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Bitcoin Price Prediction Using Deep Learning Algorithms

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ABSTRACT

Bit coin has come to be viewed as an investment asset more and more after the recent ups and downs in the values of crypto currencies. A strong forecast is required in order to support investment decisions given the market's high volatility. Few studies have examined the viability of using multiple modelling techniques to samples with diverse data formats and dimensional properties, even though current studies have utilized machine learning to predict the price of Bit coins more accurately. We initially divide the price of Bit coins into two categories: the daily price and the high-frequency price, in order to estimate the price of Bit coins at various frequencies using machine learning techniques. For the purpose of daily price prediction for Bit coins, a number of high-dimension features, such as network and property, trade and market, and attention and gold spot price, are used. The 5-minute interval price forecast makes use of the fundamental trading tools obtained from a crypto currency exchange. Using high-dimensional information, statistical methods such as Logistic Regression and Linear Discriminant Analysis beat more complex machine learning algorithms, achieving an accuracy of 66% for daily price prediction of Bit coins. A pilot examination of the significance of the sample dimension in machine learning methods can be viewed in our investigation of Bit coin price prediction.

Key Words: Bit coins, Logistic Regression, long short-term memory, Deep Learning.

1. INTRODUCTION

Bit coin is a crypto currency that is utilized all over the world for investing or for making digital payments. Bit coin is de centralized, meaning that nobody owns it. Bit coin transactions are simple because they are not country-specific. Investments can be made on a

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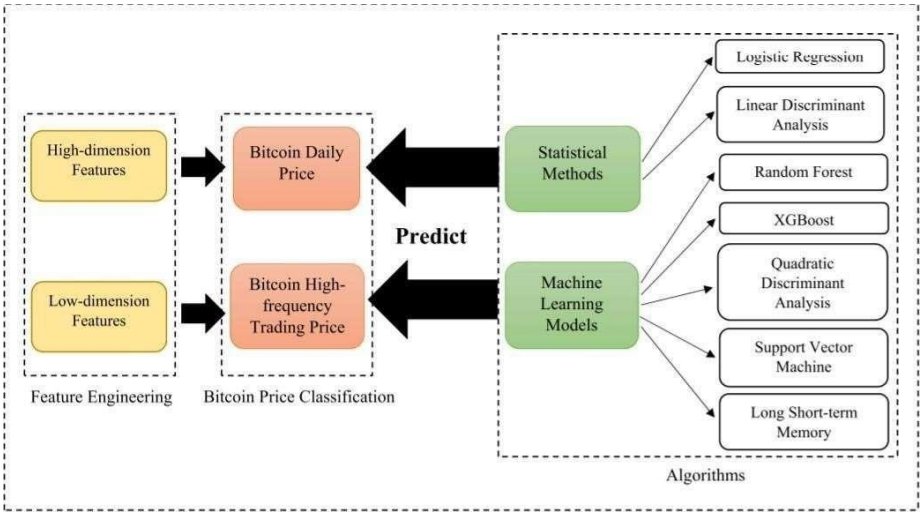
variety of "bit coin exchanges" or marketplaces. They enable the sale and purchase of bit coins in many currencies. Mt. Gox is the biggest crypto currency exchange. A digital wallet, which functions somewhat similarly to a virtual bank account, is where bit coins are kept. Block chain is a site where the timestamp data and transaction history are kept in record form. A pointer to the previous block of data is present in every block. On a block chain, the data is encrypted. Just the user's wallet is private during transactions; the user's name is not disclosed. We can probably gain the knowledge we need to understand the future of crypto money through machine learning models[1-4]. It won't tell us what will happen in the future, but it might indicate a broad trend and the way prices are likely to travel. Let's try to make use of these machine learning models and foretell the future of Bitcoin by implementing them in Python!



2. LITERATURE SURVEY

In order to get required knowledge about various concept related to the present application, existing literature were studied. Some of the important conclusions were made through those are mentioned below.

Sean McNally et al[5]., previously mentioned using a Bayesian optimized recurrent neural network (RNN) and a Long Short-Term Memory (LSTM) network, the objective is accomplished to variable degrees of success. With a 52% classification accuracy and an RMSE of 8%, the LSTM performs best. As a contrast to the deep learning models, the well-known ARIMA model for time series forecasting is used. As anticipated, the non-linear deep learning techniques surpass the poor-performing ARIMA forecast. The

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training time on the GPU outperformed the CPU implementation by 67.7% when both deep learning models were benchmarked on a GPU and a CPU.

