DAYANANDA SAGAR UNIVERSITY

MINOR-PROJECT ON BITCOIN PRICE PREDICTION USING MACHINE LEARNING ALGORITHMS

Presented by:

Abhijeet Kumar (ENG19CS0009)
Abhijith J K (ENG19CS0010)
Amisha Asrani (ENG19CS0029)
Aryan Kumar (ENG19CS0044)

Under the guidance of

Prof. Nazmin Begum

INTRODUCTION

Cryptocurrencies are a digital method of cash in which all the transactions are done electronically. In this study, we mainly focused on a well known cryptocurrency, i.e., bitcoin.

- Bitcoin is the very first digital decentralized cryptocurrency which has marked a remarkable increase in market capitalization in recent years.
- It is an international cryptocurrency and digital payment system that is highly stable and secure.
- In 2017 because of recurrent exponential growth in capital, the demand for cryptocurrencies had taken an uptrend. At present, there are more than 1500 actively listed cryptocurrencies which capitalize over $300 billion. In Jan 2018, the market capital was totaling over $800 billion. Because of the rise of a 170 hedge funds in cryptocurrencies, the bitcoin future has demand for commercialism and hedging Bitcoin.

PROBLEM STATEMENT

- It can be said that crypto market is very volatile, and among all the crypto currencies available in the market, Bitcoin is experienced by most of the investors due to its anonymity and transparency in the system.
- This project aims to work on the prediction of Bitcoin price using Machine learning algorithms and deep learning models. There are various factors affecting the price of Bitcoin, in this project we will focus on open, close, high, and low factors.

OBJECTIVES

The purpose of this study is to find out-

- With what accuracy the direction of the price of Bitcoin can be predicted using machine learning methods.
- Also, to ensure less risks and more profits for investors

LITERATURE REVIEW

TITLE	Bitcoin price prediction using Deep learning
AUTHORS	Temesgen Awoke, Minakhi Rout, Lipika Mohanty, and Suresh Chandra Satapathy
YEAR OF PUBLICATION	October 2020
METHODOLOGY	• RNN (Recurrent Neural Network) • LSTM (Long short-term Memory) • GRU (Gated recurrent Unit)
KEY FINDINGS	• Observed from the study that LSTM takes larger compilation time than GRU model. It is discovered that the variation of actual value and foretold value is a lot more in LSTM than GRU. As per the study the prediction accuracy of the LSTM is healthier at WINDOW SIZE of twelve and DAYS previous seven.
RESEARCH GAP	It needs to investigate further to enhance the accuracy of the deep learning-based prediction models by considering different parameters in addition to the previous one.

TITLE	Bitcoin price prediction using Machine learning
AUTHORS	Neha Mangla, Akshay Bhat, Ganesh Avabratha, Narayana Bhat
YEAR OF PUBLICATION	May 2019
METHODOLOGY	• Logistic Regression • Autoregressive Integrated Moving Average (ARIMA) model • RNN (Recurrent Neural Network)
KEY FINDINGS	Among the three ways, ARIMA performs well for next days predictions however performs poorly for extended terms like given previous few days value predict next 5-7 days costs. RNN performs systematically upto vi days. logistic regression-based model's assumptions weren't profaned, it's solely able to classify accurately if a severable hyperplane exists.
RESEARCH GAP	The prediction can be affected by the factors of the political system, public relations and market policy of the country.

TITLE	Review on Bitcoin Price Prediction Using Machine Learning and Statistical Methods
AUTHORS	sibel KERVANCI, I., & Fatih, A. K. A. Y.
YEAR OF PUBLICATION	December 2020
METHODOLOGY	• Various methods of BTC price prediction were reviewed and analysed for its accuracies. • The literature review of the paper covers the most of the widely used and some less used methods in detail.
KEY FINDINGS	• The paper reviews the accuracy percentage of each approach. The ARIMA model on Bitcoin price prediction has an accuracy of 90.31 percent, according to the research and produced the best results. • The paper reveals the influence of social trends on BTC prices. • BTC has no short-term or long-term relationship between bitcoin and gold prices.
RESEARCH GAP	Because there isn't a comprehensive study on it, automatic or manual hyper-parametric optimization in bitcoin price estimation could be added as future work.

Sr. No	Approach	Purpose	Accuracy	Remarks
1	ARIMA	Next day forecasts	53%	Performs badly for longer terms
2	RNN	Next day forecasts	50%	Routinely performs at that level for up to 6 days
3	Logistic regression	Next day forecasts	47%	it can only conduct accurate classifications if a separable hyperplane exists
4	SVM	Next day forecasts	48%	-

Less widely used machine learning algorithms for bitcoin price prediction were compared. GRU provided the most accurate results.

