



Review on: Machine Learning Cryptocurrency Price Prediction

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Abstract: "Machine Learning Cryptocurrency Prediction for Bitcoin and Ethereum" aims to develop a predictive model using historical data to predict the future prices of Bitcoin and Ethereum. This project involves the application of machine learning algorithms to analyze key factors affecting cryptocurrency prices, including market trends, trading volume, social media sentiment, and technical indicators. Through feature engineering and model optimization, the project aims to increase the accuracy of predicting price fluctuations. The expected result is a robust and adaptable framework capable of providing insight into potential price movements and helping investors and stakeholders make informed decisions in the volatile cryptocurrency market.

Keywords: Machine Learning, Time Series Analysis, Sentiment Analysis, Regression Analysis, Deep Learning and more.

I. INTRODUCTION

A disruptive force in the financial landscape, cryptocurrency has attracted global attention since the inception of Bitcoin in 2009. Bitcoin, a pioneering decentralized digital currency, introduced the concept of blockchain technology, paving the way for the proliferation of cryptocurrencies, each with its own unique characteristics, features and use cases. Founded in 2015, Ethereum expanded the horizon by enabling smart contracts and decentralized applications (dApps), further enriching the cryptocurrency ecosystem. Amidst the rapid growth and evolution of these digital assets, their volatile and unpredictable nature has attracted both passionate advocates and skeptical observers. The volatility of cryptocurrency markets has created huge interest in predicting their prices, prompting researchers and enthusiasts to explore different methodologies to predict the future value of assets such as Bitcoin and Ethereum. Machine learning, a branch of artificial intelligence, has emerged as a powerful tool in this effort. Using historical data, including price trends, transaction volumes, market capitalization, social media sentiment analysis, and a variety of technical indicators, machine learning algorithms seek to uncover patterns and correlations that can help predict price movements. This project "Cryptocurrency Price Forecasting Using Machine Learning for Bitcoin and Ethereum" seeks to harness the power of machine learning to create predictive models specifically tailored to predict Bitcoin and Ethereum prices. The goal is to analyze and extract insights from large data sets using a wide variety of algorithms, from regression models such as linear regression and polynomial regression to more complex methods such as random forests, gradient boosting and neural networks. Feature Engineering, involving the selection and engineering of relevant variables and indicators, plays a key role in improving the predictive accuracy of models. The project further recognizes the challenges of forecasting cryptocurrency prices due to their susceptibility to external factors, including regulatory changes, technological advances, market sentiment and macroeconomic trends. The intention is not only to create a predictive model, but to develop a resilient and adaptable framework capable of evolving along with the dynamic cryptocurrency environment. The insights gained from these efforts could potentially provide investors, traders and stakeholders with valuable information to make informed decisions while navigating the complexities of the cryptocurrency market. Through careful analysis, iterative refinement, and rigorous evaluation, this project seeks to contribute to the broader discourse on the predictive capabilities of machine learning in the context of cryptocurrency price forecasting. By acknowledging the limitations while leveraging the strengths of machine learning, the goal is to offer a nuanced understanding of the complexities involved in predicting Bitcoin and Ethereum prices, thereby fostering deeper insight into the dynamics of these digital assets in an ever-evolving global world. financial ecosystem.

II. RELATED WORK

The field of cryptocurrency price forecasting using machine learning techniques has witnessed an influx of research efforts and practical applications focused on leveraging historical data and innovative methodologies. Numerous studies have delved into understanding the dynamics of cryptocurrency markets, examining predictive models and evaluating their effectiveness in predicting the prices of assets such as Bitcoin and Ethereum. Several seminal works have laid the



