# Bitcoin Price Prediction Using Deep Learning Techniques

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**Abstract:** Cryptocurrencies are new economic and financial tools with special and innovative features. Investment in cryptocurrency has been in trend from last many years. Bitcoin is one of the most popular and valuable cryptocurrency. Many studies have been done on bitcoin price prediction using various parameters which includes bitcoin factors, social media etc. The most important thing is that they are not related assets, not issued by any government or central authority. In recent years, cryptocurrency (Bitcoin) is rising and become an attractive investment for traders. Unlike stocks or foreign exchange, Bitcoin price is fluctuated, mainly because of its 24- hours a day trading time without close time. To minimize the risk involved and maximize capital gain, traders and investors need a way to predict the Bitcoin price trend accurately. However, many previous works on cryptocurrency price prediction forecast short-term Bitcoin price, have low accuracy and have not been cross-validated. A comparative study of the various parameters affecting bitcoin price prediction is done based on Root Mean Square Error using various deep learning models like Multilayer Perceptron , Long Short Term Memory.

**Keywords:**

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| LSTM | Long Short Term Memory |
| MLP | Multilayer Percepton |
| RSME | Root Mean Square Error |
| MSE | Mean Squared Error |
| RNN | Recurrrent Neural Network |

## I. INTRODUCTION

Cryptocurrency is a digital currency in which encryption techniques are used for the generation of units of currency and verifying the transfer of funds, operating independently of a central bank. The first cryptocurrency was Bitcoin, which began trading in January 2009. Bitcoin is the largest cryptocurrency in the world. It is a peer-to-peer electronic cash system that allows online payments to be sent directly from one party to another without going through a financial institution like banks. Bitcoin is rising and becomes an attractive investment for traders. Unlike stocks or foreign exchange, Bitcoin price is fluctuated, mainly because of its 24- hours a day trading time without close time. Market price forecasting is very interesting and challenging both for investors and researchers due to the many problems involved and lots of variables that influence the market, such as economic conditions and political events. In recent years, the market is not only about the stock and foreign exchange (forex) but also about cryptocurrency. To minimize the risk involved and maximize capital gain, traders and investors need a way to predict the Bitcoin price trend accurately. Long Short Term Memory is an advanced type of RNN, a sequential network, that allows information to persist. It is capable of handling the vanishing gradient problem faced by RNN. A recurrent neural network is also known as RNN is used for persistent memory. At a high-level LSTM works very much like an RNN cell. Here is the internal functioning of the LSTM  network.  The LSTM consists of three parts, as shown in the image below and each part performs an individual function. The first part chooses whether the information coming from the previous timestamp is to be remembered or is irrelevant and can be forgotten. In the second part, the cell tries to learn new information from the input to this cell. At last, in the third part, the cell passes the updated information from the current timestamp to the next timestamp.A multilayer perceptron (MLP) is a deep, artificial neural network. It is composed of more than one perceptron. They are composed of an input layer to receive the signal, an output layer that makes a decision or prediction about the input, and in between those two, an arbitrary number of hidden layers that are the true computational engine of the MLP. MLPs with one hidden layer is capable of approximating any continuous function. Multilayer perceptrons are often applied to supervised learning problems, they train on a set of input-output pairs and learn to model the correlation (or dependencies) between those inputs and outputs. Training involves adjusting the parameters, or the weights and biases, of the model in order to minimize error. Backpropagation is used to make those weigh and bias adjustments relative to the error and the error itself can be measured in a variety of ways, including by the root mean squared error (RMSE).

## OBJECTIVE

The objective of this project is

- To predict the price of the bitcoin with an accuracy of more than 60%.
- To reduce the trading risk of the users with minimized errors.
- To predict the price of the bitcoin in both short and long periods of time.

## SCOPE

This project describes the baseline neural network models to predict the bitcoin price for the short-term using long short term memory (LSTM) and the long-term using Multilayer perceptron (MLP) which helps in trading and earn more profits from investments. Cryptocurrencies are a new asset class for the Indian markets. The Indian crypto market is seeing a boom with the number of investors multiplying each day. In the future, these cryptocurrencies are going to be used for digital payments and online shopping.The machine learning algorithms improve that feature idea of cryptocurrencies which makes the market price of global investments.This proposed model can be used for the prediction of other cryptocurrencies like Dogecoin, Ethereum, Litecoin, etc.

