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Cryptocurrency Analyzer and Predictor

Anmol Khemka[1], Mudassir Khan[2], Nihar Doshi[3]
[1, 2, 3]*Information Technology Department, D. J. Sanghavi College of Engineering,* Mumbai, India

Abstract: The field of Cryptocurrency has seen tremendous growth and expansion in the last few years. Almost a decade ago the invention of Bitcoin marked a new era of innovation in the financial sector. In our literature survey we take you through the concepts of cryptocurrency outlining its fundamental concepts, the underlying technology like Blockchain and subsequently the viability of this new financial asset. Post examining the knowledge of cryptocurrency we try to predict the price of this volatile asset. Post pricing data and the likelihood of these currencies, specifically Bitcoin. We first examine the price of cryptocurrency or rather try to examine the prices before introducing the Cryptocurrency Analyzer and Predictor web application, as discussed in our project. The research, planning methodologies, technologies, and design and evaluation of this application are described in detail in the later part of this paper followed by a concluding word on this process as a whole.
Keywords: Cryptocurrency, Volatility of cryptocurrency prices, Blockchain.

I. INTRODUCTION

The cryptocurrency market is the largest financial market in the world, having a daily volume of $10 Trillion. However this volume only reflects massive trades placed by high level organizations and government bodies. Despite its sheer size and the corresponding opportunity to generate substantial profits, common investors are unable to successfully trade in forex due to its volatile, unpredictable nature, dependency on global factors and high level of number crunching required to forecast trends. Seeing this relatively untapped but high potential market we decided to employ advanced technologies that can surely overcome the aforementioned challenges and revolutionize the way trading strategies are formulated, so as to encourage every common investor and trader to enter the forex market which will ultimately also contribute to the GDP of the country. The domain of cryptocurrency, which involves using software resources to ensure profitable currency trades has been tried and tested by researchers, developers and computer science enthusiasts alike. Although a fool proof strategy to effectively trade currencies which is completely reliant on software has not yet been devised, many methods designated as helpful for automated currency trading and forex rate prediction have been discovered. Our exhaustive literature review involves evaluating all such approaches and determining the most suitable methods to build our application.

II. LITERATURE REVIEW

A. *Technical Analysis*

1) *Gaussian Process Kernel Crossover for Automated Cryptocurrency Trading System:* To deal with the varying volatility of cryptocurrency data, we observe from "Gaussian Process Kernel Crossover for Automated Cryptocurrency Trading System" that the classical trend line crossover strategy if implemented correctly will definitely give us better trading performance in terms of both price predictions and accumulated profits. In order to perform trading an algorithm based on combination of lead-lag Gaussian process kernel and maximization of Sharp ratio objective function is developed by the authors and a new objective function is created. The 10 years daily of observation data from 15 January 2007 to 30 January 2017 is used.
2) *Strategic Methods for Automated Trading in Cryptocurrency:* As we venture into the analysis of temporal data to forecast currency prices, an inescapable choice that needs to be made is whether to apply fundamental analysis or technical analysis strategies. "Strategic Methods for Automated trading in cryptocurrency" helps us make this crucial choice by providing valuable insight into the usage of technical analysis alone, fundamental analysis alone and a correlation of both strategies specifically for the cryptocurrency market. In this paper, an algorithm for technical analysis alone was developed using Relative Strength Index (RSI), Stochastic and crossover of moving averages and returns were calculated. Next, an algorithm involving only the fundamentals of a currency pair was devised and similarly returns were calculated. Besides the two strategies explained above, another strategy was designed, based on correlations. The objective was to take advantage of situations when two pairs of great positive correlation were, momentarily, quoting in opposite directions.

a) A Review Of Missing Values Handling Methods On Time- Series Data

(Authors: Irfan Pratama, Rini Indrayani, Adhistya Erna Permanasari, October, 2016)

In this paper, the description of several previous studies about missing values handling methods or approach on time series data is explained. This paper also discusses some plausible option of methods to estimate missing values to be used by other researchers in this field of study.