TITLE	Bitcoin price prediction using Machine learning
AUTHORS	Vaidehi, M., Pandit, A., Jindal, B., Kumari, M., & Singh, R
YEAR OF PUBLICATION	May 2021
METHODOLOGY	● Data is collected from bitcoin price history and blockchain. ● Factors like Standard block size, user address number, the amount of production, and the number of miners and certain indicators are taken into account. ● Time series data window size is decided and then trained.
KEY FINDINGS	● The larger the batch size, the worse the prediction on the test set. ● Given the diversity of factors influencing the market, predicting a price-related variable is difficult.
RESEARCH GAP	Although the paper does walkthrough the LSTM model for bitcoin price prediction, the conclusion is rather vague and incomprehensive.

TITLE	Bitcoin Price Prediction Using Machine Learning and Artificial Neural Network Model.
AUTHORS	Ho A, Vatambeti R, Ravichandran SK
YEAR OF PUBLICATION	2020
METHODOLOGY	• Linear Regression • Long Short-Term Memory (LSTM) Model
KEY FINDINGS	• The study reveals that the best accuracy rate is shown in Long Short – Term Memory than in linear regression. • In linear regression the accuracy of training data is approx 99.97% ,the accuracy of the testing data is approx 99.97%. • Meanwhile, the LSTM model tended to find the accuracy with respect to the Mean Absolute Error which shows the error rate approximately to be 0.08%.
RESEARCH GAP	• Because the crypto market is volatile and influenced by social media and other external factors, data sets cannot be the only reason for forecasting. As technology advances, new data can be collected, analyzed, and practiced, resulting in better results for this experiment. • The paper does consist of a high accuracy rate but the dataset used is comparatively small for a model to work on a real time chart.

TITLE	Bitcoin price prediction using machine learning : An approach to sample dimension engineering
AUTHORS	Zheshi Chen , Chunhong Li, Wenjun Sun
YEAR OF PUBLICATION	2018
METHODOLOGY	● Linear Regression (LR) ● Neural Network Regression (NNR) ● Bayesian Linear Regression (BLR) ● Boosted Decision Tree Regression (BDTR). ● This paper was based on the CRISP-DM model
KEY FINDINGS	● The results seem to provide a high coefficient of determination with the minimum value being a significantly large 0.989459. ● The results suggest that the regression-based analysis algorithms could potentially yield more usable results for the Bitcoin price prediction.
RESEARCH GAP	● The prediction can be affected by the factors of the form of govt. , public relations and market policy of the country. ● The use of deep learning models can provide higher accuracy.

TITLE	A Research On Bitcoin Price Prediction Using Machine Learning Algorithms
AUTHORS	Lekkala Sreekanth Reddy, Dr. P. Sriramya
YEAR OF PUBLICATION	April 2020
METHODOLOGY	• Least Absolute shrinkage choice operator(LASSO) • Decision Tree • KNN (k- Nearest Neighbors)
KEY FINDINGS	• The Training RSS(Residual Sum of Squares) accuracy of k-Nearest Neighbours (KNN) is 92.99%, Ridge Regression is 75.7%, Polynomial Regression is 84.2%, Linear Regression is 94.6% and Random Forest is 89.78%. • Whereas the Test (Residual Sum of Squares) accuracy of k-Nearest Neighbours (KNN) is 90.5%, Ridge Regression is 12.4%, Polynomial Regression is 79.99%, Linear Regression is 96.99% and Random Forest is 71.56%.
RESEARCH GAP	On comparison we found that the Linear regression model will have the most accuracy than any of the other algorithms. The time complexity reduction in bitcoin value prediction with the help of the LASSO algorithm is tested by comparing all other algorithms and ends with a conclusion that LASSO is the best among all.

TITLE	Price Prediction Of Bitcoin Using Machine Learning
AUTHORS	Reshma Sundari Gadey, Nikita Thakur, Naveen Charan, R. Obulakonda Reddy
YEAR OF PUBLICATION	May 2020
METHODOLOGY	● Data pre-processing ● Data collecting to accumulate data from Blockchain ● Data cleaning to remove unnecessary columns ● Data normalization to choose the approach for normalizing a time series ● MinMax Scaling technique ● Time series data to be split into training and test data ● Implementation of LSTM
KEY FINDINGS	● Neural networks provided a better understanding of bitcoin and LSTM architecture. ● The LSTM works efficiently and provides us with the most accurate results.
RESEARCH GAP	● Most of the theories have been proved that they needed to be reconsidered to reduce overfitting problems and errors resulting from high sized datasets.