C. H. Wu et. al[6]., previously reported Modern deep learning sequence learning for time series forecasting uses long short-term memory (LSTM) networks. Little research has, however, been done on forecasting financial time series, particularly for predicting cryptocurrencies. As a result, we provide an updated forecasting framework using two different LSTM models (standard LSTM model and LSTM with ARIMA model) to anticipate the daily price of bitcoin. Using daily bit coin price data from 2018/1/1 to 2018/7/28, totaling 208 records, the performance of the proposed models is assessed. The outcomes demonstrated that the suggested model using ARIMA had outstanding predicting accuracy. that test For the purpose of predicting the price of a cryptocurrency, the following terms are used: mean squared error (MSE), root mean square error (RMSE), mean absolute percentage error (MAPE), and mean absolute error (MAE). Our suggested LSTM with AR(2) model outperformed the LSTM model as a whole. The contribution of this study is to provide a framework for forecasting the price of bitcoins that can solve and enhance the issue of input variable selection in LSTM without imposing severe data assumptions. The outcomes showed that it might be useful for predicting different crypto currencies as well as for other types of data from the medical or finance industries.

P. Akhilesh et al[7]., earlier reported Cryptocurrency values like those of Bit coin, Litecoin, and Ethereum are never clear. So, it would be of enormous value to investors if a model could forecast how the cryptocurrency market will behave the next day. This study develops a time-series model with Long Short-Term Memory Networks to forecast the value of cryptocurrency. Three digital currencies—Bitcoin, Litecoin, and Ethereum—have been considered for the study. The outcomes of employing opinion mining to gauge the current market sentiment for several currencies have been compared. The sentiment scores obtained from textual data's natural language processing are employed as features in the prediction model. The Plotly Python package for graphing plots is used to plot the time-series charts. The uncertainty quantification approach uses the Mean Absolute Error, which is determined as the difference between the actual and anticipated values. By comparing these uncertainty quantification techniques, opinion mining is used to examine the market's current situation.

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2.1 *Need of Bit Coin Prediction*

It's difficult to predict the future. Many have attempted and failed. Many of us, though, would go to tremendous lengths to predict what would happen next because we are so curious. The possibilities that would open up if we knew what would happen in the future! If you had known that Bitcoin would eventually top $15 in 2012 when it was less expensive, what would you have done? $18,000! Many individuals may regret not purchasing Bitcoin at the time, but how could they have known? This is the problem we are currently having with crypto currency. Although we are unsure of when it will or won't happen, we do not want to lose out on the next price increase. So how might we resolve this conundrum? Perhaps machine learning can provide the solution. The objective of this proposed system is to develop an application which will predict the bit coin prices in future with decent accuracy. This allows the investors to invest wisely in bit coin trading as the prices of bit coin have gone up to an exaggerating amount in the last ten years.

Earning people who wish to save money and invest it wisely in order to reap significant benefits are now in the final year. As trading in stocks and crypto currencies is popular right now, we have decided to teach the average person how these markets operate so they can make wise investments.

The objectives of the "Bit coin Price Prediction" can be stated as follows:

- Develop an application which will predict the bit coin prices in future with decent accuracy.
- Allow the investors to invest wisely in bit coin trading as the prices of bit coin have gone up toan exaggerating amount in the last ten years.
- Use machine learning algorithms to improve the precision of price predictions for cryptocurrencies.

2.2. *Existing System*

Bit coin has come to be seen as more of an investment asset in recent years after the price boom and collapse of crypto currencies. Due to its extreme volatility, accurate forecasts are necessary to guide investment choices. Few studies have concentrated on the viability of applying various modelling techniques to samples with diverse data structures and dimensional properties. even if current studies have employed machine learning to estimate the price of Bit coins more accurately. We initially categorize Bit coin price by daily price

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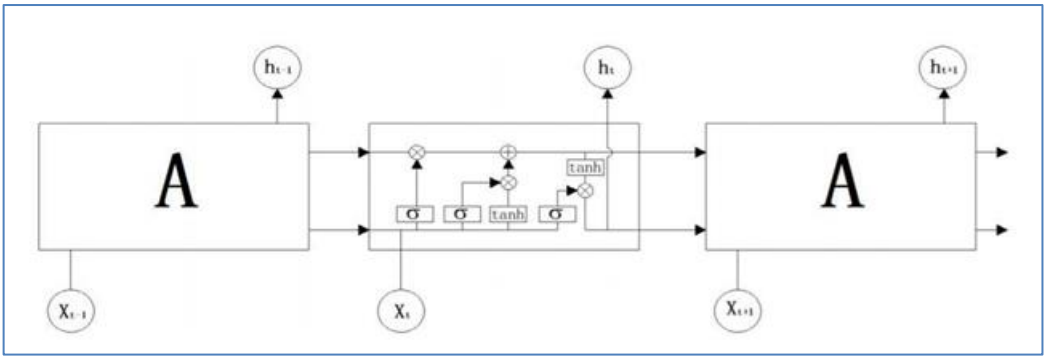
and high-frequency pricing in order to predict Bit coin price at various frequencies using machine learning techniques. The daily price prediction for Bit coins is based on a set of high-dimension features, including property and network, trading and market, attention, and the spot price of gold, while the 5-minute interval price prediction is based on the fundamental trading features obtained from a crypto currency exchange