The discussion's aim is to help figure out what method is commonly used now along with its advantages and drawbacks. Missing values becomes one of the problems that frequently occur in the data observation or data recording process. The needs of data completeness of the observation data for the uses of advanced analysis becomes important to be solved. Conventional method such as mean and mode imputation, deletion, and other methods are not good enough to handle missing values as those method can cause bias to the data. Estimation or imputation to the missing data with the values produced by some procedures or algorithms can be the best possible solution to minimized the bias effect of the conventional method of the data. So that at last, the data will be completed and ready to use for another step of analysis. This paper figures missing values handling method from the conventional one to the modern one. Methods such as deletion, mean imputation, and hot decking are considered as conventional method which can be used for more general dataset, while estimation techniques are modern method that specifically picked to handle missing values in time series data.

b) Resampling Strategies For Imbalanced Time Series

(Authors: Nuno Moniz, Luis Torgo, Paula Branco, October 2016)

The objective of this paper is to provide solutions capable of significantly improving the predictive accuracy of rare cases in forecasting tasks using imbalanced time series data. The Paper Extent application of resampling strategies to the time series context and introduce the concept of temporal and relevance bias in the case selection process of such strategies, presenting new proposals. This paper evaluates the results of standard regression tools and the use of resampling strategies, with and without bias over 24 time series data sets from 6 different sources. Results show a significant increase in predictive accuracy of rare cases associated with the use of resampling strategies, and the use of biased strategies further increases accuracy over the nonbiased strategies. Time series forecasting is a challenging task, where the non-stationary characteristics of the data portrays a hard setting for predictive tasks. A common issue is the imbalanced distribution of the target variable, where some intervals are very important to the user but severely underrepresented. Standard regression tools focus on the average behavior of the data. However, the objective is the opposite in many forecasting tasks involving timeseries: predicting rare values. A common solution to forecasting tasks with imbalanced data is the use of resampling strategies, which operate on the learning data by changing its distribution in favor of a given bias.

c) Crypto Currency Price Prediction Using Long-Short Term Memory Model

(Authors: Prashanth J R, Vineeth S Das, July 2018)

This paper tries to predict the price of Cryptocurrencies. Machine learning techniques were implemented and the use of Adam optimizer and Long Short-term Memory (LSTM) network proved very efficient in predicting the prices of digital currencies. There are lot of cryptocurrencies in the market and in this paper the following cryptocurrencies are selected for study and price prediction, Bitcoin, Ethereum, Ripple, Monaro, Litecoin and Dash. The historical data required for price prediction of cryptocurrencies are collected fromhttps://coinmarketcap.com. The methodology of the work consists of several steps data collection, data processing, feature extraction, training Long Short – Term Memory network and predictions using the trained network. The several steps data reduction, data normalization and data cleaning to get the required dataset. Then it is divided into test dataset and train dataset. Feature extraction selects the features that are to be fed to the LSTM network. In the current case it includes opening, high, low and closing price. Training foist network involves feeding the neural network with data and training the same. The prediction involves assigning random biases and weights. The proposed LSTM model is composed of a sequential input layer an LSTM layer and a dense output layer with linear activation function. The prediction from the model is taken and the mean absolute error is used to ascertain its effectiveness.

d) Prediction of Bitcoin using Recurrent Neural Network

(Authors: Pratik Mehta, E. Shashikala, march 2020)

The main objective of the work is to predict the Bitcoin prices, one of the most popular and widely used crypto Currency which is a source of attraction for many investors as a source of profit or investment. But the market for the cryptocurrencies been volatile since the day it was first introduced. So, the approach towards the survey is to use LSTM RNN and use the available dataset and train the model to give the highest possible accuracy and to provide a Realtime price of the Bitcoin for the following days. Using Neural Networking Systems, the connection between the performance of Bitcoin and the next day's price change of Bitcoin using an Artificial Neural Network Ensemble solution called the Selective Neural Network Ensemble Dependent Genetic Algorithm was discussed, then the neural network singultus-Layered Perceptron was constructed. The organization was used to predict the price of Bitcoin's next day course through a sequence of nearly 200blockchain apps over a 2-year cycle to better understand Bitcoin's practicality and utility of real- world applications.