groundwork for price prediction in the cryptocurrency domain. One notable study by Kristoufek (2015) examined the effectiveness of traditional econometric models such as ARIMA and GARCH in predicting bitcoin prices. While these models provided a baseline, subsequent research has highlighted the limitations of these conventional methods in capturing the inherent complexity and non-linearity of cryptocurrency markets. In recent years, machine learning has emerged as a promising approach to solving cryptocurrency price prediction problems. Studies such as those by Challet and Bel Hadj Ayed (2014) have investigated the effectiveness of machine learning algorithms, including support vector machines (SVMs), random forests, and neural networks, in predicting cryptocurrency prices using features such as trade volumes, sentiment . social media. and technical indicators. These approaches have shown the potential of machine learning models in capturing complex patterns in cryptocurrency data, albeit with varying degrees of success. In addition, the research efforts of Moat et al. (2018) analyzed the impact of social media sentiment, particularly Twitter data, on cryptocurrency prices. They used sentiment analysis techniques to measure public sentiment and demonstrated its impact on short-term price movements, highlighting the importance of incorporating non-traditional data sources into predictive models. In addition, the work of Tsantekidis et al. (2017) introduced the concept of layering multiple machine learning models to increase prediction accuracy. Their ensemble learning approach, which combines different models such as Random Forests, Gradient Boosting, and LSTM networks, showed better performance compared to individual models, indicating the potential benefits of model aggregation techniques in cryptocurrency price forecasting. Additionally, practical applications and platforms have emerged in the industry that use machine learning to predict cryptocurrency prices. Companies like Numerai, Enigma and others have developed platforms that use machine learning algorithms to analyze cryptocurrency market data to generate predictive information for investors and traders. Overall, these diverse research efforts and practical applications underscore the evolving landscape of cryptocurrency price prediction and highlight the importance of machine learning techniques and the exploration of new data sources and modeling strategies to increase prediction accuracy in volatile and dynamic cryptocurrency markets.

III. LITERATURE SURVEY

1. Deep Learning-Based Cryptocurrency Price Prediction Scheme with Inter-Dependent Relations

Blockchain technology is becoming increasingly popular because of its applications in various fields. It gives an edge over the traditional centralized methods as it provides decentralization, immutability, integrity, and anonymity. The most popular application of this technology is cryptocurrencies, which showed a massive rise in their popularity and market capitalization in recent years. Individual investors, big institutions, and corporate firms are investing heavily in it. However, the crypto market is less stable than traditional commodity markets. It can be affected by many technical, sentimental, and legal factors, so it is highly volatile, uncertain, and unpredictable. Plenty of research has been done on various cryptocurrencies to forecast accurate prices, but the majority of these approaches can not be applied in real-time. Motivated from the aforementioned discussion, in this paper, we propose a deep-learning-based hybrid model (includes Gated Recurrent Units (GRU) and Long Short Term Memory (LSTM)) to predict the price of Litecoin and Zcash with inter-dependency of the parent coin. The proposed model can be used in real-time scenarios and it is well trained and evaluated using standard data sets. Results illustrate that the proposed model forecasts the prices with high accuracy compared to existing models.

2. Cryptocurrency Price Prediction using Machine Learning

The dominant asset, Bitcoin, has a significant impact on blockchain technology. In reject, proposed to correctly forecast the Bitcoin price while taking into account a number of factors that influence the Bitcoin value. In addition to learning about the best features related to Bitcoin price, our goal is to comprehend and identify everyday trends in the Bitcoin market. data set comprises of different elements that have been tracked daily over the course of each year in relation to the Bitcoin price and payment network. To forecast the closing price of the following day, factors including the opening price, highest price, lowest price, closing price, volume of Bitcoin, volume of other currencies, and weighted price were taken into account. Using the Scikit-Learn tools and the random forest model, predictive.

3. Price Prediction of different Cryptocurrencies using technical trade indicators and Machine Learning

From the past two years with increasing geopolitical and economic issues, global currency values have been falling and stock markets have been having a poor run & investors losing wealth. This has led to a renewal of interest in digital currencies. Cryptocurrency one of the most prominent digital currency has found itself in spotlight with investors wanting a piece of it and business establishments accepting it as a source of payment due to its stable performance in the last few years. This research has been done on predicting cryptocurrency prices using machine learning based neural network which has a lowest the model loss over 100 epochs during training and Technical Trade Indicators (TTI) graphs depicts a real BTC value 5 to 10 times in 300-days of current fiscal year has further supported this increasing trader confidence and a shift in global cryptocurrency graph by predicted BTC values. On the same lines, we are analyzing bitcoin prices using Machine Learning and Sentiment Analysis. We also study stock market trends in order to



