An Enhanced Deep Learning Technique to Measure the Impact of Cryptocurrency on the World Payment system using Random Forest

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Abstract

Cryptocurrency is a technology that uses an encrypted peer-to-peer network to facilitate digital barter. Bitcoin, the first and most popular cryptocurrency, is paving the way as a disruptive technology to long-standing and unchanging financial payment systems. While cryptocurrencies are unlikely to replace traditional fiat currency, they have the potential to alter how Internet-connected global markets interact with one another, removing the restrictions that exist around traditional national currencies and exchange rates. Technology advances at a breakneck pace, and a technology's success is almost entirely determined by the market it tries to improve. Cryptocurrencies have the potential to change digital trade marketplaces by enabling a fee-free trading mechanism. A SWOT analysis of Bitcoin is offered, which highlights some of the recent events and movements that may have an impact on whether Bitcoin contributes to a paradigm change in economics. Cryptocurrency is a relatively new payment option, and users are naturally drawn to it because it offers privacy. To measure the impact of cryptocurrency on the world payment system, we use a Cryptocurrency extra data – Bitcoin. The proposed algorithm uses Random Forest Algorithm for prediction. The RFPA has achieved a 0.073 MSE. The RFPA has achieved the best results as it can handle huge datasets with a lot of dimensionality. It improves the model's accuracy and eliminates the problem of overfitting. When compared to other algorithms, it takes less time to train.

Keywords: Cryptocurrency; Bitcoin; Exchange Rates; Random Forest; Machine Learning

1. Introduction

The popularity of Bitcoin, the world's most famous and well-known cryptocurrency, has been growing. Users can exchange value digitally without the involvement of a third party when they use a cryptocurrency. Cryptocurrency is based on the principle of solving encryption techniques to generate unique, finite-number hashes. There will only ever be a finite number of bitcoins created, preventing an oversupply and guaranteeing their uniqueness.

Despite its importance as a life-sustaining substance, water is widely assumed to be free or inexpensive due to its abundance. Water would be more valuable than diamonds if it were uncommon. Bitcoin has value because its users believe that if they accept it as payment, they will be able to use it to buy anything else they desire or need [1]. The valued object might be anything as long as the users maintain their faith. Bitcoin's value is based on its environment, much like how Native Americans used wampum, a seashell, as their land money. Bitcoin does not have intrinsic worth in the same way that gold does, in that it cannot be used to create valuable physical goods such as jewellery [1]. Despite this, value exists because of trust and acceptance.

Current legal and financial institutions were not created with this type of technology in mind. It is comparable to the computing business in certain aspects. Computing is still based on receiving and

processing 1s and 0s, with just two dimensions of input available. Despite this, due to adoption, nurturing, and a lack of necessity for newer systems, all of our current technology is based on this technologically obsolete system. Long-standing trade institutions would have to be fundamentally modified to deal with this type of competition if cryptocurrency became the worldwide standard for transactions. As a result, cryptocurrencies may be the most disruptive technology in the global financial and economic systems. BitPay, the world's largest bitcoin processor, has seen its transaction rate increase by 110 percent in the last year [2].

An increase in transaction volume indicates that user acceptance is increasing. A "fire triangle" exists in the conditions for Bitcoin's widespread adoption. To ignite, Bitcoin requires user acceptance, vendor acceptance, and innovation, much as fire requires fuel, air, and heat to exist.

The other two components of the "fire triangle" are currently being driven by an increase in user acceptance and use of Bitcoin. The adoption of cryptocurrency will be a key topic to follow in the future, since it has the potential to be a genuinely disruptive technology that changes the way money is traded around the world. The contemporary global market, which is fuelled by the Internet, is highly interwoven. If one regional market begins to decline, the others are likely to follow suit. Bitcoin, like the Euro, has the ability to freely move across numerous national borders, fostering global trade, mutual prosperity, and even peace.

Every four years, bitcoin will be mined with diminishing returns until the maximum number of bitcoins is reached: 21 million [3]. This feature of Bitcoin is critical to its value. Because there are a finite number of bitcoins, there will never be an overabundance of bitcoins. Furthermore, bitcoin and other cryptocurrencies are typically thought to be immune to inflation caused by national government actions or prohibitions [4]. Bitcoin is swiftly establishing itself as a viable alternative to inflated national currencies. However, as with most commodities, the price can change dramatically depending on a variety of external circumstances. Due to a combination of demand for a safe haven option and price volatility, Bitcoin became the top performing currency in 2015 using the US Dollar Index [5]. This means that at the end of last year, Bitcoin was the most valuable currency on the planet [6].

