Cryptocurrency Portfolio Optimizer with Machine Learning

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Abstract- *In the past eight years of Bitcoin's history, the economy has seen the price of Bitcoin rapidly grow due to its promising outlook on the future for crypto currencies. Investors have taken note of several advantages Bitcoin provides over the traditional banking system. One such trait is that Bitcoin allows for decentralized banking, meaning that Bitcoin cannot be regulated by powerful banks. There is also a market cap of 21 million Bitcoins that can be in circulation, therefore a surplus of Bitcoins cannot be "printed" which would result in inflation. Bitcoin resolves the issue with transaction security by using a block chain, or a ledger, which records the history of every transaction ever made into one long hexadecimal "chain" of anonymous transactions, which keeps transaction history transparent, but also confidential.*
Bitcoin as a result has become a very bullish investing opportunity, and due to the huge volatility of the Bitcoin market price, this paper attempts to aid in investment decision making by providing Bitcoin market price prediction. Our team explored several Machine Learning algorithms by using Supervised Learning to train a prediction model and provide informative analysis of future market prices. We start with Linear Regression models, and train on several important features. We show that the price of Bitcoin can be predicted with Machine Learning with high degree of accuracy.
Keywords: Bitcoins, Crypto Currency, Deep Learning, Machine Learning

I. INTRODUCTION

The Bitcoin crypto currency experienced tremendous growth over the past year. The price of one Bitcoin went from about $750 at the end of 2016 to over $10,000 in the mid of 2020. Great rates of growth were also observed in the other crypto currencies, such as Ethereum and Litecoin. There is currently a shortage of quantitative analysis tools and techniques for predicting the prices of crypto currencies. Mathematical analysis has a well-established place in the financial industry for evaluating expected returns of a stock of a given company or performance of an entire portfolio. [12] However, Machine Learning & Deep Learning literature is lacking verification of whether the stock analysis techniques are valid for the crypto currencies, and if so, how they can be modified. [13] That is, what features need to be removed or added as a basis for price prediction, whether current Machine Learning algorithms & Deep Learning work for crypto currencies, and which approach yields the best results.

In this paper, we investigate these questions. Such analysis is relevant given a great amount of attention that crypto currencies, in particular Bitcoin, are generating. [18] Both individuals and large financial firms are attracted to crypto currencies because of the transparency and anonymity that they provide to their users, as well as their resistance to fraud due to the distributed nature of the ledger records. [19] Moreover, purchasing crypto currencies is promising in terms of making a profit and should be of interest to investors.

II. PROBLEM AND SOLUTION

Unstructured and bad data in the crypto-currency market provided from the internet is mostly manipulated or inaccurate data. This helps for the fake and bot trading with most of the cryptocurrency exchanges which are most often manipulated. As per the bitwise, a report in March 2019, 95% of the trades or exchanges are fake also includes Coin market cap which is one of the popular crypto data websites. [4] Cryptocurrency is a coin-based market which is volatile in nature compared to the stock market. [12] It depends upon the people's sentiment regardless to the actual market strategies. Using supervised learning, which is one of the Machine Learning algorithms by evaluating predictive analysis of the price and movement of the cryptocurrencies.

This research main contribution is to investigate two major questions:

i)   Can machine learning algorithms efficiently predict cryptocurrency prices?

ii)   Any proper validations for the predictive analysis for the cryptocurrency market?

Machine learning algorithms using supervised learning, random forest algorithms to analyses a large amount of data using sentiment analysis.

Also, Block chain technology is used to secure and store the data for analyzing by supervised machine learning algorithm. By the process of optimization, another limitation raises by its parameters which are to be tested as the priority of this research is to find out the predictive memory analysis and historical memory analysis.

III. LITERATURE REVIEW

Helder Sebastião et al. [6] presented a study that scrutinizes the predictability of three major cryptocurrencies like bitcoin, ethereum, and litecoin with the profitability of trading strategies using machine learning techniques like linear models, random forests, and support vector machines. These methods use trading and network activity attribute from August 15, 2015, to March 3, 2019, with the test sample starting on April 13, 2018. The forecasting accuracy is quite different across models and cryptocurrencies, and there is no evident pattern that allows concluding on which model is superior or which is the most predictable cryptocurrency in the validation or test periods.