MODULES

Following are the Modules in the proposed system: -

- DATA COLLECTION
- DATA PREPARATION
- FEATURE SELECTION
- SPLITTING THE DATA
- SCALING DATA
- BUILDING THE MODEL
- MAKING PREDICTIONS

```
data = pd.read_csv('/content/BTC-USD (4).csv', date_parser = True)
data.head()
```

	Date	Open	High	Low	Close	Adj Close	Volume
0	2017-10-27	5899.740234	5988.390137	5728.819824	5780.899902	5780.899902	1.710130e+09
1	2017-10-28	5787.819824	5876.720215	5689.189941	5753.089844	5753.089844	1.403920e+09
2	2017-10-29	5754.439941	6255.709961	5724.580078	6153.850098	6153.850098	2.859040e+09
3	2017-10-30	6114.850098	6214.990234	6040.850098	6130.529785	6130.529785	1.772150e+09
4	2017-10-31	6132.020020	6470.430176	6103.330078	6468.399902	6468.399902	2.311380e+09

SOFTWARE AND HARDWARE REQUIREMENTS

Software Requirements:

- Windows 7 or higher
- Python 3
- Google Colab

Hardware Requirements:

- Processor – Core i3
- Hard Disk – Minimum 5 GB
- Memory – Minimum 1GB RAM

SOFTWARE PACKAGES USED

Libraries used-

1. **Numpy**
2. **Pandas**
3. **Scikit-Learn**
4. **Keras**
5. **Matplotlib**
6. **Seaborn**

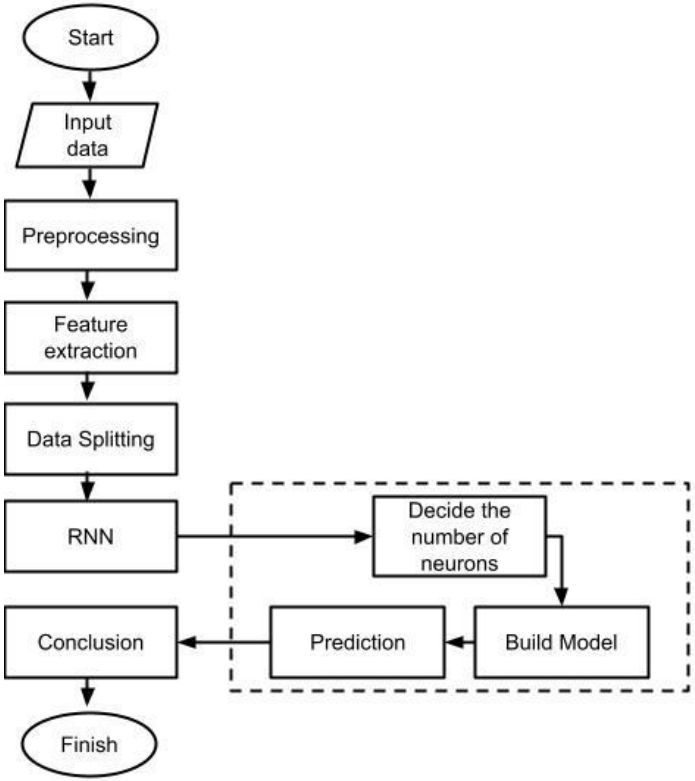
DESIGN OF THE PROJECT

SYSTEM DESIGN:

The architecture of the proposed system has the following components: -

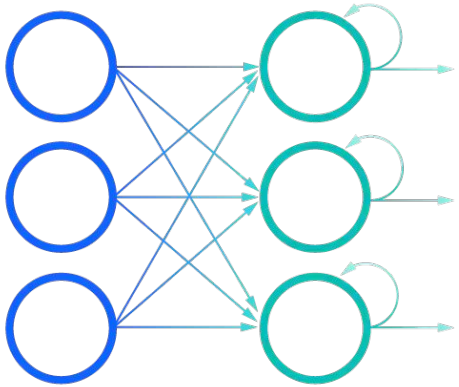
- Dataset which consists of data of bitcoin
- Preprocessing the data
- Feature Extraction
- Splitting the data into Train, Test and Validation set
- Scaling data by Min-Max Normalization
- Designing the model
- Prediction algorithms

FLOWCHART DIAGRAM:



ALGORITHM DESIGN: RECURRENT NEURAL NETWORK (RNN)

- Uses sequential data or time series data.
- Recurrent neural networks utilize training data to learn.