Argentinians used to convert their currency into US dollars to maintain its worth. Argentina, on the other hand, recently limited the amount of US dollars that its citizens could convert. As a result, a black market for buying USD at a higher price has emerged, as has increased bitcoin acceptance [7]. The urge for Argentinians to maintain their monetary worth has become extremely clear, and cryptocurrencies are one of the most popular legal vehicles for doing so.

Bitcoin has several inherent flaws that are inherent in its design and cannot be easily remedied. Every transaction is visible to all users on the public ledger, or block chain. Although bitcoin wallet owners cannot be identified outright, there remains semi-anonymity, which may be unsettling for some potential adopters. Because the public block chain is open to all users, it is vulnerable to assault due to the ease with which it may be accessed. The Bitcoin network has already been exposed to a number of "stress tests," which are essentially DDoS attacks [8]. Exchanges and miners launched these "tests" to demonstrate a point about Bitcoin's design: that the network can't support high transaction speeds. The fact that participants in Bitcoin's operation can shut down the network to prove a point is an unpleasant design flaw in the code.

These two features of Bitcoin's design are essential to its operation and cannot be altered. Despite these characteristics, reticent users must adopt the product. Due to recent incidents, Bitcoin has gained a shady reputation. Silk Road stories might paint a poor picture of digital currency in general, not just Bitcoin. Silk Road was a dark-net marketplace that allowed thousands of drug traffickers and almost a million clients to conduct illegal drug transactions. Due to the lack of government tracking and semi-anonymity, Bitcoin was their preferred method of payment. It lasted from 2011 to 2013 and generated approximately one billion dollars in revenue [9]. The broad user base will believe that cryptocurrencies are solely used by criminals if there is no positive marketing promoting the value of semi-anonymity for legitimate users.

The purpose of digital currency is to serve as a means of exchange. Although there are many distinct kinds of cryptocurrency, these nine are among the most well-known: (i) Bitcoin (BTC) is the first cryptocurrency. Bitcoin is a cryptocurrency that was created in 2009. It is one of the most well-known currencies. It was released as open-source software in 2009. Satoshi Nakamoto, a pseudonym, was the creator of the whitepaper that founded this digital currency. (ii) Litecoin (LTC) is a cryptocurrency that was launched in July (LTC). Litecoin was created in 2011 as a Bitcoin alternative. Litecoin, like

other cryptocurrencies, is an open-source, global payment network that is totally decentralised, which means it has no central authority.

(iii) Ethereum is a cryptocurrency (ETH). Ethereum is a sort of cryptocurrency that was created in 2015 as an open source platform based on blockchain technology. While the Ethereum blockchain concentrates on recording ownership of digital currency transactions, it also runs the programming code of any decentralised application, allowing application developers to use it to pay for transaction fees and services on the Ethereum network. (iv) (BCH) is a type of cryptocurrency. Bitcoin Cash is a digital currency that was established to improve upon some of the features of Bitcoin. Bitcoin Cash raised the block size, enabling the speedier processing of more transactions.

(v) Ethereum Classic (ETC) is a cryptocurrency that (ETC). The Ethereum Classic blockchain is a fork of the Ethereum blockchain. It uses a similar decentralised infrastructure to run smart contracts. Smart contracts are programmes that function exactly as they are planned, with no downtime, censorship, fraud, or third-party interaction. It, like Ethereum, has a value token called "traditional ether" that can be used to pay for goods and services. (vi) Zcash is a cryptocurrency (ZEC). Zcash is a cryptocurrency that was created using the Bitcoin code foundation. It was created on a decentralised blockchain by scientists from MIT, Johns Hopkins, and other prestigious academic and scientific organisations. The emphasis on privacy is a key feature and differentiator of Zcash. Users can send and receive Zcash without disclosing the sender, receiver, or transaction amount, which is not a feature offered to investors on Equity Trust's platform.

