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A Survey on Anticipation the Prices of crypto currency using Deep Learning

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Abstract: Cryptocurrency is a decentralized digital currency, it without a central bank or single administrator that can be sent from user-to-user on the peer-to-peer network without the need for the negotiator. Cryptocurrency has been one of the top hit in social media and search engines recently. Their high volatility leads to the great potential of high profit if intelligent inventing strategies are taken. Unfortunately, due to their lack of indexes, Cryptocurrencies are relatively volatile compared to traditional fiat currencies. Hence when wisely invested with the assistance of predicted data, increased profit is achievable.
Keywords: Cryptocurrency, machine learning, neural network.

I. INTRODUCTION

The common definition of Cryptocurrency is electronic money often referred to as virtual money, digital money, e-currency or. Satoshi Nakamoto (2009), the inventor of Cryptocurrency himself, referred to it as "electronic cash". Cryptocurrency is however not only the name of the currency but also the name of the open-source software and peer-to-peer network that forms its architecture and facilitates transactions[1]. The technical principles of Cryptocurrency, the production of coins, executing transactions and general development of the crypto-currency market is a subject that goes beyond the scope of this study. However, to set the proper context for this work it is essential to describe some of its selected characteristics. Cryptocurrency shares the theoretical assumptions of software money presented in early 90's[2]. It is simply a digital code that cannot be directly converted to any radioactive commodity (like gold or raw material), and the idea of its operation is based exclusively on users' trust. However, in a contrast to software money which is issued and verified by a specific institution, such as Liberty Reserve (offered by Costa Rica-based money transfer service) or Linden Dollars (used in the social game – 'Second Life'), Cryptocurrency does not substitute any Cryptocurrency is characterized by a decentralized mechanism of creation and operation. It is not established by any particular institution but rather jointly administered by the users themselves through the peer-to-peer network. However, unlike earlier software money, Cryptocurrency virtual currency does not depend on the user's trust but is rather build upon cryptographic proof. Generation of new coins (recognized as "mining" or "digging") consists of processing very specific, random-based numerical calculations that require significant computing power[3]. In this respect, a certain amount of Cryptocurrency is obtained as proof that the work has been done to solve a computational problem, the so-called "Proof of Work". The size of this reward, set initially to 50 Cryptocurrency, is halving every four years and currently amounts to 12 Cryptocurrency[6]. Due to Cryptocurrency's specific and unique design, this virtual currency cannot be forged outside of the standard creation mechanism, and any attempt to falsify Cryptocurrency or its transaction is ineffective. Carrying out a Cryptocurrency transaction requires the use of digital signatures (public and private keys) which allow authenticating transfer of Cryptocurrency ownership between two different user addresses in the network. Each such activity is designated in public entries, so-called "blockchain" and distributed among all nodes of the network. Also, on the contrary to traditional payment systems, Cryptocurrency protocol defines that each and every transaction is final and irreversible[1]. Cryptocurrency status and classification within the current financial system is actively discussed and opinions, whether Cryptocurrency can be considered a real currency, are still split. Cryptocurrency is primarily used to facilitate trade and as such it satisfies one essential function of money – being a 'medium of exchange'. However, authors explain that Cryptocurrency does not meet the remaining criteria, notably a 'store of value' and 'unit of account', due to its limited adoption and highly volatile price. Nonetheless, argues that, since Cryptocurrency represents its own unit of measure and that its volatility is progressively diminishing it should, in fact, be considered as true money. Currently, it seems that increasing interest in Cryptocurrency, from both media and the market, is primarily caused by its ever-growing value. However, the real utility of Cryptocurrency is the ability to perform fast and low-cost transactions, with global reach, that 6 are available to anyone, and are virtually anonymous. Those features, however, open a possibility to use Cryptocurrency for money laundering, trade of prohibited goods, supporting terrorist groups or other criminal activity, which depreciates its functionality from the viewpoint of maintaining the legal order. Also, exchange rate instability and high susceptibility to speculation mean that many countries do not accept Cryptocurrency as means of payment and find its development as a threat to the subsistence of price resistance in commercial and payment systems.

