Bitcoin Price Prediction Using Deep Learning

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Abstract

Cryptocurrency, especially Bitcoin, is one of the most volatile markets today and has gained a lot of attention from investors across the globe. Cryptocurrency, being a novel technique for transaction systems, has led to a lot of confusion among investors and any rumors or news on social media has been claimed to significantly affect the prices of cryptocurrencies. Implemented linear regression and Long Short-Term Memory (LSTM) models for bitcoin price prediction. The goal of this proposed work is to predict prices for Bitcoin using Machine learning techniques for the next day and prepare a strategy to maximize gains for investors. We also aim to find out if there is a correlation between fluctuating Bitcoin prices and related news. The proposed method compared to other Machine Learning models from relevant studies, it was revealed that the linear regression model's accuracy rate is quite high; it was shown to be 99.87 percent correct. On the other hand, the LSTM model has a minor error rate of 0.08 percent. The neural network model is thus shown to be more optimal than the machine learning model as a result of this. Ensemble learning and other eminent deep learning techniques may improve the bitcoin price prediction accuracy.

Keywords: Bitcoin Prices, Machine Learning Techniques, Cryptocurrency, Transaction System

1. Introduction

The stock market is one of the most volatile data available in terms of machine learning datasets. Researchers have been trying for a long time to predict the stock. Cryptocurrencies, to be specific, have gained a lot of traction in recent years from investors across the globe. Cryptocurrency being a novel technique for transaction systems has led to a lot of confusion among investors and any rumors or news on social media has been claimed to significantly affect the prices of cryptocurrencies. Bitcoin is one of the oldest and biggest cryptocurrencies being traded as of now, in terms of the volume being traded. It is so big that even now, with the advent of thousands of new cryptocurrencies, Bitcoin has a market share of more than 55% as compared to other cryptocurrencies, followed by Ethereum at 8.57%. This says a lot about why Bitcoin might be a really interesting and important stock to predict. Also, Bitcoin prices fluctuate heavily. It is very sporadic and this is one of the most important reasons which attracted us to analyze and predict its price. The rest of the paper would discuss our various attempts to predict its price and us trying to reason out how external factors like news affect its price.

2. Motivation

Today Bitcoin is a safe and secure payment method with a significant financial impact. Customers must provide their computer authorization to register and list deals using Bitcoins before they can get them. Cryptocurrency Price Prediction Using News and Social Media Sentiment examines the capability of updating and societal broadcasting data to forecast value variations for three cryptocurrencies: Bitcoin, litecoin, and Ethereum [1]. The buying and selling of Bitcoins in various currencies take place in a separate location, where "buy" or "sell" requests are entered into the ordered e-book. "Buy" or "bid" refers to the intention of purchasing specific Bitcoin measures at a specific price, whereas "provide" or "ask" refers to the anticipation of providing specific Bitcoin measures at a specific price. The shift is brought about by the coordination of pricing requirements, which range from the layout of e-books to a genuine customer-supplier exchange. Review associates the model of ARIMA to that of a seq2seq persistent deep multi-layer neural network (seq2seq) exploiting a wide-ranging selection of input types [2].

3. Related works

1. Financial market forecasting is a popular branch of financial study that has received a lot of attention. The evidence on the predictability and efficiency of financial markets is divided. The proposed work formed a deep learning model expanding the Python library, Keras, to mark predictions on Bitcoin and intended two neural networks to sort similar forecasts with significant discrepancies. In the principal method, shaping a modest neural net with one input layer and an added dropout layer produces an incessant value. This incessant worth is the foretold value of Bitcoin a week from the given effort [3]. Conducting regression analysis on possible signals to explain asset returns is a well-established method for analyzing return-predictive signals. The proposed work investigates the effect of accounting for long memory in the instability process as well as its asymmetric reaction to past values of the series to predict: day, one, and two weeks volatility levels [4]. Proposed Bidirectional LSTM Recurrent Neural Network in TensorFlow 2 in the sequence; Cryptocurrency data outline, Time Series, Data preprocessing, Construct and train LSTM model in TensorFlow 2, Utilise the

model to forecast future Bitcoin value. Our method is appealing and broad and can be utilized for further datasets[5].

