, Bitcoin wallets can compute their spendable balance and verify their owners. Cryptography ensures the chain's integrity and chronological order. People who engage in the process of validating and adding bitcoin transactions to the public ledger known as the blockchain are known as bitcoin miners.' By doing so, they add a new block to the current block chain, enhancing the security of transactions conducted via the use of block chain technology. For the purpose of adding new transactions to the block chain, mining uses a distributed consensus technique to confirm previously unconfirmed ones. It safeguards the neutrality of the network, enforces a chronological order in the block chain, and enables multiple computers to agree on the system's state. There are strong cryptographic requirements that must be met for a transaction to be accepted by the network. Modifications to prior blocks would invalidate all future blocks if they were made in accordance with these criteria. Additionally, mining acts as a kind of competitive lottery, making it difficult for a single user to add successive blocks to the block chain. In this sense, no one organisation or person can control or alter sections of the block chain to roll back their own expenditures. Every 210,000 blocks, the value of the bitcoins generated will be half. Initially, every new block adds 50 BTC. Only 21 million bitcoins may be generated in total throughout the course of the allotted time frame.. At this point, 18.78 million Bitcoins have been mined. According to current predictions, all of the bitcoins will have been mined by 2040.

Factors Affecting the Price of Bitcoin:
Demand and Supply, Regulations in Different Countries , Bitcoin Halving, Bitcoin Hashrate, Fear and Greed Index, Technical Analysis, Fundamental Analysis, Mining cost, Adoption of Bitcoin usage by people, Derivate And Future Market, Big movements on the block chain, Market Price and Trading platform.

Prediction: The value of a Bitcoin fluctuates in a similar manner to that of a stock, but for a different reason. The elements that determine Bitcoin's price are dissimilar from those employed in other stock market prediction systems. As a result, accurate investing choices need an understanding of what to anticipate from the price of Bitcoin. Bitcoin's value is no longer tied to specific business events or the actions of the government. Investing in Bitcoin is necessary to make the best possible choices. In contrast to the stock market, Bitcoin's value is no longer dependent on the actions of corporations or governments. As a result, we believe that machine learning is crucial in order to predict the Bitcoin rate. It is possible to invest in a business by purchasing stock, which gives

you a stake in the firm's profits. Only as a store of value can it be employed. Bitcoins, on the other hand, are virtual currency. They are both a medium of commerce and a means of storing wealth. Real-world use cases and community members contribute to the value of Bitcoin.

II. LITERATURE SURVEY

Sebastian Franz Huppmann et al.[1] This uses ARIMAX (Auto Regressive Integrated Moving Average with Explanatory Variable) models. The sentiment regression is a benefit for the forecasting models and can lead to higher returns. Farokhmanes hF et al.[2] This usesthe SVM (SUPPORT VECTOR MACHINE) Algorithm .It is much more convincing to use it in high- dimensional spaces like those occupied by random vectors.It works well in cases that have aclear margin of separation. It is effective in cases where the number of samples is lesserthan the number of dimensions. Siddhi Velankar et al.[3] This uses the Bayesian regression and GLM/Random Forest on the datasets which produces three linear models. It works the prediction bytaking coin Markup cap. Quandl is used to filter the data set by using MAT lab properties. Yogeshwaran et al.[4] This uses the CNN (Convolution Neural Network) and RNN (Recurrent Neural Networks).The main advantage of CNN is weight sharing,It is easy to calculate the dataset prices. Yakup Gorur et al.[5] This uses the Random Forest with pyspark and scikit learn frameworks. The Bitcoin market is open to manipulation, price of bitcoin may be hard decrease or hard increase. It may be necessary to provide data that the model can predict manipulations to better capture these ups and downs. Zheshi Chen and others .[6] A linear discriminant analysis is used in conjunction with Logistic Regression. The findings reveal that statistical approaches outperform machine learning models for high-frequency data, whereas statistical methods outperform low-frequency data with high-dimensional characteristics. Thearasak Phaladisailoed and colleagues .[7] Scikit-learn and Keras packages are used to construct regression models. Mean Squared Error (MSE) was 0.00002 and R-Square (R2) was 99.2 percent in the top findings, respectively. Albariqi, Rahmat, and Others [8]have written the MLP and RNN models are used in this application. Multilayer Perceptrons and Recurrent Neural Networks perform best when forecasting the next 60-day price change and the following 56-day price change, respectively, in long-term prediction. Struga, Kejsi, and others .[9] In order to create a more accurate network design, this implements hyper parameter adjustment with the LSTM. It is possible to include microeconomic elements into the model to improve its accuracy. Researchers: Sean McNally and co-workers .[10] Deep learning models such as the RNN and LSTM are clearly useful for Bitcoin prediction, with the LSTM better capable of identifying longer-term relationships, and this employs the Recurrent neural network (RNN)