2.3. *Proposed System*

For the daily forecast of Bit currency prices using high-dimensional characteristics, statistical methods like Logistic Regression and Linear Discriminant Analysis outperform more complex Deep learning algorithms[8-10], with an accuracy of 66%. We outperform bench mark results for daily price prediction, with the statistical methods' and Deep learning algorithms' maximum accuracy values of 66% and 65.3%, respectively. With an accuracy of 67.2%, machine learning models such as Long Short-Term Memory for Bit coin 5-minute interval price prediction outperform statistical approaches. Considered a pilot study on the significance of the sample dimension in machine learning methods, our investigation into Bit coin price prediction.

LSTM MODEL

A recurrent neural network (RNN) architecture used in deep learning is called LSTM (Long Short Term Model). A cell, an input gate, an output gate, and a forget gate make up a typical LSTM unit. The three gates control how information enters and leaves the cell, and the cell stores values across arbitrary time intervals.



The application of several machine learning algorithms is shown in this section. We use two statistical techniques for predicting Bit coin daily price with higher dimensional features: logistic regression (LR) and linear discriminate analysis (LDA), and machine learning models like random forest are used to predict the 5-minute interval price with a few features.

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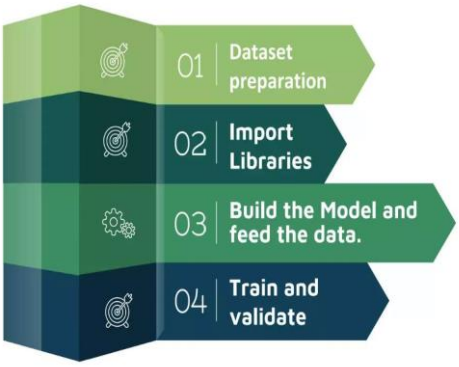
Long short-term memory, XGBoost (XGB), quadratic discriminate analysis (QDA), and support vector machines (SVM) (LSTM).

- Step1: Cell state should be discarded first. The Sigmoid layer makes this choice
- Step2: The information to be stored in the cell state is subsequently decided by the input gate layer. A vector of fresh candidate values is then created by the tanh layer.
- Step3: The old state is then multiplied by feet. This represents the updated value scaled by how much each state's value was updated.
- Step4: We first run a sigmoid layer, which determines the states of various cell components. That is what we intend to produce. Finally, in order to output only the portions, we decided to, we multiply the cell state by the output of the sigmoid gate after passing it through tanh (which forces the values to be between 1 and 1).



3. METHODOLOGY

Data collection: Data Collection is the first step we will collect data from concern source. It is defined as the procedure of collecting, measuring, and analyzing accurate insights for research using standard validation techniques. The most important objective of data collection is ensuring that the gathered information is rich in content and reliable for statistical analysis so that data-driven decisions can be made efficiently and effectively. The data set contains day transactions from 29th August 2017 to 9th August 2020. The data is first tested out with certain regression techniques and then a deep learning model is implemented to provide better accuracy compared to machine learning concepts when there are high or more data sets.

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```
btc.head()
```

	Date	Symbol	Open	High	Low	Close	Volume BTC	Volume USDT
0	2020-08-05 03-PM	BTCUSDT	11617.56	11693.94	11593.01	11678.72	2108.69	24576947.18
1	2020-08-05 02-PM	BTCUSDT	11609.99	11644.65	11466.00	11617.56	5554.28	64363597.97
2	2020-08-05 01-PM	BTCUSDT	11562.86	11620.00	11542.32	11609.99	4847.99	56151259.42
3	2020-08-05 12-PM	BTCUSDT	11438.06	11584.60	11391.59	11562.86	5612.11	64457434.98
4	2020-08-05 11-AM	BTCUSDT	11393.24	11450.00	11382.21	11438.06	3069.55	35035195.65