(vii) Luminous Stars (XLM). The Stellar Lumen is a currency that acts as a bridge between two different currencies. A person can send any currency they hold to someone else in a different currency using Stellar. In 2014, Jed McCaleb founded the open-source Stellar network and generated the network's native currency. (viii) Satoshi Nakamoto's Bitcoin Vision (BSV). Bitcoin Satoshi's Vision (BSV) is the result of Bitcoin Cash's hard fork in 2018. It is meant to be more similar to Bitcoin's initial aim, namely decentralisation and the use of bitcoin as a payment method. (ix) chain links (LINK): The Chainlink, which was launched in June 2017, was created to encourage a global network of computers to give essential external data to smart contracts (contracts that execute when specific criteria are satisfied) that run on top of blockchains. The 5 best performing cryptocurrencies of 2021 is shown in Figure 1.
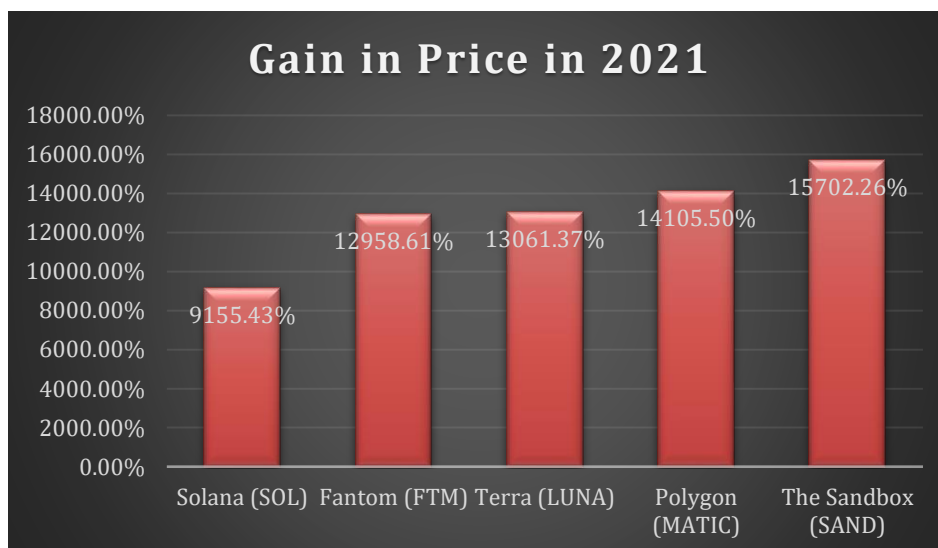

Figure 1: the 5 best performing cryptocurrencies of 2021

From Figure 1, it is shown that Solana (SOL) is in the fifth oreder. Solana is a public blockchain platform that employs proof-of-stake and proof-of-history technologies to allow for dependable and scalable DeFi transactions while maintaining decentralisation and security. Solana debuted in March of 2020. The SOL token is the platform's native token. Fantom (FTM) is in fourth order. Fantom is an open-source blockchain platform that allows developers to trade digital assets and receive decentralised financial services. The Fantom platform has a proprietary consensus mechanism that allows developers to complete transactions in under two seconds. FTM is the blockchain platform's native cryptocurrency.

Terra (LUNA) is in the third order. Terra is a blockchain platform that uses stable-coins to construct global payment systems that provide price stability, fiat currency adoption, and quick and economical settlements. Terra was founded in April of this year, and its native token, LUNA, helps to keep the price of its stablecoins stable. Polygon (MATIC) is a second-order polygon. Polygon is an Ethereum scaling and infrastructure development platform that allows developers to create a multi-chain system that benefits from Ethereum's security and stability.

MATIC is Polygon's native token, which secures the platform and provides for proper governance. MATIC is an Ethereum-based token. The Sandbox (SAND) is in the first order. The Sandbox, a blockchain-based platform where users may create, purchase, and sell digital assets in a gaming format, was created in 2011. The Sandbox has a thriving gaming community and a decentralised platform powered by non-fungible coins and decentralised autonomous organisations. The platform's native SAND cryptocurrency enables transactions with the purpose of integrating blockchain into the gaming sector. The total supply of SAND tokens is limited to 3 billion.

To measure the impact of cryptocurrency on the world payment system, we use a Cryptocurrency extra data – Bitcoin. The proposed algorithm uses Random Forest Algorithm for prediction. The RFPA has achieved the best results as it can handle huge datasets with a lot of dimensionality. It improves the model's accuracy and eliminates the problem of overfitting. When compared to other algorithms, it takes less time to train. The remaining work is organized as follows. In section 2, some of the recent related work in the cryptocurrency on the world payment system is presented. In section 3, the proposed method is presented. Experimental evaluation is provided in section 4. And in section 5, we conclude this work.

2. Related Work

The backbone of any economy is a well-functioning payment and settlement system. It aids in the reduction of the cost of exchanged services and goods. A weak payment system, on the other hand, cripples the economy, stifles development, undermines trust in the system, and leads to inefficient use of financial resources. The digital means of payment have changed the way people conduct business and have led to the current move from a barter system to a contactless payment method. The payment mechanism has progressed significantly.