With a series of almost 200 blockchain over a period of 2 years, the firm was used to predict the next day path of Bitcoin's price to better understand the practicality and utility of it in real world applications. The program was used to predict the next day's market path for Bitcoin with a selection of about 200 blockchain apps over a 2-year span to better understand the practicality and efficacy of real-world applications. An ensemble-based trading methodology was compared over a span of 50 days with a previous day trend following a back-test trading strategy. The former trading strategy produced about 85 percent returns, outperforming the previous day trend following a special trading strategy that yielded about 38percent returns and a trading strategy that follows the one-time, best MLP (Multilayer Perceptron) model in the ensemble that yielded around about 53percent. Provides multi-layered perceptron for estimating bitcoin level. Jagland Lee's work which predicts the bitcoin price using Bayesian Neural Network and blockchain information. There are multiple online platforms nowadays, such as Coin Tracking, Bitcoin Charts, Vicinity, and Bitcoin Wisdom, that enable traders to use many technological analytics tools to identify trends and market feelings that are useful for entering a trade. Several Regression models which were based on Linear Regressions, Random Forests, Gradient Boosting Technology, and Basic Neural Networks. Kim et al. and Li et al found the Bitcoin price volatility to be expected by social evidence.

e) Bitcoin Price Prediction using ARIMA Model

(Authors: Dr. Jinan Fadhil, Ahmar Sabah, Amhara Anwar Ansari, Zebra Ayaz, preprint 2020)

In this research work, we have investigated bitcoin closing price prediction by using an ARIMA model. Towards this end, at first, we have pre-processed timeseries data to make it stationary, and then, have searched over feasible (p, did) parameters for finding the ARIMA model which minimizes the MSE (Mean Squared Error) of prediction. The results we get indicates that the bitcoin price prediction using the value "closing price" history could result in large MS values since bitcoin's price is vulnerable to high jumps and fall-downs. On the other hand, the results also confirm that the ARIMA model could be still used for price prediction in sub-periods of the timespan, which is by dividing the timespan to several timespans over which, dataset has a unique trend. Furthermore, we have investigated the effect of the different parameter p, and d value on the achieved MSE in price prediction. We have elaborated this work by creating web service and high chart for better resolution of elaborated this predict the BTC prices, we have modelled time series using prediction. The with lower MSE are considered to be the ideal ones. First, we fit an ARIMA (2,1,0) model. This sets the lag value to 2 for First, we difference order of 1 to make the time series stationary and uses a moving average model of 0. Second, we try to fit an ARIMA (0,1,18) model. This sets the lag value to 0 for autoregression, uses a difference order of 1 to make the time series stationary, and uses a moving average model of 18. We tried many combinations of ARIMA for obtaining the lesser MSE value so that we can find the best fit for our model. After fitting the model by passing its parameters we have loaded the testing dataset from the drive again in the same way how we read training dataset. In training we have stored the Backdate collected for January 1st until January 7th, 2020. Finally, we are going to predict the bitcoin closing price and display the Mean Squared error which is the evaluation metric for our predicted Model. We assign the timestamp of the dates to the data frame dates and predict the bitcoin price for seven days using forecast function.

B. Tools, Technologies and Frameworks

1) *Machine Learning and Deep Learning frameworks and libraries for large-scale data mining: a survey [10]:* This paper talks about various tools and technologies to be used for machine learning, deep learning and data analytics. They discussed Shogun, Scihit-Learn, XGBoost for machine learning frameworks and libraries. TensorFlow, Keras and Theano were discussed for deep learning. Matlab, R and Python were considered as data analytics languages.

III. OBSERVATIONS

A. Technical Analysis

By studying Recurring Patterns of Cryptocurrency Time Series Data we observe that the foundation of technical analysis holds strong in the cryptocurrency market and we come across extremely pertinent findings in this paper to prove the fact that history does, in fact, repeat itself in the cryptocurrency market albeit with a slight difference.

Gaussian Process Kernel Crossover helps us take an approach towards handling the volatility of cryptocurrency prices and we find that the classical trend line crossover strategy if implemented correctly will definitely give us better trading performance in terms of both price predictions and accumulated profits. From Strategic Methods discussed we observe that employing technical indicators to generate BUY/SELL signals is more efficient as compared to using fundamental analysis or a correlation of both fundamental and technical analysis in case of the foreign exchange market since there are no structured financial data reports and statements available.

B. Algorithms

Studying LSTM, we found that despite the highest achievable overall accuracy being 61%, individual uptrend/downtrend accuracies have been found to reach 96% in certain epoch cases. Apart from this, comparison of LSTM with several other machine learning techniques likes DTs, SVM, linear regression, feed forward NN has also been performed and LSTM is found to be the most efficient algorithm out of all those considered with a highly reliable forecasting ability.