Machine learning technologies, on the other hand, which typically do not impose these constraints, are increasingly being used for financial market prediction. proposed an original data decomposition-based hybrid bidirectional deep-learning technique in forecasting the daily price alteration in the Bitcoin market and directing procedural exchange on the market. Two main phases are tangled in our practice framework, specifically, data decomposition for inner factors extraction and bidirectional deep learning for predicting the Bitcoin value [6]. Suggests the original technique of the building of forecasting prototype utilizing deep learning method. The projected method originated to be more precise than the Machine learning replicas utilized for forecasting as the deep learning technique deliberate the non-linear sort of value [7]. Recurrent neural networks (RNN) are the advanced procedure for sequential data and are utilized by Apple's Siri and Google's voice exploration. It is a procedure that reminisces its input due to its internal memory, which marks the procedure as flawlessly matched for answering machine learning problems connecting in sequence data [8]. The deep learning approaches were prophesied to outpace the below-par accomplishment ARIMA forecast.

Proposed Gated Recurrent Network prototype (GRU) to predict Bitcoin value [9]. Proposed inclusive feature set, counting practical, blockchain-based, sentiment-/interest-based, and asset-based features. Outcomes from the proposed method confirm that practical features endure the most pertinent for most approaches, trailed by designated blockchain-based and sentiment-/interest-based features [10].

4. Proposed Methodology

The proposed model implements a machine learning algorithm to build the model to predict the price of Bitcoin based on a historical dataset available on an online database. In the proposed model, the Bitcoin price prediction can be done using the LSTM (Long Short Term Memory) which is one of the types of the RNN (Recurrent Neural Networks). The tool used for the project is anaconda-navigator. The procedure to be followed for the proposed system is given as follows:

- First, collect the data set using the Rest-API to collect the historic of the Bitcoin prices from the online database.
- Arrange the data into the data frame according to the problem definition, to get the analysis correct and produce the results which are efficient to meet the goals of the system.
- Then the rows of the dataset which are outdated for analysis/prediction to build a model and in order to feed the relevant data to the model extra columns are removed and stored in a CSV file.
- Then data-preprocessing is performed to missing values for the attributes, this is done to reduce the noise and inconsistency in the data.
- Then we build the model for the data-set using the LSTM (RNN) algorithm to predict the values of bit-coin on daily basis.
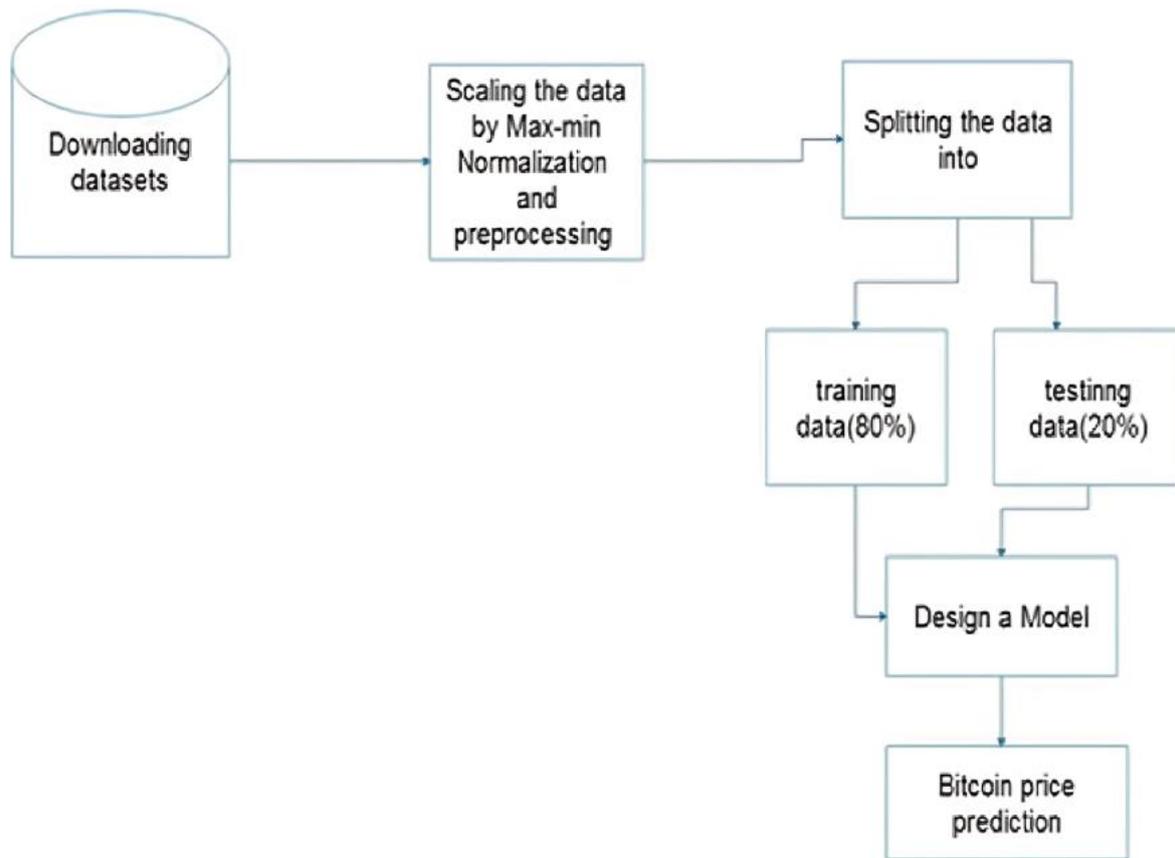- Test the predictions with different layers of the RNN Model.
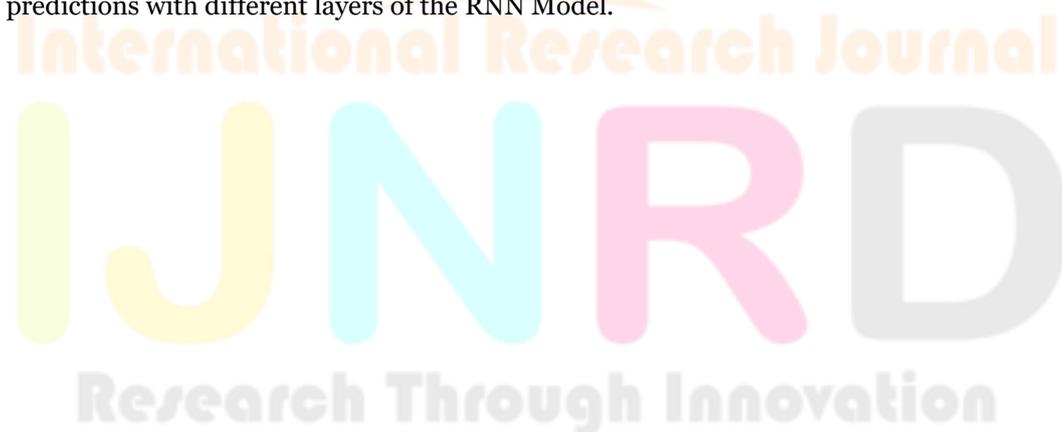
Fig 4.1 Workflow of the proposed work

4.1 Dataset Collection

Our dataset is classified into quarter categories by amalgamating a wide range of classes from the original collection. In our data, we have Bitcoin Price Data from Jan 2015- August 2018. The prices are as per coinbase cryptoexchange.