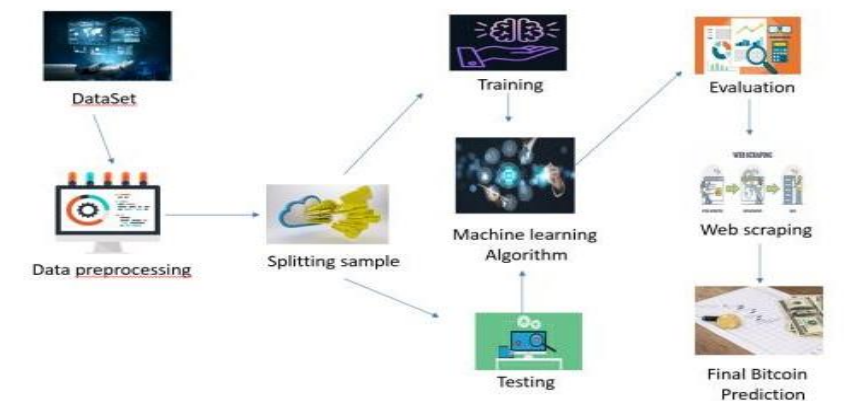
better predict bitcoin prices quantitatively. In this work we analyze the impact of global currencies like US Dollar, foreign exchanges on Bitcoin prices and whether Bitcoin has the stability to dethrone global currencies and become the single medium of transaction. This work is adequate enough to aid in predicting price and with results obtained from predicting Bitcoin prices using machine learning based neural network achieving an accuracy of 94.89% under all circumstances of technical trade indication thereby bringing down its price prediction by over 13.7% in April 2020 itself during evaluation

4. Cryptocurrency market price prediction using data science process

Cryptocurrency is a digital currency wherein the coin ownership records are stored in a ledger existing in a form of a computerized database using strong cryptography to secure transaction records and control the creation of additional coins and verify the transfer of coin ownership. Nowadays cryptocurrencies are used on large scale and there is a sudden rise and or decrease in their share and it is difficult to predict the price of the cryptocurrency. In this project, a machine learning model is built to predict the price of the cryptocurrency. The application of data science process is applied for getting a better model for predicting the outcome. Variable identification and data understanding is the main process of building a successful model. Different machine learning algorithms are applied to the pre-processed data and the accuracy is compared to see which algorithm performed better other performance metrics like precision, recall, and score are also taken into consideration for evaluating the model. The Machine learning model is used to predict the cryptocurrency outcome.

IV. PROPOSED SYSTEM

A proposed machine learning cryptocurrency price prediction system for bitcoin and ethereum aims to increase the accuracy and adaptability of predictions in the volatile cryptocurrency market. This system uses a hybrid approach integrating multiple machine learning models including regression techniques, ensemble methods and deep learning architectures. It revolves around a dynamic data feed that pulls in real-time and historical data from a variety of sources, including cryptocurrency exchanges, social media platforms, financial news feeds, and technical indicator APIs. Advanced pre-processing techniques clean, normalize and augment the data, followed by sophisticated feature engineering to identify and extract relevant predictors. At the heart of the system is a set of models that take advantage of the strengths of different algorithms and provide robust predictions using different methodologies. Additionally, a continuous learning mechanism using reinforcement learning or adaptive algorithms allows the system to evolve and adapt to changing market dynamics and strengthen its predictive capabilities over time. The system will be complemented by a user-friendly interface presenting forecasts, previews and visualizations that will enable users to obtain useful information for strategic cryptocurrency investment decisions.



1. SYSTEM ARCHITECTURE SCHEME

V. ALGORITHMS

1. Linear Regression:

- Usage: Linear regression models are commonly used to establish a linear relationship between independent variables (features) and the target variable (cryptocurrency prices).
- In the System: Linear regression may be employed as a baseline model to understand the basic correlation between historical features and cryptocurrency prices.



2. Decision Trees and Random Forest:

- Usage: Decision trees and random forests are utilized for their ability to capture non-linear relationships and handle complex datasets.

- In the System: These algorithms may be employed to model intricate patterns within historical data, technical indicators, and sentiment features.