II. PRICE DRIVERS

Dynamics of Cryptocurrency's price proves to be quite a controversial subject since this digital currency became popular and accessible to the wider public in late 2010. While it is hard to recognize direct factors driving its value, there is a strong indication that its economy is mainly influenced by social factors[3]. Early work of indeed shows a positive bi-directional correlation between search queries on Google Search Engine and the price of the digital currency. This indicates that Cryptocurrency price may be directly affected by information available in media or by general public opinion, but also suggests that amount of publicity around Cryptocurrency is directly linked to this cryptocurrency's price changes during its rapid appreciations or depreciation. later study shows that this relationship between Cryptocurrency price and the level of attention coming from internet users is not only directional (increased interest drives prices up during the establishment of price bubbles as well as push it further down during their bursts) but also asymmetric (effect is more accelerated during price deflation comparing to its inflation). The author also suggests that Cryptocurrency price is mostly driven by the growing public interest in this crypto-currency. Such observable relationship [4] reflects the fact that the majority of new users joining the Cryptocurrency community uses this crypto-currency primarily as an asset for purely speculative investments. Nonetheless, Cryptocurrency price is mainly driven by supply (number of coins in circulation) and demand (number of transactions on exchanges) but may also be prone to speculation, like any other emerging market's fiat currency, due to visible characteristics of price bubbles. [7] Looking from a different perspective, explains that the value of Cryptocurrency comes from the fact that users are willing to exchange it for services and products of real value. According to the author, price in this respect is not driven by Cryptocurrency's internal economics, at least from the e-commerce perspective, because the majority of payments made in Cryptocurrency are converted instantly to traditional currencies. The author indicates that Cryptocurrency should be considered as a bridge between currency payments and barter but not a true currency itself. To the contrary, while the initial phase of Cryptocurrency evolution was characterized by significant fluctuation in the properties of its network, transaction volumes and price, there is an evidence that Cryptocurrency network, in its current "trading" stage, reached the necessary stability and can be characterized by a coherent exponential distribution and disassortative degree correlations, thus indicating that Cryptocurrency system started to behave like a real currency. While some[5] agrees that standard and fundamental economic factors, like price level, the volume of trades and currency supply indeed seem to influence Bitcoin economy, the author concludes that this effect is weak and can only be observed in the long term. The above section says how to prepare a subsection. Just copy and paste the subsection, whenever you need it. The numbers will be automatically changes when you add new subsection. Once you paste it, change the subsection heading as per your requirement.

III. DEEP LEARNING TECHNIQUES

Machine learning falls into 2 categories: supervised learning and unsupervised learning. Supervised learning consists of modelling datasets with tagged instances, whereas the latter learning has no such demand.

A. Unsupervised Learning

In supervised learning, every instance will be diagrammatic as a collection of attributes and target categories. These attributes are mapped into target classes. Examples of supervised methods include neural networks and support vector Machine (SVM).

B. Unsupervised Learning

In the case of unsupervised learning, similar information instances square measure sorted into clusters. Examples of unsupervised learning include clustering techniques. The multilayer perceptron (MLP) is a simple feed-forward neural network that is most commonly used in classification tasks. In terms of neural network nomenclature, examples fed to the model square measure called inputs, and foreseen values square measure called outputs. Each modular subfunction is a layer. A model consists of input and output layers, with layers between these known as hidden layers. Each output of 1 of those layers could be a unit that may be thought-about analogous to a vegetative cell within the brain. Connections between these units square measure called the burden, that is analogous to a colligation within the brain. The weight defines the operate of the model since this weight is that the parameter that's adjusted once coaching a model. However, the MLP's effectiveness is limited with the vanishing-gradient problem. Here, as layers and time steps of the network square measure associated with one another through multiplication, derivatives square measure vulnerable to exploding or vanishing gradients.

