An Approach for Bitcoin Price Prediction Using Machine Learning

Article *in* INTERNATIONAL JOURNAL OF MECHANICAL ENGINEERING AND TECHNOLOGY (IJMET) · April 2024

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An Approach for Bitcoin Price Prediction Using Machine Learning

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Abstract

Digital money Bitcoin operates independently of any centralized administration, governmental regulation, or bank supervision. Cryptography and peer-to-peer software are used in its operation. All bitcoin transactions are recorded in a public ledger, and copies of it are kept on servers all over the world. The Bitcoin is decentralized and its value varies differently. Depend on laws of demand and supply if demand of currency increase but limitedsupply then the price increases. and for low demand price decreases. Diverse formulas based on demand and supply change the price. Here, we have predicted the Bitcoin price correctly considering parameters that are remarkable for Bitcoin value. We have analyzed and identified daily market trends for bitcoin with best features surrounding Bitcoin price. Using dataset and proposed machine learning we have forecasted the sign of the dailyprice change with good accuracy. Proposed software provided the best performance regarding breed classification with high accuracy.

Keywords: *Bitcoin, Machine Learning, Price prediction, Accuracy, Performance*

1.Introduction

Customers uses computer authority to register and publish trades in bitcoins, making it a secure operating systemwith a respected impact on money. It is volatile in nature than other currencies and best performance currency oflast 5 years. "Purchase" or "sell" "Buy" or "bid" "provide" or "ask" measures of cost helpful in purchasing. So, research in this area is dominating. There is huge scope of research in time series prediction relates to bitcoin. The purpose is to trace accuracy using Machine Learning Approach. The main feature of this system is to propose a general and effective approach to predict the bitcoin price using data mining techniques. Analyzing and examining the hidden patterns and connections between the data in the bitcoin dataset is the primary objective. The solutionto the bitcoin analysis problem can provide extremely useful information to prevent investors from losing moneywhich is being invested on bitcoin. So, dealing with this becomes more important. The analysis and prediction play an important role.

2.Literature Survey

Most of the existing work solves these problems separately by different models.

Alvin Ho et.al predicted bitcoin value using linear regression and compare with LSTM, Machine Learning and Artificial Neural. Python libraries and code is used for data analysis and visualization. Author noticed linear regression model's accuracy 99.87 % high compared to other Machine Learning techniques [1]. Recurrent neural network (RNN) techniques were presented by Mohammad J. Hamayel and Amani Yousef Owda to calculate the prices of the cryptocurrencies Bitcoin (BTC), Litecoin (LTC), and Ethereum (ETH). Economic model proved to be quite useful for investors and traders in determining bitcoin sales and purchases [2].

Luisanna Cocco et.al., developed a one-stage framework using a Bayesian neural network, a feed-forward neural network, and a long short-term memory neural network, as well as two-stage frameworks using neural networks for support vector regression. Author identified best result with 2 stage framework model.[3]. Reshma Sundari Gadey et.al., predicted the value of bitcoin price with LSTM Architecture and proved LSTM outperform than other machine learning algorithms [4].

In first-order differential equation for a time series problem, Mahboubeh Faghih Mohammadi Jalali and Hanif Heidari forecasted the price of Bitcoin and changes using the grey system theory and the first-order grey model (GM (1,1)). Author traced Bitcoin's price accurately with 98% accuracy to identify time frame and manage asset[5].

3.Proposed System

Figure 1 depicts the proposed architecture for machine learning-based bitcoin price prediction. It follows steps - of Data Collection and Cleaning, Feature Extraction, Tracing Stationarity, Performing Seasonal Decomposition and Normalization.

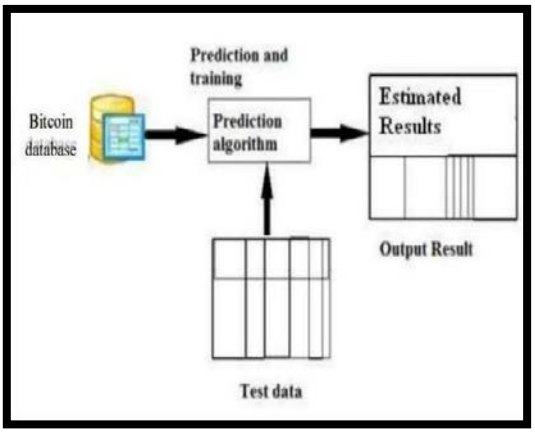

Figure 1. Architecture of Bitcoin Price Prediction Using Machine Learning

Data Collection and Cleaning-

The data considered is from coin market cap website. The dataset consists of day-wise bitcoin statistics from 29 Apr ‘13 to 1 Oct ‘20. The unit used for the price is USD. The data is consistent without null and missing fields, sothere was no need for cleaning the dataset.

Feature Extraction-

The dataset initially consisted of various Attributes that can be listed as 'time_open','time_close','time_high','time_low','USDopen','USD.high','USD.low','USD.close',‘USD.volume','USD.market_cap' and 'USD.timestamp'. The attributes retained after Feature Extraction is Date the time stamp of the observation, USD.low- the all-day lowest bitcoin price, USD.high the all-day highest bitcoin price, USD.open -the opening bitcoin price in USD, USD. close the closing bitcoin price in USD, USD.volume- the total volume of bitcoins traded in USD for the day. After Feature Crafting, we had a new attribute as Mean = (USD.low+USD.high)/2. This gives a more realistic bitcoin price value for the day. In all of the models, we have used this Mean as theforecast characteristic.