III. PROPOSED SYSTEM

Project Objectives: 1. LSTM may be used to accurately forecast the price of bitcoin 2. LSTM may be used to predict bitcoin's price with reasonable accuracy. Recurrent Neural Networks (RNN) It is regarded one of the most professional algorithms since RNNs are the only ones with internal memory, making them very resilient. Since they were initially developed in the 1980s, recurrent neural networks have just begun to reach their full potential. For managing massive volumes of data, RNN has benefited greatly from increased computer power and the development of short-term memory (LSTM) in the 1990s. For sequential data, such as time series, voice, text, financial data, audio, video, weather, and more, thealgorithm works very well. When compared to

other algorithms, RNNs are able to build a knowledge of a sequence and its context that is considerably deeper. The data in an RNN passes through a series of steps. Decisions are made based on both the current input and what the system has learnt from past inputs. The flow of information in the RNN algorithm is shown in the diagram below.

Recurrent Neural Network
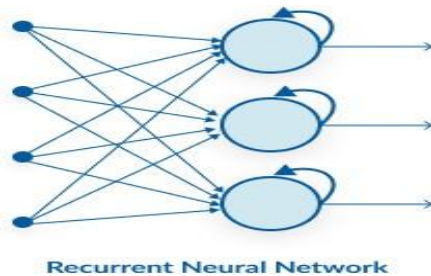
Long Short-Term Memory (LSTM): A RNN memory is extended by LSTM. Learning from long-distance, significant events may be facilitated by this method. RNNs can retain inputs for a long time with the help of LSTM. This is due to the fact that LSTMs hold information in a memory, similar to a computer's memory. The LSTM has a built-in memory that it may use to read, write, and erase data. Time-series data may be analysed and predicted using RNNs and LSTMs, which have good architectures.

Fig1: System Architecture

Step 1: For the prediction of the price we used Binance BTC/USDT hourly price dataset and it is imported the data onto the system and read it as a CSV using pandas.**Step 2: Pre-processing:**

The dataset provided by Binance needs to be cleaned up for the following reasons:

• The "date" field in the dataset is of no use as it is in the form of unix timestamp string so it is needed to be converted into a readable date.

• we added some additional fields that'll help us in the modelling process such as hour of the day and the weekday.

Step 3: Normalization: In order to avoid this skewness, we have to normalize our data. Here the Normalization method used is MinMax Scalar. Here normalization is done on the whole

dataset and only split it into train and test after the normalization step.

$m = (x - xmin) / (xmax - xmin)$

Step 4: Modelling:

Generate a prediction model used is Keras's Bidirectional LSTM's with a Batch Normalization layer in the architecture a single LSTM layer only.(mean-squared-error was the lowest for this architecture)

$dv = tan(xd[iv-1, yv] + cd)$

$dv = gv \times dv-1 + jv \times dv$

$iv = pv \times tan(dv)$

$dv \rightarrow cell\ state(memory)\ at\ timestamp(v)$

$dv \rightarrow represents\ candidate\ for\ cell\ state\ at$

$timestap(v)$

Step 5: Analyse the Training and validation loss graph using epochs on x-axis and their respective Loss values

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on y-axis.

Step 6: Plotting: After the completion of the above steps, plot the graph for the predicted and actual prices of bitcoin for analysis with price on y-axis and their respective index's on x-axis .

By using Binance hourly price dataset we have predicted the price of the bitcoin. This data needed to be imported to the system as a CSV files using pandas so that we can read it. After importing the data, Preprocessing is needed to clean up the dataset as it contains of some fields that are of no use (or) needed to be converted into readable formats. Preprocessing is also used for adding some other fields which help us in modeling process. After preprocessing, Normalization is done to avoid skewness by normalizing the data. The method which is used for this process of normalization is MinMax scalar method. The next step is to create a model for generating a prediction of the price. Here the prediction model used is Keras's Bidirectional LSTM with single layer. After modeling, we analyze the training and validation loss graph by epochs on x-axis and their loss values on y-axis. Finally plotting the graph for the predicted and original prices of bitcoin.