LSTMs are shown to have a high accuracy and in general, are useful in this kind of data, which shows us their importance as well as their usability in our system.

Since our project involves risks we plan to implement hedging with options.

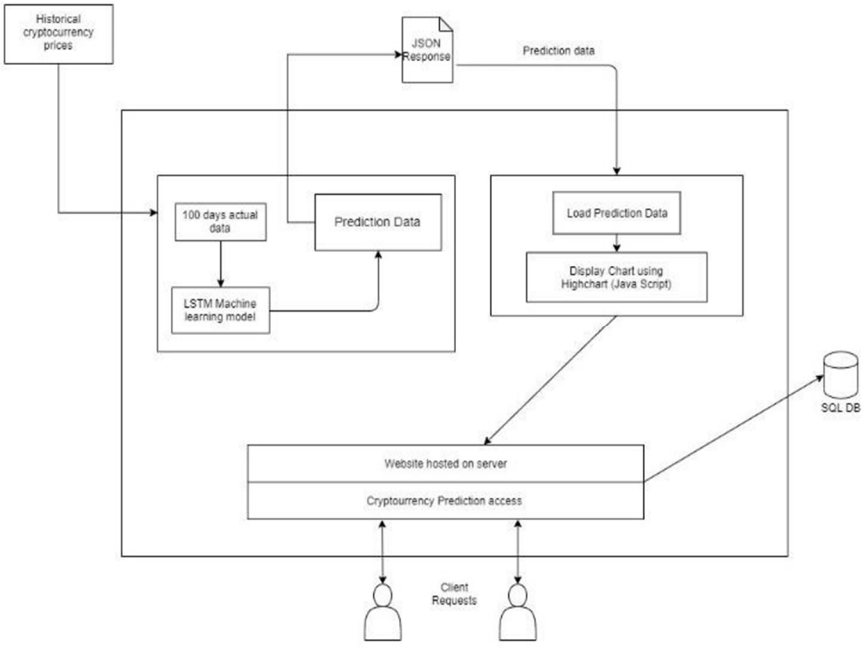
C. Tools, Technologies and Frameworks

Tool	Licence	Language	Interface	Workflow	Popularity
Shogun	Open Source	C++	Python, Octave	API	Low
Scikit-Learn	Open Source	Python, C++	Python, API	Yes	High
XGBoost	Open Source	C++	Python, C++	Yes	Medium

Tool	Licence	Language	Interface	Workflow	Popularity
TensorFlow	Open Source	C++,Python	Python, C++	API	Very High
Keras	Open Source	Python	Python, TensorFlow	Yes	Very High
Theano	Open Source	Python	Python	Yes	Low

Software	Licence	Popularity	Availability of tools	Documentation Availability
Python	Open Source	Very High	Very High	Very High
R	Open Source	High	Very High	High
Matlab	Paid	Medium	Medium	Medium

IV. PROPOSED SYSTEM ARCHITECTURE



A. Working of System

1) *Storing Historical Data:* In this step the historical cryptocurrency data is stored in the database like mongo dB or sol using a Python script. This historical data consists of a past 2000 days dataset which is used to train the model. The dataset consists of a total of 6 features. They are: close price, high price, low price, open price, volume and an important parameter called the timestamp.

2) *Training the LSTM Model:* In this step the LSTM model is trained first using a training dataset. The model learns from the dataset. The model learns from a 100 days dataset. LSTM algorithm is deployed to predict the future prices of cryptocurrency's is a very popular Deep Learning algorithm used specifically for temporal datasets. LSTM works well for time series data because our dataset involves 6 parameters one of which is timestamp. Hence this algorithm.

3) *Price Prediction:* In this step the trained LSTM model is fed with the test dataset to predict the closing price for the day of various cryptocurrencies. The output of the model is the prediction data. This prediction data is passed to the backend in the form a JSON response as shown in the system architecture.

4) *Displaying The Predicted Data:* The JSON response is converted into an easy to interpret graph using an appropriate JavaScript library. JS library that can be used here is either

B. *User Interface*

With an aim to make our application user friendly, our UI avoids unnecessary complexities by not involving the large amounts of data that are being processed on the backend. The UI is easy to navigate and informative while being concise. It displays the user's portfolio, i.e. current holdings and open positions, charts that can be read to understand the actions of our system and also the currency prices..