## II. ANALYSIS

### SYSTEM ANALYSIS

System analysis is a problem solving technique that decomposes a system into its component pieces for the purpose of studying how well those components parts work and interact to accomplish their purpose.The proposed system uses the LSTM and MLP algorithm. These algorithms can be performed in Python language because it has many libraries like numpy, pandas, matplotlib that are useful to this project.

### PROBLEM DEFINITION

Bitcoin is the most valuable in the cryptocurrency market. However, prices of Bitcoin have highly fluctuated which make them very difficult to predict. Hence, the aim of the project is to predict Bitcoin prices from various deep learning algorithms. By using the Long short term Memory and multilayer perceptron algorithm , to attain the low Mean Squared Error (MSE) and to attain high accuracy in the bitcoin price prediction result.

### EXISTING SYSTEM

The price of the bitcoin can be predicted using the twitter sentiment analysis which is done by analysing the sentiment score with the historical price to predict the future price. The major contribution is a sentiment analyser which can distinguish between the positive and negative tweets of the bitcoin over Twitter. Though it is possible to predict the price of the bitcoin from the twitter sentimental analysis , it is comparatively difficult to know the positive and negative views in other social platforms. The bitcoin price prediction using machine learning algorithms such as the Bayesian Regression and GLM/Random forest which provides less accuracy so the deep learning algorithm such as Long short term Memory algorithm is used for the predicting the price of the bitcoin which provides the better accuracy than the machine learning techniques but this is used only for the short term dependencies.

### PROPOSED SYSTEM

In this proposed model the use of deep learning algorithms such as Multilayer perceptron (MLP) and the Long short term Memory (LSTM) are used to predict the price of the bitcoin for both long term and short term dependencies. In predicting the future price in the market, traders and investors use the technical analysis or fundamental analysis. These multilayer perceptron uses the 2-hidden layer feedforward networks with a formulated number of hidden nodes and the Long short term memory which is a special type of RNN which allows the network to learn from its previous state, it also makes this network really useful for time-series data. The architecture used is many-to-one with various experimented time-window.

## III. SYSTEM DESIGN

**Overall System Design**

The following figure represents system architecture of the proposed system. First the dataset is loaded, pre-processed, split

into train and test sets then, by applying the deep learning algorithms such as LSTM and MLP the results are predicted . These predicted results are compared with the original values and evaluate the performance of the implemented algorithms.
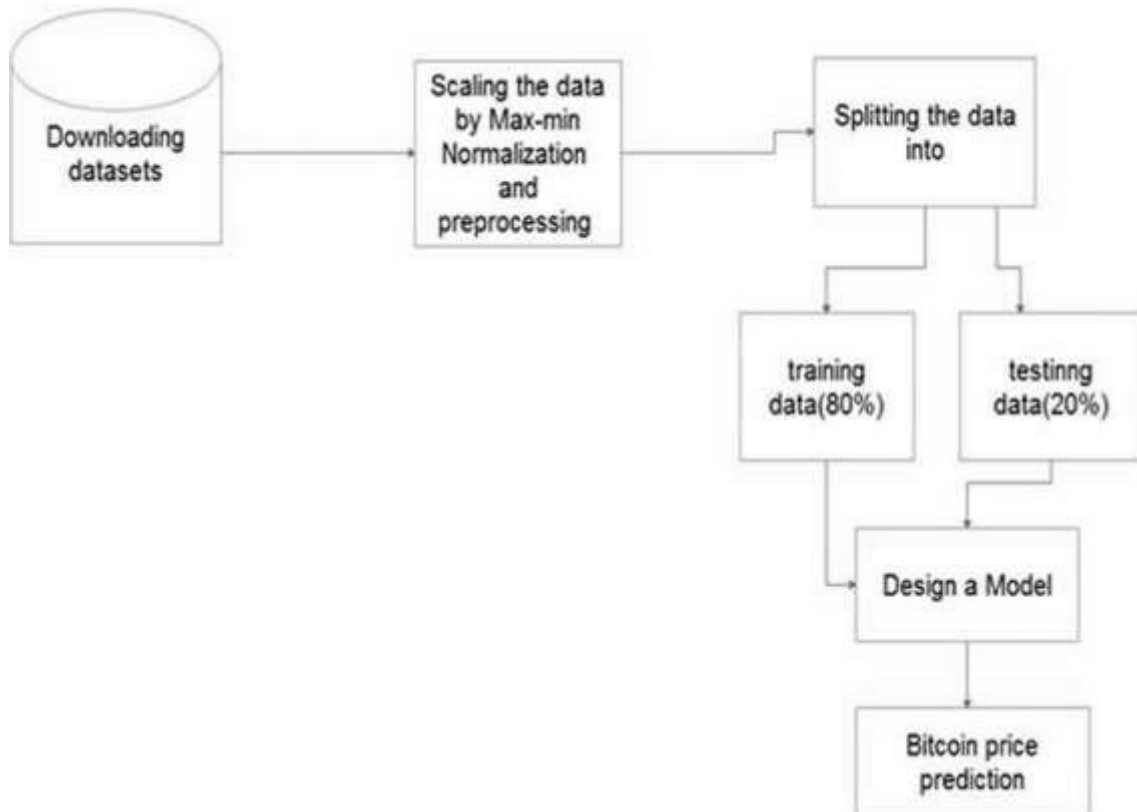