Disadvantages: 1. The forecasting accuracy of the individual models is low when compared with other similar studies.

Edwin Sin et al.[7] explores the relationship between the features of Bitcoin and the next day's change in the price of Bitcoin using an Artificial Neural Network. The collaborative approach called Genetic Algorithm-based Selective Neural Network Ensemble is constructed using Multi-Layered Perceptron. This approach was used to predict the next-day direction of the price of Bitcoin given a set of approximately 200 features of the cryptocurrency over 2 years. Over 50 days, a trading strategy based on the ensemble was compared against a "previous day trend following" trading strategy through back-testing. By using this ensemble, the trading strategy generated almost 85% returns, outperforming the "previous day trend following.

Advantages: 1. The system helps to understand and identify daily changes in the Bitcoin market while obtaining insight into the most appropriate features surrounding Bitcoin price.

Nor Azizah Hitam et al. [8] presents a comparative performance of Machine Learning algorithms like Neural Networks (NN), Support Vector Machines (SVM), and Deep Learning for cryptocurrency forecasting using time series data. time-series data based on 5 years of daily history, as inputs for all models and may vary based on the availability of datasets from the source. The data is prepared from the daily open, close, high, and low prices of daily trading for a total of six types of cryptocurrencies. The paper concludes that SVM has several advantages over the other models in forecasting and provides a result that is almost or close to the actual result.

Advantages: 1. SVM is considered a reliable forecasting model that gives 95.5% accuracy for six selected cryptocurrencies.

Samiksha Marne et al. [9] attempted to predict Bitcoin prices by the use of RNN using the LSTM model to predict the price of the cryptocurrency. The results were computed by extrapolating graphs along with the Root Mean Square Error of the model which was found to be 3.38. The use of RNN using the LSTM algorithm was done effectively.

Ruchi Mittal et al. [10] makes use of multivariate linear regression to predict the highest and lowest price of multiple cryptocurrencies like bitcoin, ripple, NMC by using features like open, low, and close. The dataset consists of over nine features relating to the cryptocurrency price recorded daily over 6 months. By using data preprocessing and examine the independent features in the dataset the highest price of the cryptocurrency was predicted. **Disadvantages:** The dataset used for experimentation is relatively small.

Sean McNally et al. [11] presented a scheme for Bitcoin price prediction in USD using a Bayesian optimized recurrent neural network (RNN) and a Long Short Term Memory (LSTM) network. The LSTM achieves the highest classification accuracy of 52%. The popular ARIMA model for time series forecasting is implemented as a comparison to the deep learning models. the non-linear deep learning methods outperform the ARIMA forecast which performs poorly. Siddhi Velankar et al. [12] attempts to identify and understand daily trends in the Bitcoin market by gathering optimal features surrounding Bitcoin prices and plot a graph using normalization.

IV. PROPOSED SYSTEM

• **DATASET**

For the experimentation Cryptocurrency track history record has been used to in which it contains closing price, opening price, high, low, close, close ratio, volume of all cryptocurrencies.
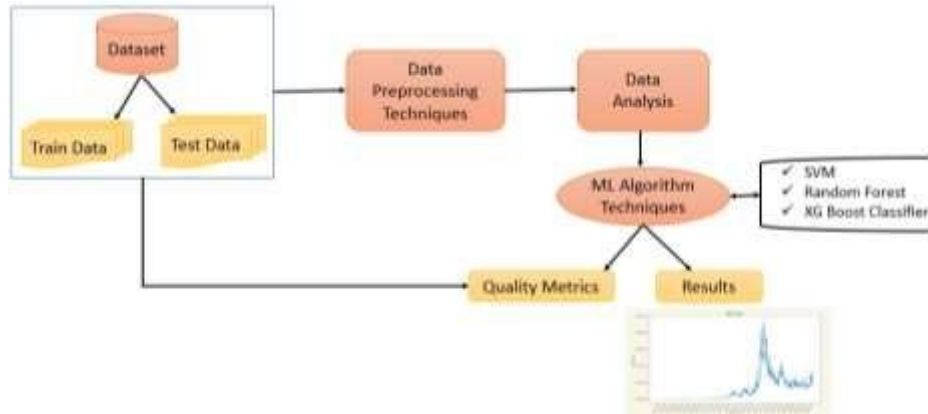

Figure: - System Architecture.