Vanishing gradients square measure additional of a priority as they'll become too tiny for the network to be told,whereas exploding gradients is restricted victimization regularization. Another limitation of the MLP is that its signals solely pass forward during a network during a static nature. As a result, It doesn't acknowledge the temporal part of a statistic task in an efficient manner since its memory isthought-about frozen in time.

The MLP is thought-about to treat all inputs as a bucket of objects with no specific order in terms of your time. As a result, constant weight is applied to any or all incoming information, which is a naive approach.

The RNN, additionally called a dynamic neural network, addresses a number of these limitations [6]. The structure of the RNN is similar to that of the MLP, but signals can be both forwards and backwards in an iterative manner. To facilitate this, another layer called the context layer is intercalary. In addition to passing inputs between layers, the output of every layer is fed to the context layer to be fed into ensuing layer with ensuing input. In this context, the state is overwritten at each timestep. This offers the benefit of allowing the network to assign particular weights to events that occur in a series rather than the same weight to all inputs, as with the MLP. This results in a dynamic network. In one sense, the length of the temporal window is the length of the network memory. It is associate applicable technique for a statistic prediction task [5, 7]. While this addresses the temporal issue during a statistic task, vanishing gradient will still be a difficulty. In addition, some studies have found that, whereas the RNN will handle long dependencies, it often fails to learn in practice because of difficulties between gradient descent and long-term dependencies [8,9].

LSTM units address both these issues [10]. They allow the preservation of weights that square measure forward and back-propagated through layers. This is in contrast tothe RNN, in which the state gets overwritten at each step. LSTM units additionally permit the network to continue learning over several time steps by maintaining a additional constant error. This allows the network to learn long-term dependencies. An LSTM cell contains forget/remember gates that permit the cell to determine what data to dam or pass supported data strength and importance. As a result, weak signals can be blocked, preventing the vanishing gradient. LSTM cell states have 3 dependencies that may be generalized as previous cell states, previous hidden states, and current time steps. These states square measure in control of memorizing things, and special gates are used for manipulating this memory. These gates square measure forget gates, input gates, and output gates. As the name indicates, forget gates remove information that is no longer mandatory for the LSTM. Any addition of latest data to the cell state is completed victimization the input gate. The input gate makes use of the tanh function, which gives the output in the form of -1 to +1. The input gate ensures that each one redundant data is removed and solely the foremost necessary data is gift. The selection of the foremost helpful data from the cell state and its show square measure the most task of the output gate.

IV. PREDICTION METHODOLOGIES

Over the years, different methodologies have been studied widely. Shah et al [7] describe the Bayesian regression algorithm for producing latent source models. The Cryptocurrency exchange datasets are taken from Okcoin in China. By collecting the data every 10 minutes to use in Cryptocurrency exchange, the result shows that, in 50 days, ROI is 89% with the sharp ratio at 4.10. Madan et al [8] are also use the datasets from Okcoin, but separating the data into a series of 30, 60, and 120 minutes. Binomial Logistic Regression, Support Vector Machine (SVM), and Random Forest are used to predict Cryptocurrency's prices with the accuracy at 97% and 55% for the next 10 minute's prices. However, there is no cross-validate in this research which might cause the obtained models to be overfitting. Greaves et al [9] propose transaction graph data to predict the Cryptocurrency's prices. By collecting Cryptocurrency transactions, this research uses Linear Regression, Logistic Regression, SVM, Neural Network generating models to predict the prices. The result of accuracy is only 55% since the exchange behavior which directly affects the prices is not included in the transactions. Therefore, this research recommends including the exchange behavior into the transaction to increase accuracy. Almeida et al [10] propose artificial neural networks models to predict trends of tomorrow's Cryptocurrency prices. The models are generated by using the history open-source dataset from Quandl and Theano library from MATHLAB. In two years of replacement, the profit of 8000 USD from the models is increased. [11] appraised the price of Cryptocurrency with Multilayer Perceptron (MLP), Nonlinear Autoregressive and Exogenous Inputs (NARX) model, using opening, closing, minimum and maximum earlier prices with Cryptocurrency Moving Average (MA) technical pointers. The results of their study showed the ability of the model to accurately estimate the Cryptocurrency prices when passing all model validation tests.