Electronic payments, as stated in the research report, provide an easier way for customers to pay for their fees, licences, taxes, and purchases at any time, whether online or in person [10]. Another researcher [11] looked into the benefits and drawbacks of the payment system, as well as how it has influenced the economy. He also mentioned the four elements that have fueled the cashless payments movement in India, including the high cost of currency, technological advancements, economic factors, and government initiatives. Due to the global smartphone revolution, there has been a boom in digital payment possibilities, and e-money transactions have expanded at a rapid rate since demonetization.

According to projections, by 2021, cheque payments would account for fewer than 2% of all retail electronic transactions. The number of digital transactions by December 2021 will become 8707 crores and the increase is more than four times compared to 2069 in December 2018. End users are one of the most important stakeholders in any payments ecosystem. Cryptocurrency is a relatively new payment option, and users are naturally drawn to it because it offers privacy.

According to the US Treasury Department in 2013, a virtual currency is "a means of exchange that acts like a currency in some situations but does not have all the features of an actual currency". Bitcoins meet all of these criteria [12]. A bitcoin wallet is a piece of software that allows you to send, receive, and store bitcoins. According to University of Cambridge researchers, there were roughly 2.9 to 5.8 million unique wallets containing cryptocurrencies in 2017, with the bulk of them being bitcoin wallets [13]. Bitcoin is a decentralised digital currency that does not require the use of a third party or financial intermediary such as a central bank. Each transaction is recorded in a Bitcoin blockchain, which is a publicly accessible ledger that can be validated.

A blockchain is a distributed ledger that records transactions and is often duplicated and finalised to reach a consensus among users [12]. A blockchain is a distributed ledger that records transactions and is often duplicated and finalised to reach a consensus among users. People will become more aware of the alternative form of bitcoin and educated about its qualities as a result of increased awareness and education. The two biggest Indian cryptocurrency exchange platforms, CoinDCX and WazirX, observed a surge in the volume of cryptocurrencies after the Supreme Court of India lifted the ban.

3. Problem Definition

To measure the impact of cryptocurrency on the world payment system, we use a Cryptocurrency extra data – Bitcoin [14]. The proposed algorithm uses Random Forest Algorithm for prediction.

3.1. Dataset

Cryptocurrency extra data – Bitcoin [14]: this dataset is a supplement to the G-Research Crypto Forecasting competition's main dataset. This is a daily updated dataset that collects market data automatically for the G-Research crypto predicting competition. All competition assets are captured using 1-minute resolution data, and both retrieval and uploading are totally automated.

3.2. Random Forest based Prediction Algorithm (RFPA)

The proposed algorithm uses Random Forest Algorithm for prediction. It is based on ensemble learning, which is a method of integrating several classifiers to solve a complex problem and increase the model's performance. The working of the Random Forest algorithm is shown in Figure 2.
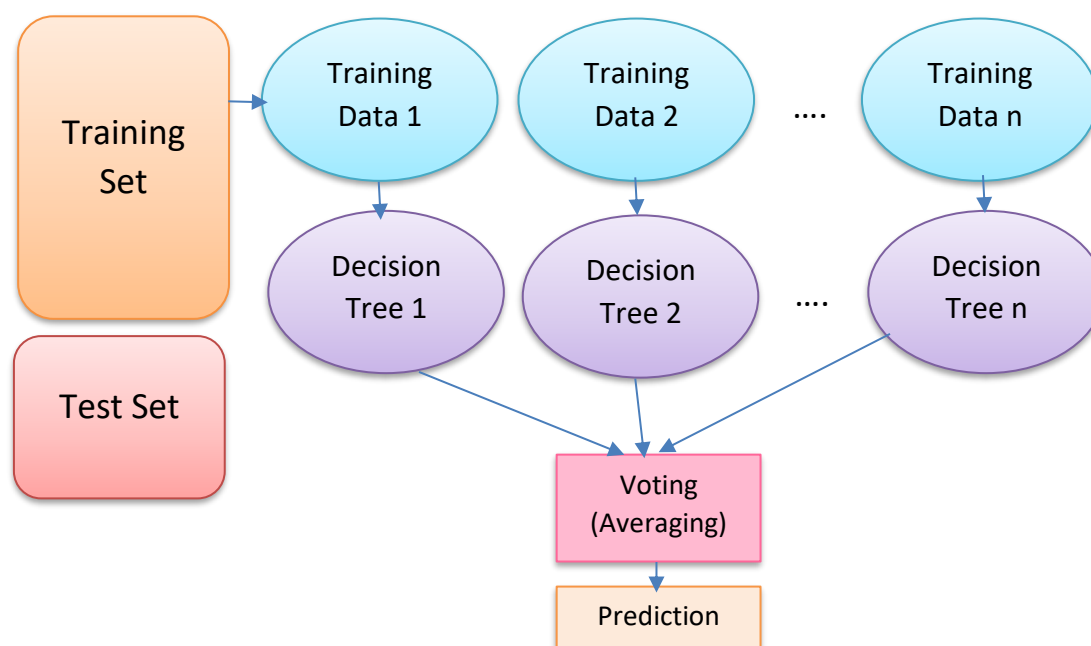