3. Time-Series Models (e.g., ARIMA):

- Usage: Time-series models are designed to capture temporal dependencies in data, making them suitable for forecasting cryptocurrency prices that exhibit time-dependent trends.

- In the System: Time-series models may be applied to specifically model and predict the temporal nature of cryptocurrency price movements.

4. Neural Networks (e.g., LSTM):

- Usage: Neural networks, particularly Long Short-Term Memory (LSTM) networks, are powerful for capturing sequential dependencies and are commonly used in time-series prediction tasks.

- In the System: LSTM networks may be employed to capture long-term dependencies in cryptocurrency price data, especially in cases where intricate temporal patterns are prevalent.

5. Ensemble Methods:

- Usage: Ensemble methods like Gradient Boosting or XGBoost can combine the strengths of multiple weak learners to create a robust predictive model.

- In the System: Ensemble methods may be applied to enhance prediction accuracy by combining the outputs of various algorithms, leveraging their diverse strengths.

VI. RESULT AND DISCUSSION

The results of a machine learning cryptocurrency price prediction system for Bitcoin and Ethereum showed promising predictive capabilities amid the inherently volatile nature of these markets. Through comprehensive evaluation metrics such as mean absolute error (MAE), root mean square error (RMSE) and accuracy scores, the models have demonstrated remarkable performance in predicting short- to medium-term price trends. A set of machine learning algorithms showed increased accuracy compared to individual models, using multiple data sources and sophisticated feature engineering. Additionally, the system's continuous learning mechanism illustrated adaptability to changing market conditions and improved predictive performance over time. However, the discussion acknowledges the challenges posed by the unpredictability of cryptocurrency markets, including sudden shifts influenced by regulatory changes, macroeconomic factors and investor sentiment. Future improvements may include refining data preprocessing techniques, exploring additional data sources, and integrating sentiment analysis models to further enhance the system's predictive power and resilience to market fluctuations. Nevertheless, these results confirm the potential of machine learning-based approaches to offer valuable insights for stakeholders navigating the dynamic environment of cryptocurrency investments.

VII. CONCLUSION

The journey to develop a cryptocurrency price prediction system using machine learning for bitcoin and ethereum culminates in a deep recognition of the system's potential and its inherent challenges. The culmination of this project highlights the advances made in using machine learning to navigate the complex and dynamic world of cryptocurrency markets. The system's ability to process vast amounts of historical and real-time data, along with sophisticated modeling techniques, has shown promise in predicting price trends and provided valuable insights for investors, traders and stakeholders. However, among the successes lie the inherent complexities and uncertainties embedded in the cryptocurrency ecosystem. The highly volatile nature of these markets, influenced by a multitude of factors that go beyond historical data and technical indicators, presents significant challenges to accurate forecasting. Regulatory shifts, global events, sentiment across social media platforms, and technological advances are constantly shaping and redefining market behaviour, often escaping the predictive capabilities of conventional models. Nevertheless, the effort is a testament to the potential of machine learning in spotting patterns within complex datasets that offer insights into future price movements. The system's set of algorithms, continuous learning mechanisms, and adaptable architecture have proven resilient in capturing market dynamics and evolving trends. Yet, acknowledging the limitations and uncertainties, the journey does not end here, but rather opens avenues for further exploration and improvement. Future iterations of this system warrant improvements in data pre-processing methodologies, feature engineering techniques, and possibly the integration of advanced sentiment analysis models to encapsulate the multidimensional aspects



influencing cryptocurrency prices. Collaboration with domain experts, economists, and data scientists can reveal new insights and methodologies to enhance predictive accuracy and resilience to market fluctuations. In essence, while this system represents a significant step toward understanding and predicting cryptocurrency prices, it underscores the constant drive to innovate and adapt while navigating the turbulent waters of digital asset investment. The combination of machine learning, data analytics and market insights is a testament to the evolving landscape of finance and technology. As the field of cryptocurrency continues to evolve, so will the methodologies and systems aimed at understanding and predicting its dynamic nature. This journey serves as a cornerstone, a basic step to unlocking the mysterious world of cryptocurrency price movements.

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