Long short-term memory (LSTM)

- LSTM networks are well-suited to classifying, processing and making predictions
- Relative insensitivity to gap length is an advantage of LSTM over RNNs.

Why use LSTM for Bitcoin Price Prediction?

LSTM enables RNNs to remember inputs over a long period of time. This is because LSTMs contain information in a memory, much like the memory of a computer. The LSTM can read, write and delete information from its memory.

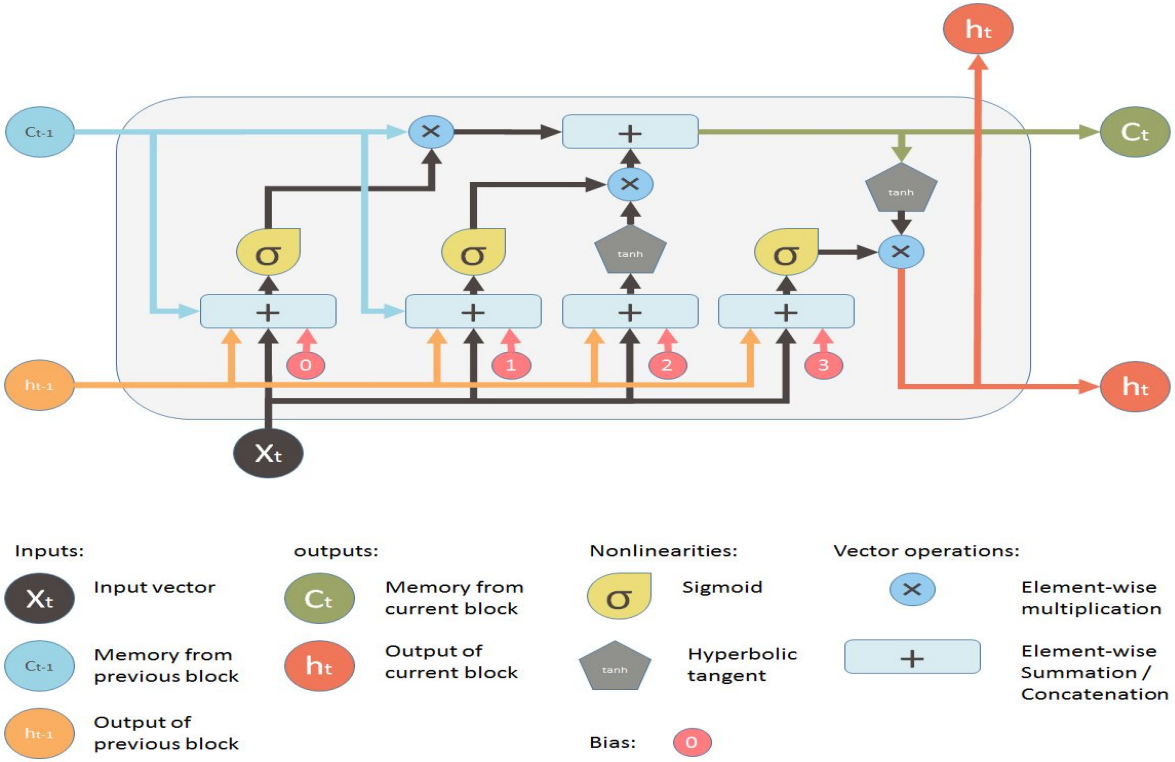
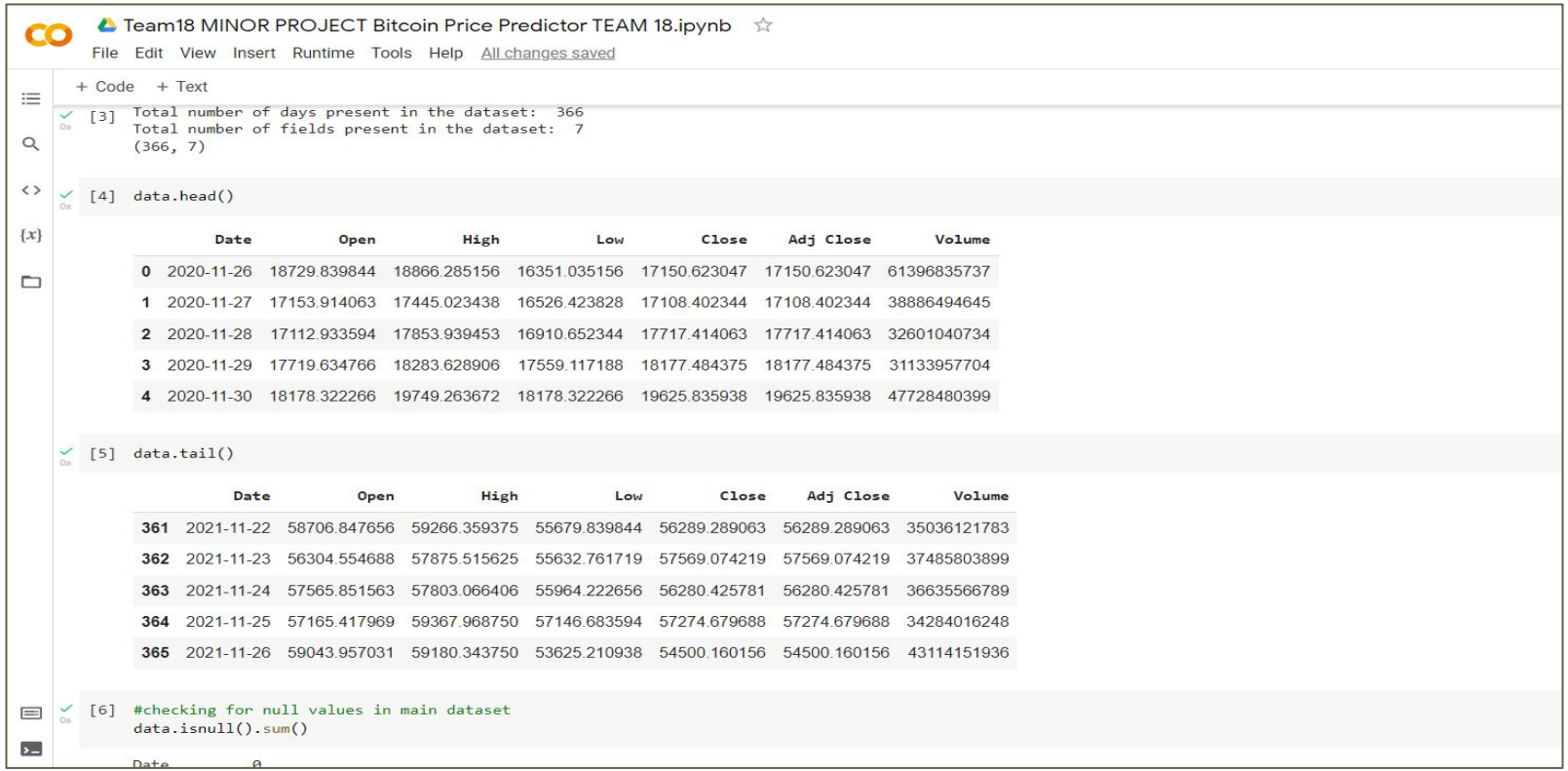