```
btc.tail()
```

	Date	Symbol	Open	High	Low	Close	Volume BTC	Volume USDT
26023	2017-08-17 08-AM	BTCUSDT	4349.99	4377.85	4333.32	4360.69	0.9499	4139.70
26024	2017-08-17 07-AM	BTCUSDT	4324.35	4349.99	4287.41	4349.99	4.4400	19241.06
26025	2017-08-17 06-AM	BTCUSDT	4315.32	4345.45	4309.37	4324.35	7.2300	31282.31
26026	2017-08-17 05-AM	BTCUSDT	4308.83	4328.69	4291.37	4315.32	23.2300	100304.62
26027	2017-08-17 04-AM	BTCUSDT	16199.91	16199.91	4261.32	4308.83	44.5100	190952.85

Data collected from different sources

3.1. *Feature Selection*

For data analysis purpose we required data getting through Feature selection method, we need to start the procedure called data segregation or feature selection. This is a process where we trim out the unwanted data or noise data remove from the data set. This step is necessary as we require only those features which can contribute to our prediction as unnecessary data can cause noise in our final output.

Features	Definition
Open	Opening value of trade at that time stamp
Close	Closing value of trade at that time stamp
High	Highest trade value in the time stamp
Low	Lowest trade value in the time stamp
Volume BTC	Total trade volume in BTC in the given timestamp
Volume USDT	Total trade volume in USDT in the given timestamp
Date	The given date and time of each bid
Symbol	Symbolic representation of coin

The features represented in the data

4. RESULT AND DISCUSSION

After the data analysis process we find that the only four features were well suited for the testing of this project. The data was trimmed and only the selected features were left as shown in below Table

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	Open	High	Low	Close
0	11617.56	11693.94	11593.01	11678.72
1	11609.99	11644.65	11466.00	11617.56
2	11562.86	11620.00	11542.32	11609.99
3	11438.06	11584.60	11391.59	11562.86
4	11393.24	11450.00	11382.21	11438.06

Attribute/Features selected are Open, High, Low, and Close

Linear regression, and the other one is the Recurrent Neural Network model i.e. Long Short-Term Model (LSTM) which shows us the two different outcomes.

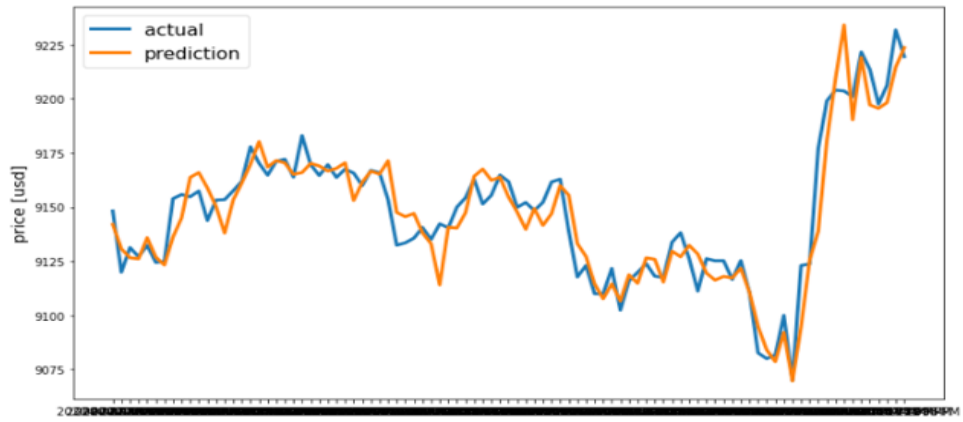
```
In [38]: model.score(x_train, y_train)
Out[38]: 0.9997158887216999

In [39]: pred = model.predict(x_test)

In [40]: model.score(x_test, y_test)
Out[40]: 0.9997966090479169
```

Accuracy obtains from the training and testing data set using Linear regression model Testing

```
preds = test[target_col].values[:-window_len] * (preds + 1)
preds = pd.Series(index=targets.index, data=preds)
line_plot(targets, preds, 'actual', 'prediction', lw=3)
```




```
targets = test[target_col][window_len:]
preds = model.predict(X_test).squeeze()
mean_absolute_error(preds, y_test)
```

```
0.0008476415191452829
```

Final Resultant graph of LSTM and the Mean Absolute Error rate (0.08%)

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5. CONCLUSION AND FUTURE SCOPE

Deep learning models like the RNN and LSTM are clearly successful at predicting the price of bit coin, with the LSTM being better at spotting longer-term dependencies. Unfortunately, a work of this kind with a high variation makes it challenging to translate this into attractive validation findings. It is nevertheless a challenging task as a result. Between over fitting a model and preventing it from learning well, there is a narrow line. Drop out is an important feature to help with this. Although Bayesian optimization was used to enhance the dropout selection, it was still unable to ensure successful validation. The actual performance of the ARIMA forecast based on error was much worse than the neural network models, despite the criteria of sensitivity, specificity, and precision indicating acceptable performance.

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