4.2 Coaching The Model And Classification

We use the coin base dataset, which is freely available on the coin base website and is by far the most trustworthy crypto exchange in the United States. Because our forecast horizon spans days, we aggregate the hourly data by day. The data filtration process was completed with the help of python libraries. Python provides a fantastic capability for data visualization and analysis. We reduce the data and employ the characteristics or attributes that are most suited for the model after we have a good knowledge of it. The model is put into action, and the results are recorded. Several Bitcoin data sets are free to download on the internet. The majority of them provide statistics on the price of Bitcoin on a minute-by-minute basis. The project's main purpose, however, is to make a one-day forecast of Bitcoin's highest and lowest value. As a result, we will want data such as the highest and lowest Bitcoin prices for each day over a period of several years. The Bitcoin value knowledge set is provided by coinbase. The major information gleaned via the internet is still in the form of assertions, numbers, and qualitative expressions. There are errors, omissions, and discrepancies in the raw data. It necessitates modifications following a thorough examination of the completed questionnaires. Within the process of primary knowledge, the steps that follow are involved. A massive amount of data gathered through a field survey must be sifted for similar elements in individual responses. Data preprocessing is a technique for converting {raw knowledge | data | information} into a clean data set. In other words, anytime data is received from many sources, it is collected in a raw format that makes analysis impossible. As a result, bound steps are no longer required to convert the knowledge into a small clean data set. This strategy is used to perform reiterative analysis. The sequence of events is referred to as knowledge preprocessing. The procedure includes the following steps:

- Data Gathering
- Data Cleaning
- Data Normalization

Data preprocessing is important due to the presence of unformatted universe knowledge.

5. Results and Discussions

The objective of this projected work is to forecast prices for Bitcoin using Machine learning and Deep learning Techniques for the next day and formulate an approach to make the most of gains for investors. We also explored and found a correlation between changing Bitcoin values and related bulletins. The projected technique associated with other Machine learning algorithms from applicable revisions, it was revealed that the linear regression model's accuracy rate is fairly high; it was exposed to be 99.87 percent precise. On the additional hand, the LSTM model has a minor error rate of 0.08 percent. The neural network technique is thus exposed to be added more ideal than the machine learning algorithms as a consequence of this. Ensemble learning and further eminent deep learning techniques may advance the bitcoin price forecasting accuracy.

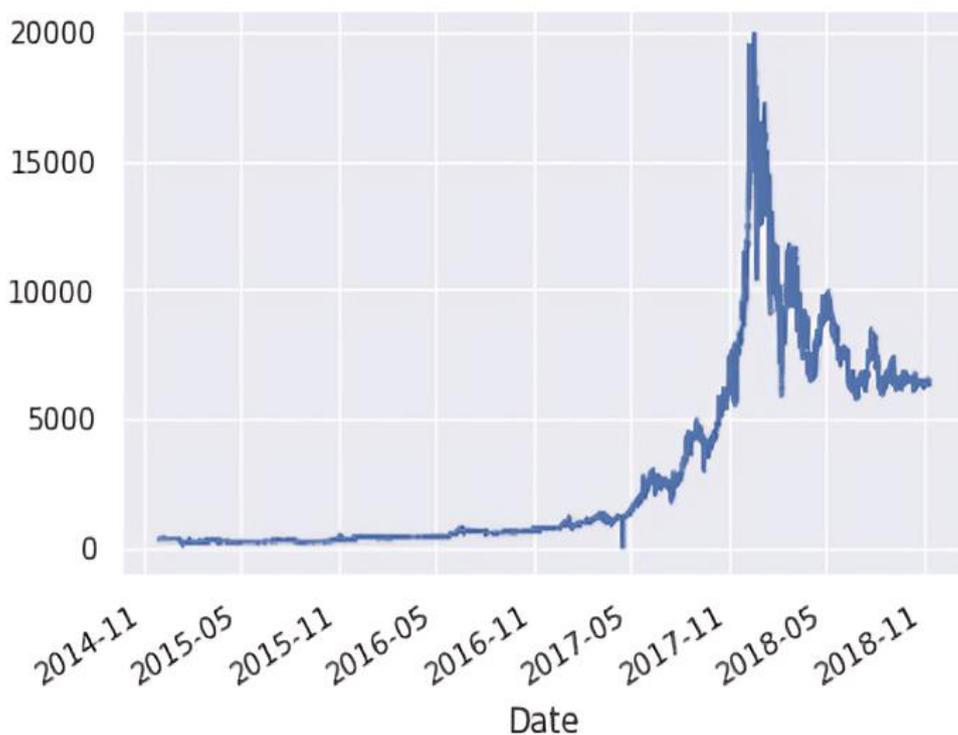The final prediction results screenshots are as follows.