Fig. Architecture of LSTM

HYPERPARAMETERS

1. Optimizer
2. Loss function
3. Activation function
4. Dropout Rate
5. Number of Neurons in hidden layers
6. Epochs
7. Batch Size
8. Architecture of Network
    1. 1 LSTM Layer
    2. 1 Dropout Layer
    3. 1 Dense Layer
    4. 1 Activation Layer

RESULTS & ANALYSIS



	Date	Open	High	Low	Close	Adj Close	Volume
0	2020-11-26	18729.839844	18866.285156	16351.035156	17150.623047	17150.623047	61396835737
1	2020-11-27	17153.914063	17445.023438	16526.423828	17108.402344	17108.402344	38886494645
2	2020-11-28	17112.933594	17853.939453	16910.652344	17717.414063	17717.414063	32601040734
3	2020-11-29	17719.634766	18283.628906	17559.117188	18177.484375	18177.484375	31133957704
4	2020-11-30	18178.322266	19749.263672	18178.322266	19625.835938	19625.835938	47728480399

	Date	Open	High	Low	Close	Adj Close	Volume
361	2021-11-22	58706.847656	59266.359375	55679.839844	56289.289063	56289.289063	35036121783
362	2021-11-23	56304.554688	57875.515625	55632.761719	57569.074219	57569.074219	37485803899
363	2021-11-24	57565.851563	57803.066406	55964.222656	56280.425781	56280.425781	36635566789
364	2021-11-25	57165.417969	59367.968750	57146.683594	57274.679688	57274.679688	34284016248
365	2021-11-26	59043.957031	59180.343750	53625.210938	54500.160156	54500.160156	43114151936

Fig. This image is showing the first 5 and last 5 entries of the data set.