Particle Swarm Optimization (PSO) method is done to optimize the number of deceived units, input and output lags of the NARX model. Results demonstrate that the model predicts Cryptocurrency prices accurately while passing through validation tests. Cryptocurrency as virtual currency serves interest to economists having the potential to disrupt other payments and banking methods [12]. Almeida et al. [13] used past prices and trading volume of Cryptocurrency to train an an artificial neural network to predict the next-day price. [14]predict Cryptocurrency's next day price performance based on previous day's price and volume. They apply the ANN model. Their performance criterion is MSE. Their results suggest that the ANN network outperforms the Trend Follower meaning that the model is able to evaluate valuable information. [15]predict Cryptocurrency prices by using Linear Regression (LR) and Support Vector Machine (SVM) for the period of 2012-2018. Their sample consists of daily data. They use filters with different

weighted coefficients for different window lengths. Their performance measure is Mean Absolute Error (MAE), Mean Squared Error, Root Mean Squared Error (RMSE), and Pearson Correlation. Their results show that SVM model performs better than the LR model.[16]If you have a Table, simply paste it in the box provided below and adjust the table or the box. If you adjust the box, you can keep the table in single column, if you have long table.

V. RECENT APPROACHES

A. Follows the CRISP data mining methodology. The motivation for CRISP-DM over the more traditional KDD revolves around the business setting of the prediction task. The dataset Cryptocurrency dataset used, ranges from the 19th of August 2013 until the 19th of July 2016. A time series plot of this can be seen in Figure 1. Data from previous to August 2013 has been excluded as it no longer accurately represents the network. In addition to the Open, High, Low, Close (OHLC) data from CoinDesk.

B. The ANN ensemble was created with a set of 5 MultiLayered Perceptron (MLP), all with the same specifications but different number of nodes in the layers. As shown in Fig 1, each MLP model has an input layer with 190 nodes, 2 hidden layers with varying nodes and 1 output layer with 1 node. The number of nodes in the first hidden layer were preset to be in multiples of 5. 1st MLP will have 5, 2nd will have 10 and the 5th will have 25. The number of nodes in the second hidden layer for all MLP will be the floored half of the nodes in the first hidden layer.

C. first train a Bayesian NN to model Cryptocurrency price formation using given above-mentioned relevant features of the process. We have evaluated Bayesian NN in terms of training and test errors by using the representative non-linear methodologies, SVR, and the linear regression model as the benchmark methods.

D. crawled all comments and replies posted in online communities relevant to cryptocurrencies[19–21].We then analyzed the data (comments and replies) and tagged the extent of positivity or negativity of each topic as well as that of each comment and reply. Following this, we tested the relation between the price and number of transactions of cryptocurrencies based on user comments and replies to select data(comments and replies) that showed significant relation. Finally, we created a prediction model via machine learning based on the selected data to predict fluctuations

E. Cryptocurrencies files were transformed into useful and informative features then these transformed feature files were fed an input to prediction algorithm to learn the cryptocurrencies patterns from the historic time series data and construct the forecasting model to predict the future values of 20 major cryptocurrencies. Three different prediction algorithms were trained to learn forecasting rules and to compare which one is suitable on our corpus. These three prediction algorithms are; Support Vector Machine for Regression (SVMR), Linear Regression (LR), and Random Forest (RF).