Stationarity-

A time series is said to be stationary if it does not show seasonal or trend effects on an aggregate level, i. e. no changein mean or variance throughout the data. This can be observed by analyzing the seasonal decomposition of the timeseries attribute to beforecast (i. e. Mean in our case). So to check if data is stationary or not, we used the Augmented Dickey-Fuller (ADF) test. It is the most popular statistical method to find if the series is stationary or not.

Seasonal Decomposition-

Seasonal Decomposition separates a time series variation into three main components
Trend: This depicts the increase or decrease in the series giving a general idea or trend about the aggregated variations.
Seasonality: This identifies the repeating short-term variation cycle in the series.
Residual: This depicts the random variation in the series sometimes known as the noise. Seasonal decomposition of dataset with observational is shown in Fig.2.

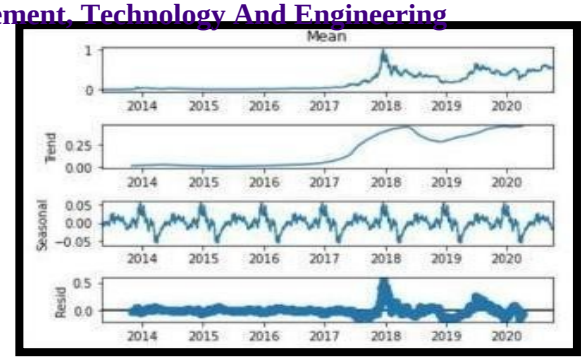

Figure 2. Seasonal decomposition of dataset with observational on top, trend, seasonal and residual data Normalization

We have performed min-max scaling for Normalization which scales the attributes to the range (0,1). This is doneby dividing the difference between an observation and the attribute's minimum value by the range of that attribute,
i.e. X_normalized= (X-Xmin) / (Xmax-Xmin)

4.Implementation

We have used Anaconda Tool with IDE Jupyter Notebook and Python Programming Language. We have used coin market cap website for data collection. The dataset consists of day-wise bitcoin statistics from 29Apr '13. ARIMA model representing varying bitcoin prices.

Sarimax Approach To Predict Bitcoin Price Prediction is shown in Fig.3

Figure 3. SARIMAX model representing varying bitcoin prices

The min-max normalized dataset with default differencing, equal to 1 applied on the variable to be forecasted. We used AR, MA, ARIMA, ARMA, SARIMAX with Open, close, high, and low as exogenous variables and seasonal,yearly data(m=12) as shown below. Comparison of Arima and Sarimax Model Result is shown in Table.1.

Table1. Comparison of Arima And Sarimax Model

Attribute	Model	RMSE value
Mean value using Open value for the previous day	ARIMA	181.94589519
	SARIMAX	196.22975044
Mean value using Open, Close, Low, High, Volume from the previous day	ARIMA	179.17065121
	SARIMAX	156.81198263

Residuals Of Sarimax for the seasonal data and trends is shown in Fig.4

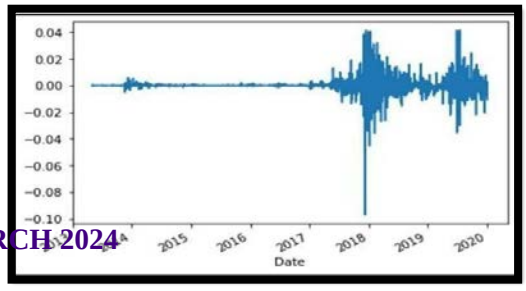

Figure 4. SARIMAX models for the seasonal data and trends

5.Conclusion And Future Scope

In conclusion, in the field of machine learning our work expanded the knowledge on topics of linear regression an
regularization and made us learn the difference between routine regression problems and the prediction/ forecasting problems. It made us encounter algorithms specially made for forecasting, i. e. time series algorithms like ARIMA, VAR and GARCH. Here we have analyzed time-series data with seasonal decomposition, further breaking down to a better understanding of the SARIMAX model, which uses this functionality to predict the best values. Algorithms work on the concept of assigning weights on new and old data, which is different from the weights assigned by regressive algorithms on features. Time Series algorithms provide better results than simpleregression models, we have used the best model ARIMA forecasting in machine learning. It motivates us to expand further in the direction and apply DL techniques like CNN and LSTM to obtain accurate predictions for a more considerable time in future. In future Bitcoin Price Prediction is rewarding for maintaining large amountsof data and Access of data through Mobile devices with more interactive user interface and facilities for backup creation.

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Dr. Suwarna Gothane presently working as Assistant Professor in Pimpri Chinchwad College of Engineering, Pune, INDIA. She received her Ph. D (CSE) from Sant Gadge Baba Amravati University, Amravati in year 2019, M.E. (CSE) degree from P.R.M.I.T&R, Amravati in the year 2012 and B.E. (CSE) degree from H.V.P.M C.O.E & Technology, in the year 2006. Her area of interests are Data Science, Data Analytics, Machine Learning.