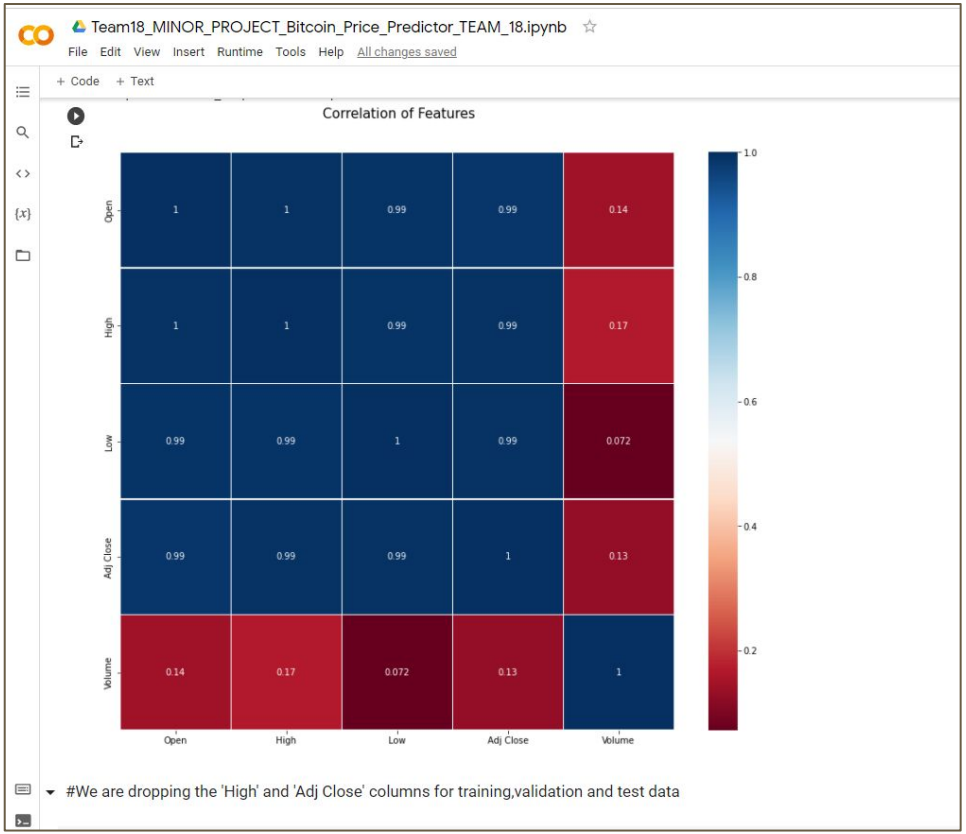


Fig. The heatmap shows the relationship of every feature with each other and with the label.which helps us to understand which features are relevant to make predictions.