F. The features extracted from both methods for 4,254 manually labeled tweets are trained with five different algorithms Naïve Bayes, Bernouli Naïve Bayes, Multinomial Naïve Bayes, Linear Support Vector Classifier [17] and Random Forest [18]. A voting classifier is created which takes output of each of these algorithms (ie. positive and negative) and then classifies the new tweet to that class for which the vote is maximum

G. Implementation of Markov switching generalized autoregressive conditional heteroscedastic (MSGARCH) models with normal and t-distributed innovations to recent Cryptocurrency/US Dollar price dynamics, and also show that these can be an improvement over single-regime models of the same kind, by demarcating high and low volatility regimes. Furthermore, we also look at both maximum likelihood estimation, and Bayesian estimation via Markov Chain Monte Carlo.

Table. 1.
A Comparison on approaches

SURVEY	PREDICTION METHODOLOGY	MERITS	LIMITATIONS
Tian Guo et al.(2018)	Temporay Mixture Model	visualizes the mixture gate values and important features over time, it enables to interpret the effect of order book on the volatility	It requires detailed analysis .
Arti Jain et al .(2018)	Multi-Linear Regresion Mode	Price of cryptocurrencies for every 2 hours is predicted & a dependency of cryptocurrency price on the number of positive tweets in this duration are reflected	It fails to take into consideration the difference in the attributes between real currencies and cryptocurrencies.
Sean Mcnally et	Auto Regressive	Fit into time series and gives better prediction.	Large amount of data is needed

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al.(2018)	Integrated moving average model		to get accurate prediction
Muhammad saad et al.(2018)	Long short term memory model	The hesian algorithm reduces training and validation error at a fast rate in less epoches.	Less accuracy in analysing the prices.
Dibakar Raj et al.(2017)	Sentiment analysis	combining the sentiment score with historical price to predict future price is implemented	Predicting prices requires large amount of data.
Huisu Jang et al.(2017)	Predective Model	BNN performs well in predictind the time series and explaining high volatility.	The model used is expected to have more similar data
Edwin Sin et al.(2017)	Ensembles of neural network	ANN was created with 5 MLPs	Reduced consistent accuracy.
KangZhang et al.(2014)	Latend source model	By using all possible time series it has improved the prediction power and efficiency of the strategy.	It comes with high computational costs in large parameters.
M. Spagnuolo et al.	BitIodine framework.	proposed BitIodine, which is a modular framework for forensic analysis of transactions and blocks in Bitcoin, extracting intelligence from the Bitcoin network	Directly parses only the populated data.
Ruchi Mital et al.	Bayesian Neural Network.	succeeded in relatively accurate direction prediction	It is computationally expensive.
Anna Bonello et al.	Markov switching model	Uses MSGARCH models with two regimes, and the single-regime counterpart for comparison, on Bitcoin/US Dollar using both normal and innovations	Large amount of data is requried to predict the prices.

Fig. 1. Title of the figure with 8 pt. size

VI.   SUMMARY

The market of cryptocurrency is fast and wild . It is a decentralized digital currency without a central bank or single administrator that can be sent from user-to-user on the peer-to-peer network without the need for intermediaries. Thus more efficient the prediction algorithms, more the profits with investments. Stated above are the wide comparison on various approaches carried out in predicting the prices of cryptocurrencies. Every approach has its own defects. In future credibility of the user , popularity of user, user network are some other social factors that can be considered to measure the price prediction model.

VII.   FUTURE WORK

The future work definitely is to anticipate the prices of cryptocurrencies as a plotted graph with real values indicated in red line and the predicted values indicated in blue line measuring the accuracy. A forum is to be developed through which the prices of various cryptocurrencies can be foreseen via the prediction approach. The parameters to be considered includes Volume, Opening price, Highest price, Lowest price and the Close price. The accuracy is to be increased upto 95 % for any particular day. In future, the prediction of prices of all the available cryptocurrencies could be made and suggestion of wise investment plan for any currency can be added as an additional module.

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