IV. RESULTS
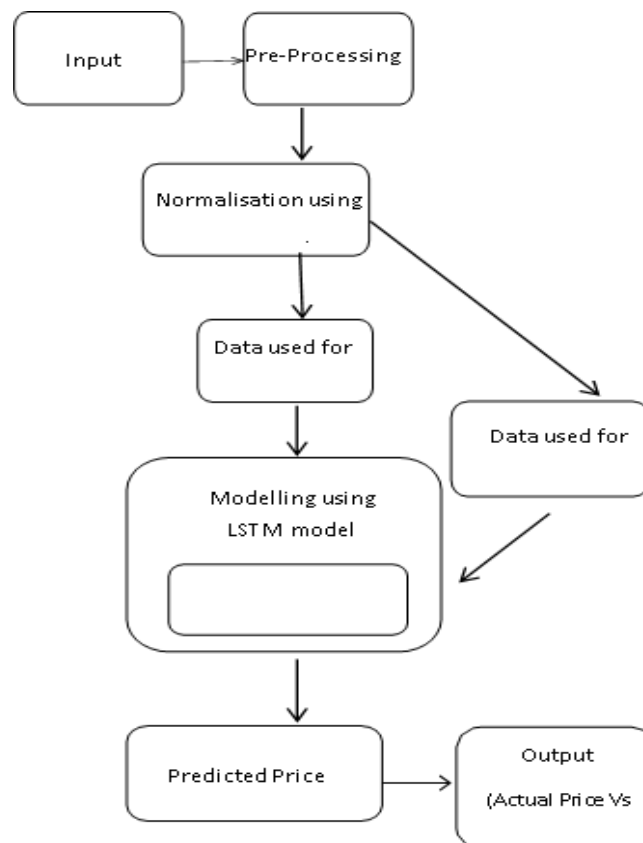
The ratio between observed data and anticipated data ishow accuracy is used.

Accuracy = (a+b)/ (a+c+d+b)

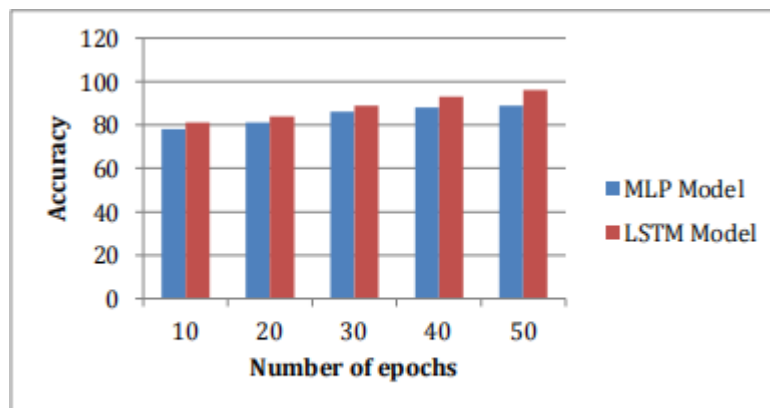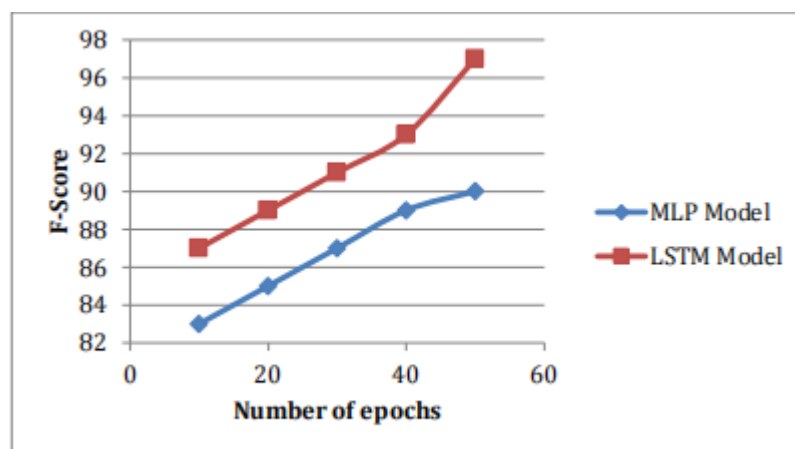Where a= Positive True, b= Negative True, c= PositiveFalse, d= Negative False.