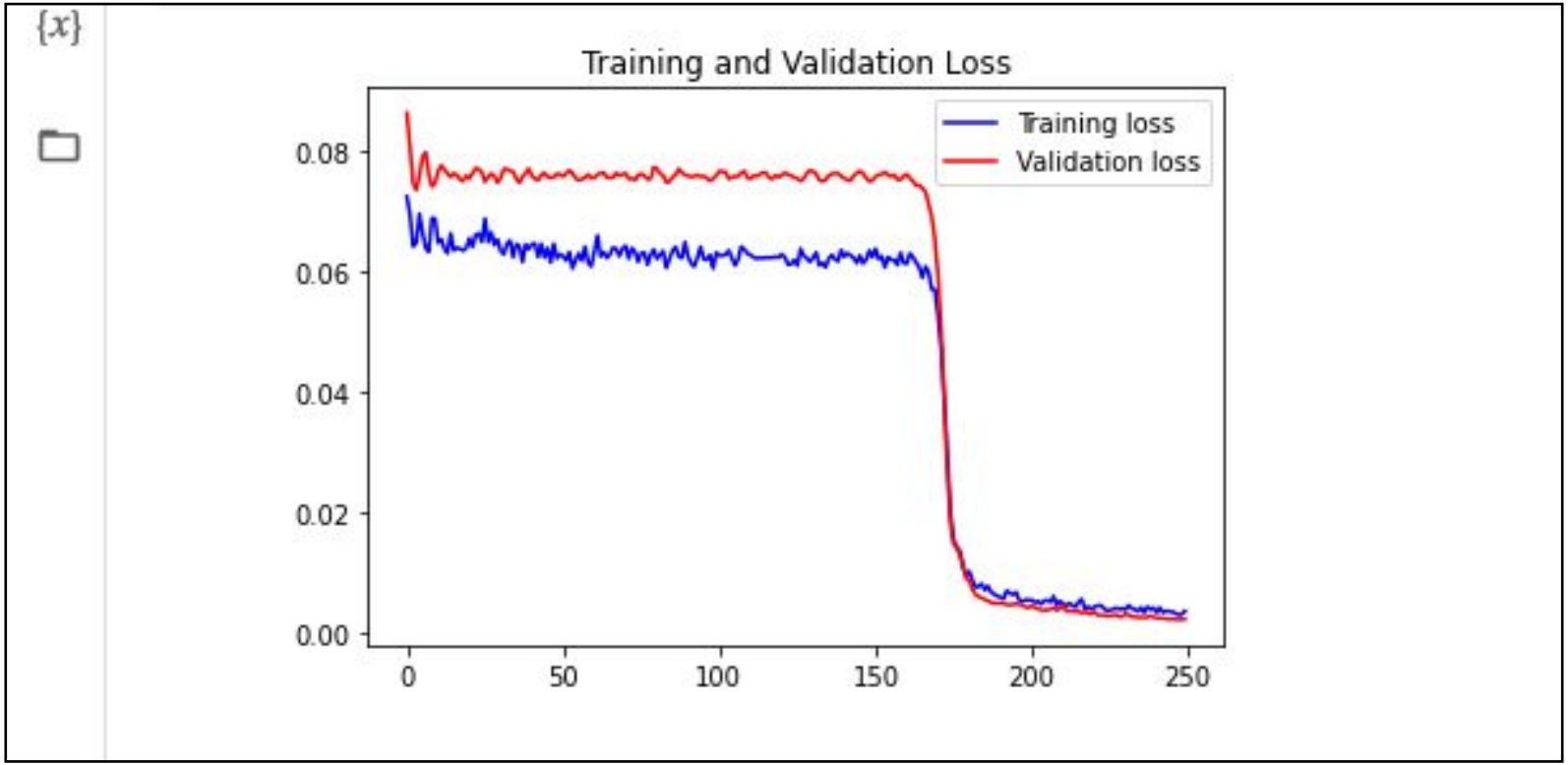


Fig. This graph shows the validation loss and training loss of our model.