V. CONCLUSION

A. *Objectives*

1) Create a simple web application which is easy to use and clear to understand.

2) Deliver cryptocurrency prices to the user.

3) Provide an educated guess as to future changes in prices

4) Work closely with the given learning outcomes for this project.

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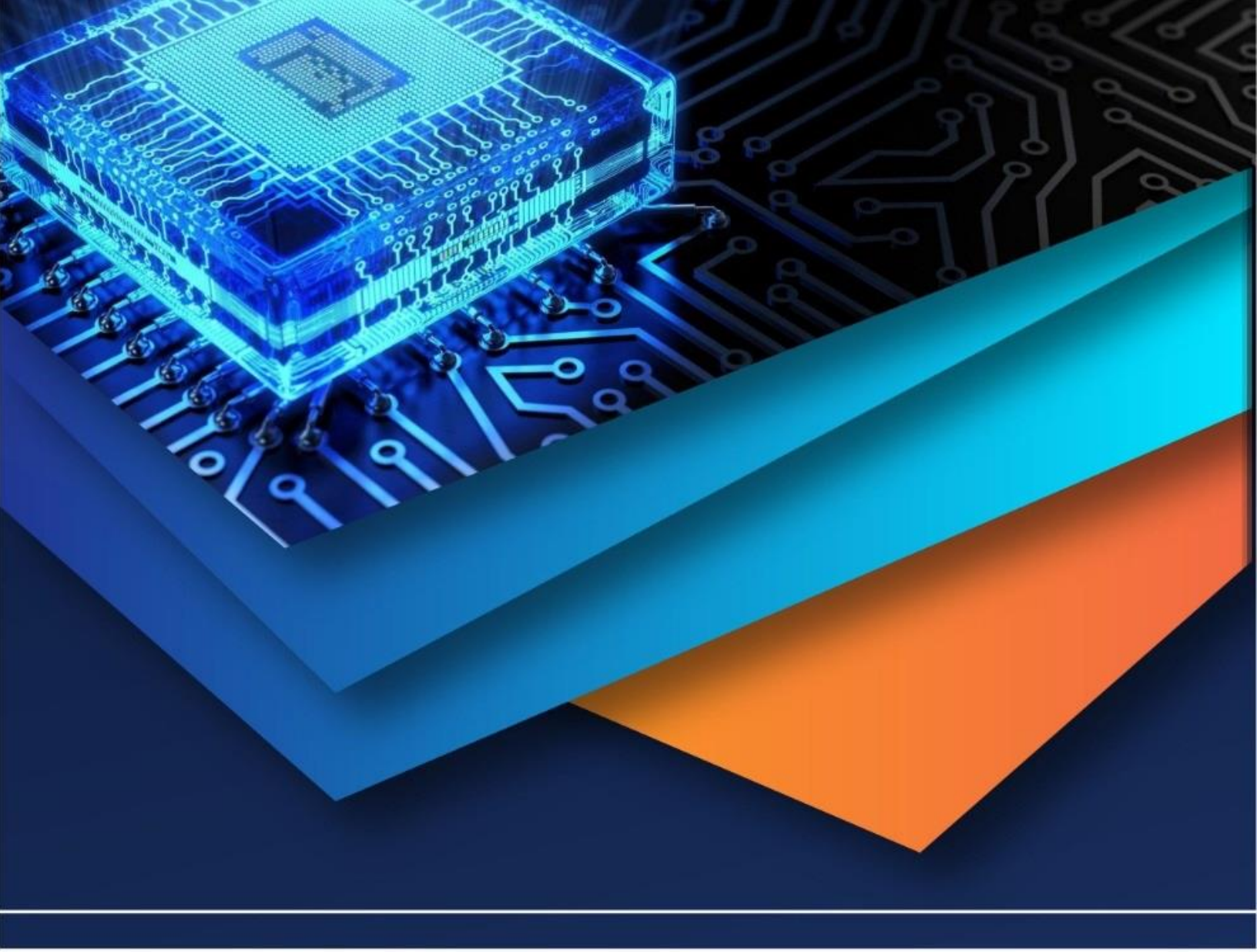

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