## IV. MODULES

1. Data Preprocessing
2. Model Training
3. Prediction

**1.Data Preprocessing:** The dataset for historical prices of Bitcoin is downloaded from the Kaggle dataset which is in the format of CSV file. These data contains the value for the prices from January 2012 to January 2020, counting to approximately 3,161,057 data points, each with an interval of one minute and having values of OHLC (Open, High, Low, Close), Volume in BTC and indicated currency, and weighted bitcoin price. Timestamps are in Unix time.Before exploring and visualizing the data, it is necessary to clean the dataset available. Cleaning includes getting rid of the null values or irrelevant zero values. Then read the data and load it into the pandas library the data can be cleaned . Since bitcoin data is basically time-series data, the first step is to perform some data exploratory techniques before forecasting. That includes checking whether the time-series is stationary. This is performed by a seasonal decomposition of the data to estimate its trend and seasonality. In the case of non- stationarity, it can perform techniques to stationarize the series. Then check the auto-correlation i. e, the similarity between the observations as a function of the lags.

**2.Model Training:** The first step is to split the dataset into train and test sets. It predict for 'n' number of timestamp based on 'm'timestamps. In this case, it is required to choose n and m both to be one, i.e it predicts for $t$ by giving input for $t-1$. Hence use the most recent approaches like the LSTM and MLP with the moving window method. Thus, reshape the dataset according to the design of the final architecture.

**3.Prediction:** LSTM and MLP are very powerful in sequence prediction problems because they're able to store past information. This is important in case of predicting the future bitcoin prices. The pre-processed data is provided as the input to the model and then compile the model after the compilation of the model the evaluation is done. The prediction is visualized by ploting the graph with importing the matplotlib library.Two hidden LSTM layers were chosen. For a time series task two layers is enough to find non-linear relationships among the data for a time series task. Three and four layers were tested but didn't improve validation performance. Several layers can be required for tasks such as image recognition when the number of features is significantly large.The last 20 percent of the dataset is withheld for validation

while the model trains on the remaining 80 percent of the date. This is the only method natively supported in Keras. K-fold cross validation was investigated through the Python ScikitLearn library. However, it was not implemented due to the significant training times that result from it.

## V. RESULTS AND DISCUSSION

In the implementation of the proposed model for the prediction of bitcoin price using the deep learning algorithms such as Long short term Memory (LSTM) and Multilayer perceptron (MLP). The dataset is collected from the bitcoin historical data. Using these datasets the prediction is performed for the both the long term and short term dependencies.

## VI. CONCLUSION:

The main purpose of this project is to predict the price of the bitcoin with the use of deep learning algorithms such as long short term memory LSTM and multilayer perceptron MLP which helps in the trading and investment of the money. LSTM results into the least RMSE value when bitcoin parameters are considered for price prediction when compared to the other algorithms. The proposed approach helps the researcher to determine optimal input variables for building LSTM time series forecasting model without trial and-error process.

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