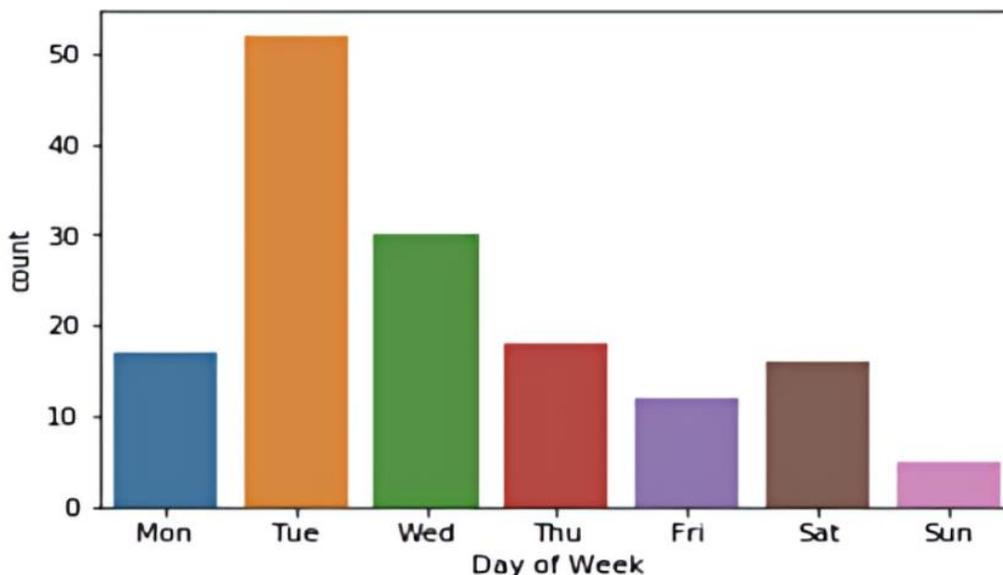*Fig 5.1.1 Bitcoin price dataset visualized from November 2014 to November 2018*

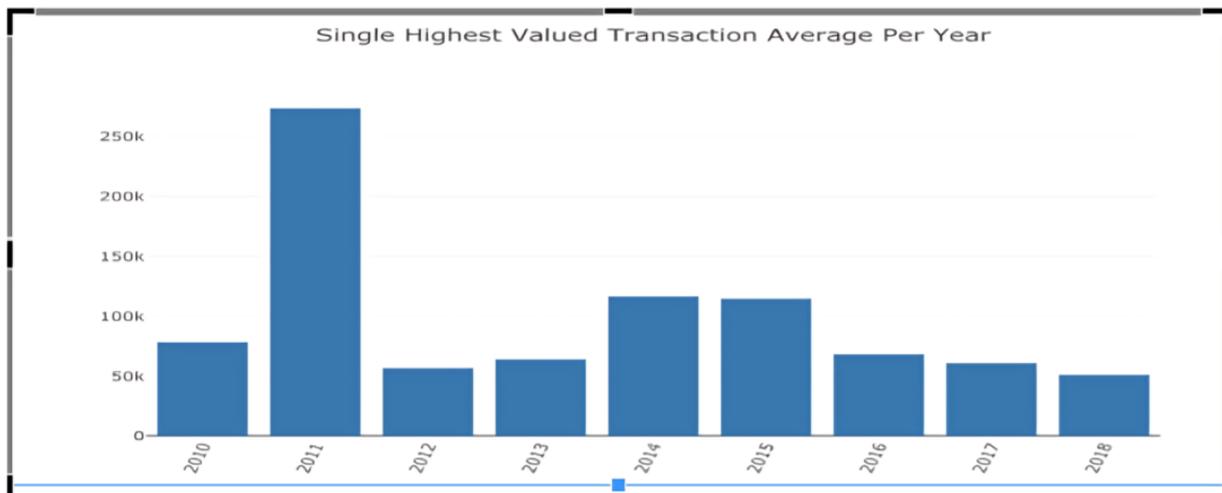*Fig 5.1.2 Bitcoin Volume traded per week from Monday to Sunday*