Fig2: Accuracy

The figure-2 shows the accuracy of prediction of bitcoin price. Here, the proposed LSTM have more accuracy when compared to MLP model. There are some limitations with MLP model. It uses 10 points of epochs on X-axis. The limitations of MLP are it includes too many parameters because it is fully connected, it doesnot use the information which is contained in the partitioning of the input. These are overcome by LSTM. LSTM can have relative insensitivity to gap length. The range of LSTM is high when compared to other algorithms. In this way, my method produces the best result when compared to other methods. The accuracy for the proposed model is 95 and the accuracy for the existing models are 87.

Precision

The specific number of positive observations compared to the overall number of positive observations is what precision is.

Precision = a/ (a+c)

The figure-4 shows the recall of prediction of bitcoin price. Here, the proposed LSTM have more precision when compared to MLP model. There are some limitations with MLP model. It uses 10 points of epochs on X-axis. The limitations of MLP are it includes too many parameters because it is fully connected, it doesnot use the information which is contained in the partitioning of the input. These are overcome by LSTM. LSTM can have relative insensitivity to gap length.
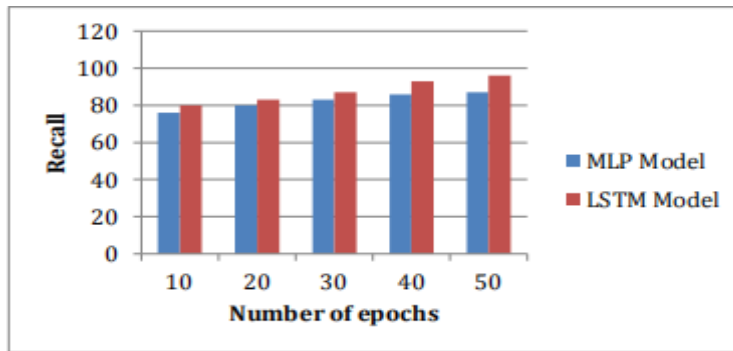
Fig4: Recall

The range of STM is high when compared to other algorithms. In this way, my method produces the best result when compared to other methods. The recall for the proposed model is 96 and the precision for the existing models are 90.

F-Score:

It is the sum of Precision and Recall's respectiveweights..

F-Score = 2*[e * f] / [e + f] Where e=Recall, f=Precision**Fig4**: F-Score

The figure-5 shows the F-Score Graph of prediction of bitcoin price. Here, the proposed LSTM have more precision when compared to MLP model. There are some limitations with MLP model. It uses 20 points of epochs on X-axis. The limitations of MLP are it includes too many parameters because it is fully connected, it does not use the information which is contained in the partitioning of the input. These are overcome by LSTM. LSTM can have relative insensitivity to gap length. The range of LSTM is high when compared to other algorithms. In this way, my method produces the best result when compared to other methods. The F-Score value for the proposed model is 94 and the precision for the existing models are 90.

Prediction Graph

The following graph represents the comparison between the actual and predicted prices of bitcoin.
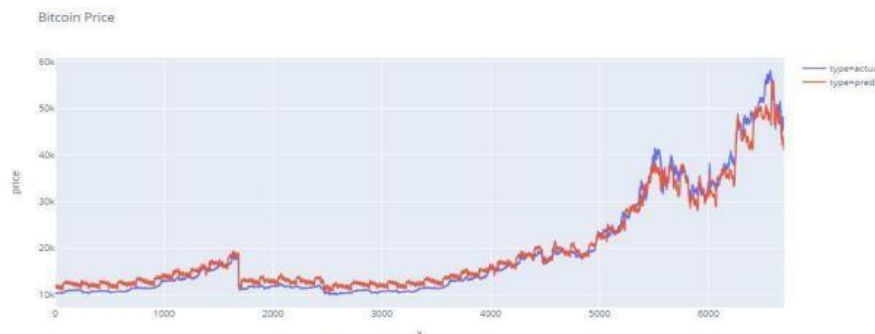

Fig5: Resultant graph

V. CONCLUSION

You don't require an intermediary to transfer bitcoins between users on the peer-to-peer bitcoin network. There is a public distributed ledger known as a block chain where transactions are validated by network nodes using encryption and recorded. We employ a long short-term memory for our bitcoin price forecasts. The LSTM

network is an extension of the recurrent neural network, which effectively expands the memory capacity. There are three gates in an LSTM. The input gate, the output gate, and the forget gate are the three types of gates. Learning rate, input and output biases, as well as other parameters, are all available in the LSTM. As a result, finer changes are unnecessary. Future values may be predicted from previous and sequential data with the help of the LSTM algorithm. The level of difficulty is lowered. Our model is very adaptable, and it provides better precision. Our models' results are more accurate when compared to those of other models. You don't have to worry about it not being able to manage your data.

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