V. EXPERIMENTAL RESULTS ANALYSIS

• **Module – 1 (Correlation Matrix)**

The Correlation matrix is a critical data analysis measure that is calculated to summarize data in order to understand the connection between different variables and make appropriate choices. The different types of experiments and data have been tried in this, as well as applying the filters to correlate with the various fields in the dataset and comparing and attempting to obtain the best coefficient ratios across all the currencies. Also, practice getting the values of overbought and undervalue charts of all the currencies in which it will get to identified the previous track his- tory of all the currencies and get the values of in which the user can identify the relation between sentiments and volumes which can identifies the risk before investment.

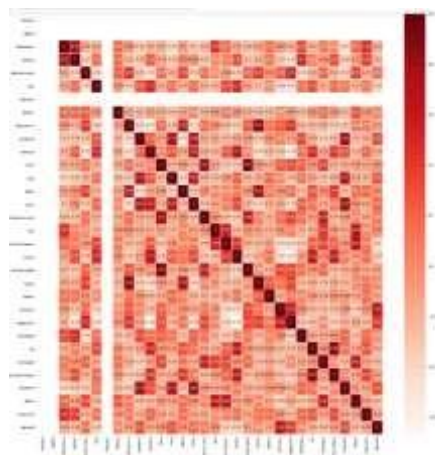1. **Correlation between cryptocurrencies with base volume.**

Figure: - Hit Map for correlation between cryptocurrencies with base volume.

The above figure is the part of experimentation of the cryptocurrencies in which each block has been representing the relation with the other variable and on inspired on this the various experiment has been occurred for cryptocurrencies.

2.   Correlation between cryptocurrencies with base open price.

The following figure is the part of experimentation of the cryptocurrencies in which each block has been representing the relation with the other variable and on inspired on this the various experiment has been occurred for cryptocurrencies
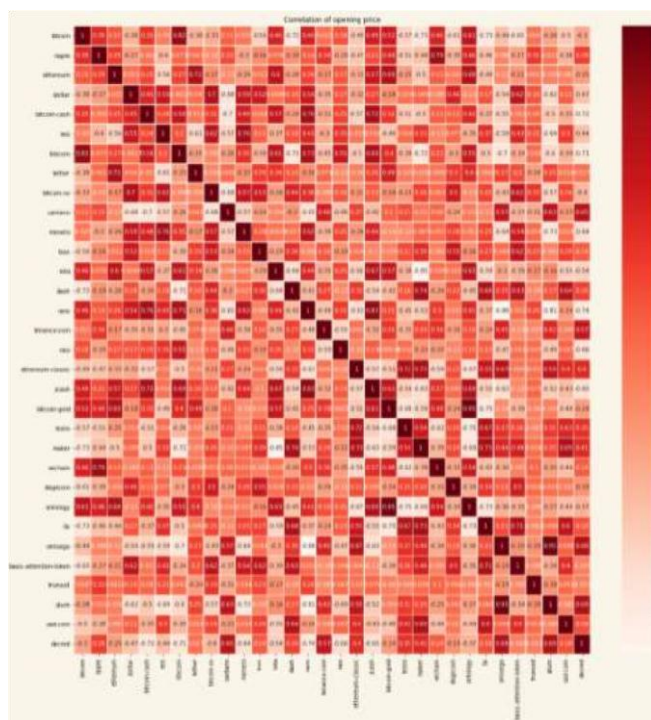

Figure: - Hit Map Correlation between cryptocurrencies with base open price.

•   **Module – 2 (Volume Weighted Average Price)**

The term VWAP determines the actual average price of a stock by taking into account the number of transactions at a particular price point rather than the closing price. Algorithms to earn the trader's commission and produce P&L, a broker may have a computer programmer execute orders at the VWAP. It's called a guaranteed VWAP execution. In this case, the broker will inform the client of the final price. As a consequence, the responded price is more dispersed than the customer price, but there is a smaller received/paid charge. Volume participation algorithms are trading algorithms that use this as a goal.
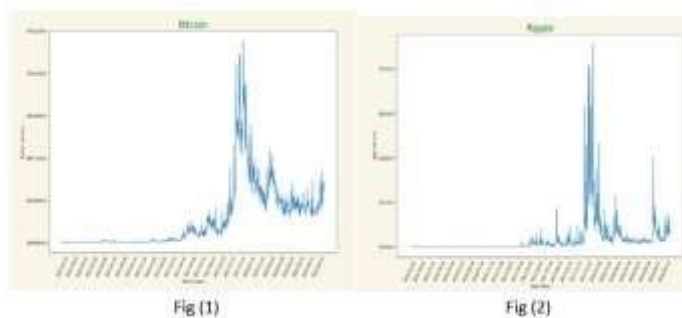