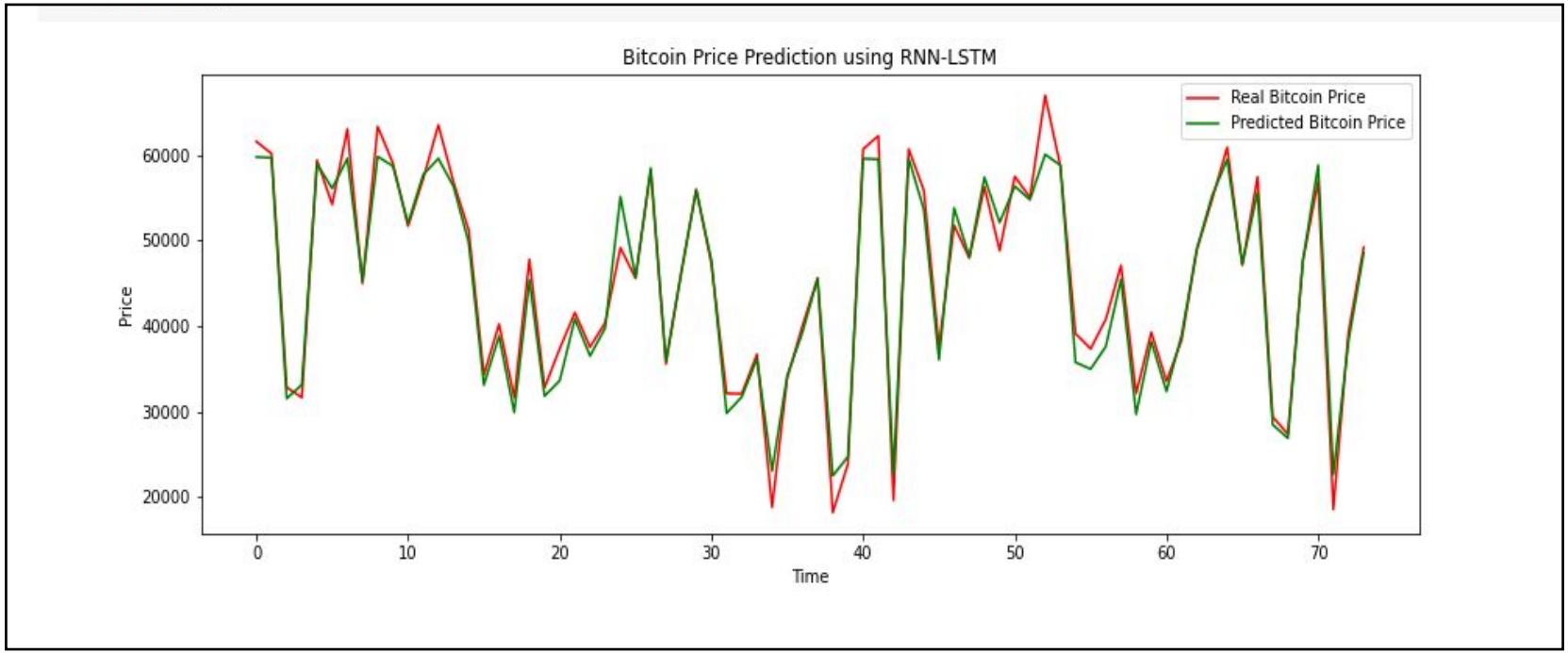


Fig. This graph shows the real and predicted price of bitcoin and we are able to achieve an accuracy of 99.4% for the prediction.

CONCLUSION

- Bitcoin is the most popular decentralized way of virtual currency which has a great role in the free market economy and avoids the intermediary of another third party between customers.
- The main objective of our study is to forecast the bitcoin price with improved efficiency using deep learning models and minimizing the risks for the investors as well as policy-makers.
- We have implemented deep learning technique-LSTM as prediction models.
- In our study, we have not considered other cryptocurrencies such as ripple, ethereum, lite coin, and others. We will enhance the model by applying on these cryptocurrencies so the model becomes a stable one.

REFERENCES

1. https://www.researchgate.net/publication/345262720_Bitcoin_Price_Prediction_and_Analysis_Using_Deep_Learning_Models
2. https://www.granthaalayahpublication.org/ijetmr-ojms/index.php/ijetmr/article/view/IJETMR21_A05_2586/771
3. http://202.62.95.70:8080/jspui/bitstream/123456789/12673/1/1NH16CS719.pdf
4. http://203.201.63.46:8080/jspui/bitstream/123456789/6114/1/PR3109.pdf
5. https://www.ijstr.org/final-print/apr2020/A-Research-On-Bitcoin-Price-Prediction-Using-Machine-Learning-Algorithms.pdf
6. https://indjst.org/articles/bitcoin-price-prediction-using-machine-learning-and-artificial-neural-network-model
7. https://www.analyticsvidhya.com/blog/2021/05/bitcoin-price-prediction-using-recurrent-neural-networks-and-lstm/
8. https://www.granthaalayahpublication.org/ijetmr-ojms/index.php/ijetmr/article/view/IJETMR21_A05_2586/771
9. https://www.ijert.org/research/predicting-price-of-cryptocurrency-a-deep-learning-approach-IJERTCONV9IS03083.pdf
10. https://arxiv.org/ftp/arxiv/papers/2006/2006.14473.pdf
11. https://iopscience.iop.org/article/10.1088/1757-899X/928/3/032007/pdf
12. https://eudl.eu/pdf/10.4108/eai.7-7-2021.170286
13. https://www.imperial.ac.uk/media/imperial-college/faculty-of-natural-sciences/department-of-mathematics/math-finance/Forecasting_cryptocurrency_prices.pdf
14. http://203.201.63.46:8080/jspui/bitstream/123456789/6114/1/PR3109.pdf
15. https://ieeexplore.ieee.org/document/8323676
16. https://www.irjet.net/archives/V7/i12/IRJET-V7I12175.pdf
17. https://www.pantechelearning.com/product/bitcoin-price-prediction-using-machine-learning-python/
18. http://norma.ncirl.ie/2496/1/seanmcnally.pdf
19. https://peerj.com/articles/cs-413.pdf
20. https://www.ijeast.com/papers/502-506,Tesma501,IJEAST.pdf

Colab Link-
https://colab.research.google.com/drive/1sJ4D_f34-3ksRJo3pOhGbvz_05xyZz0-?usp=sharing

Github Link-
https://github.com/ENG19CS0009-ABHIJEETKUMAR/Bitcoin-Price-Prediction-using-ML-DL-Algorithms

THANK YOU!