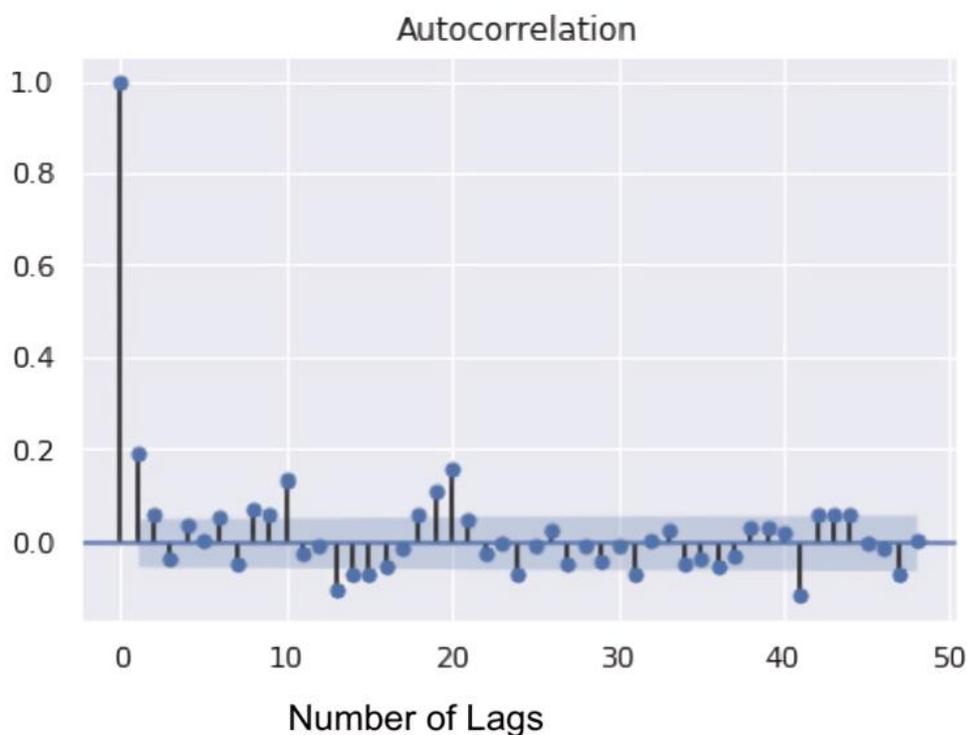*Fig 5.1.3 Bitcoin Volume traded per year from 2010 to 2018*

Fig 5.1.4 Autocorrelation Plot

6. Conclusions and Future Work

Overall, given the diversity of influences influencing the market, predicting a price-related variable is challenging. Add to that the fact that prices are heavily influenced by future potential rather than past performance. However, we now have a better knowledge of Bitcoin and the LSTM architecture thanks to the use of deep neural networks. Implementing hyperparameter adjustment to obtain a more accurate network design is part of the ongoing development. Other characteristics can also be examined (although from our experiments with Bitcoin, more features have not always led to better results). Microeconomic elements could be incorporated into the model for a more accurate prediction. Anyway, even if the data we acquired for Bitcoin has been accumulated over many years, it may have only recently been interesting, resulting in historic interpretations. Furthermore, a paradigm shift in peer-to-peer transactions is underway, reshaping the payment services environment. While it appears that all doubts have yet to be resolved, now may be the best time to act. We believe it is impossible to offer a mature perspective on Bitcoin's future.

- Use to predict the prices of other cryptocurrencies like litecoin, Ethereum, etc.
- We tried to incorporate the idea of transfer learning, this model can be optimized for better performance.
- The web application which is the final software product of this project can provide numerous other

applications on a single site like live sentiment analysis of Bitcoin, tutorials to do trading using Bitcoin cryptocurrency, etc.,

- The result predicted from the model and the idea of sentiment analysis can be combined to predict the prices more accurately, this predicted price will use both historical data as well as current events related to Bitcoin.
- Develop an automated trading system with Buy/Sell notification which has a threshold system where if the predicted Bitcoin price is above the threshold you get a 'Buy' signal and if it is below the threshold you get the 'Sell' signal.

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