Figure: - Volume Weighted Average Price

•   **Module – 3 (Next day price prediction of BTC)**

Various machine learning techniques are used to forecast the daily bitcoin price prediction. It's more of a test to see which algorithm is the most successful. It is critical to get an accurate currency forecast, particularly if the currency is the BTC or bitcoin, since it has the power to influence other cryptocurrencies or digital currencies. Bitcoin plays a significant role since it is one of the most influential exchange trading currencies. So understanding the nature of bitcoin is critical based on this. So, the categorization of the following day forecast was completed using six distinct methods. Next day price prediction of BTC as a parent using Random Forest Regression,

AdaBoost Regression, Extra Tree Regression, Gradient Boosting Regression, Multi Task Lasso, Multi Task lactic Net. The most accurate prediction is done by Graident Boost Regression which is 0.999758 And the average score has been obtained is 0.994162 with least mean _square _error which is 2856.45.

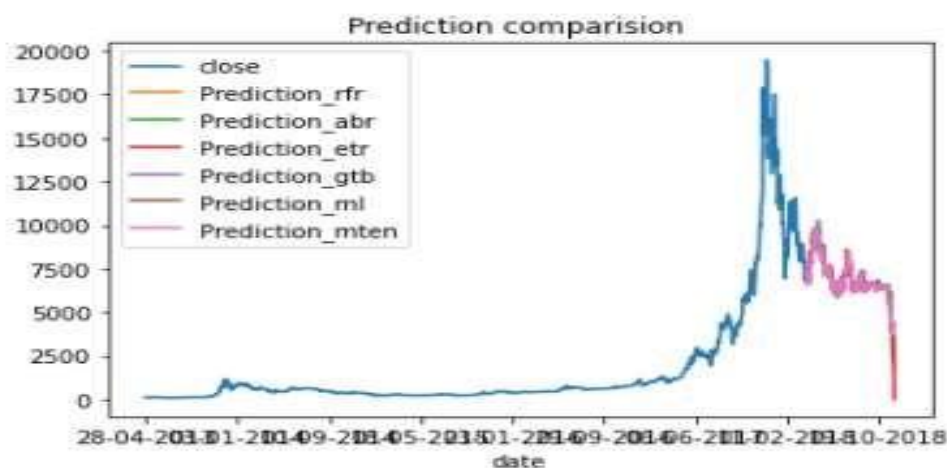| Algorithms	R2 Score	Mean Square Error
Random Forest Regression	0.994356	66614.92
AdaBoost Regression	0.981870	214385.11
Extra Tree Regression	0.994578	63994.86
Gradient Boosting Regression	0.999758	2856.45
Multi Task Lasso,	0.997255	32397.41
Multi Task lactic Net.	0.997255	32397.09
Average Score	0.994162	

Figure: - comparison of the prediction of different algorithms to calculate the next day price prediction

The Above figure is the comparison of the prediction of different algorithms to calculate the next day price prediction of the BTC or bitcoin in which graph can represented the different conditions of six different algorithms.

VI. CONCLUSION

In this proposed research, we have designed a price prediction system of different cryptocurrencies using technical trade indicators and machine learning under all circumstances of technical trade indication For any new product to become global, it needs to be accepted by people and business firms alike. When we look at advance methods of machine learning for the transactions of paperbased currencies (such as US Dollar currency) to cryptocurrency for that matter on which the global world depends, we observe that it has been accepted and implemented at the root level. We used a python language based fully automated machine learning and technical trade indicator for the prediction of price.

In our proposed work six different algorithms are used to predict the next day closing price prediction of the cryptocurrencies in which we have determined whether the price of the BTC or any cryptocurrency should go up or it will fall respectively.

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