Figure 2: the working of the Random Forest algorithm

Because the random forest combines numerous trees to forecast the dataset's class, some decision trees may correctly predict the output while others may not. However, when all of the trees are combined, the proper result is predicted. As a result, two assumptions for a better Random forest classifier are as follows: (i) The dataset's feature variable should have some actual values so that the classifier can predict accurate results rather than guesses. (ii) Each tree's predictions must have very low correlations. The overall steps of the Random Forest based Prediction Algorithm (RFPA) are shown in figure 3.
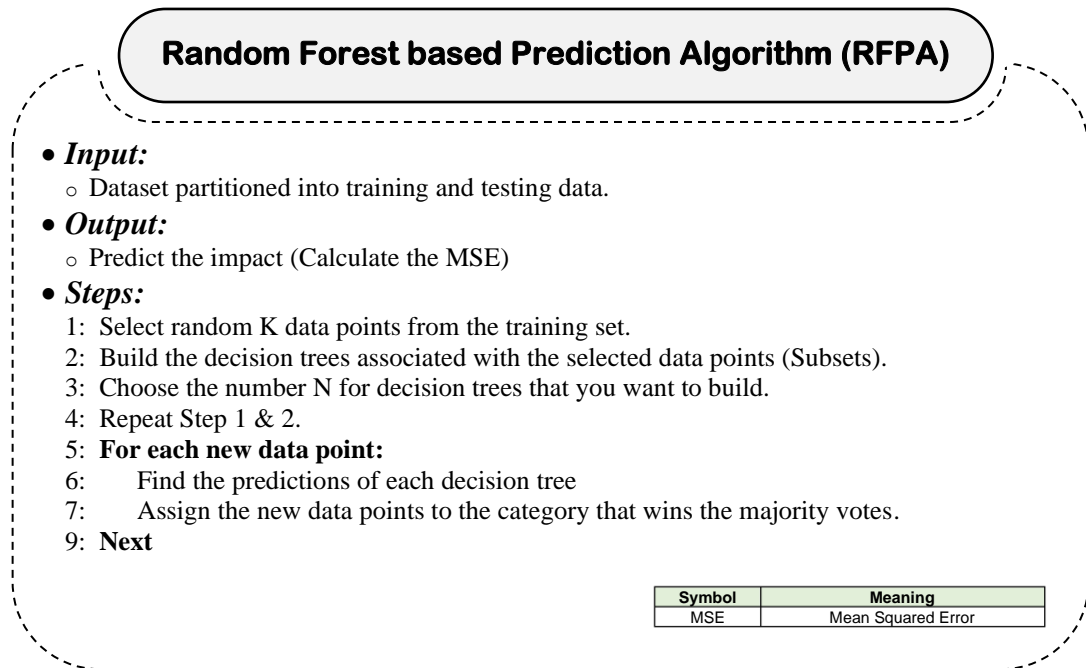
Random Forest based Prediction Algorithm (RFPA)

- *Input:*
  - ○ Dataset partitioned into training and testing data.
- *Output:*
  - ○ Predict the impact (Calculate the MSE)
- *Steps:*
  1: Select random K data points from the training set.
  2: Build the decision trees associated with the selected data points (Subsets).
  3: Choose the number N for decision trees that you want to build.
  4: Repeat Step 1 & 2.
  5: **For each new data point:**
  6:     Find the predictions of each decision tree
  7:     Assign the new data points to the category that wins the majority votes.
  9: **Next**

Symbol	Meaning
MSE	Mean Squared Error

Figure 3: Random Forest based Prediction Algorithm (RFPA)

4. Implementation and Evaluation

This section performs a comparative experiment between RFPA and the common prediction algorithms such as: Linear Regression (LR), K nearest neighbor (KNN), and Neural Network (NN) using the same dataset. The results are shown in Table 1 and in Figure 4.

Table 1: RFPA vs LR, KNN, and NN

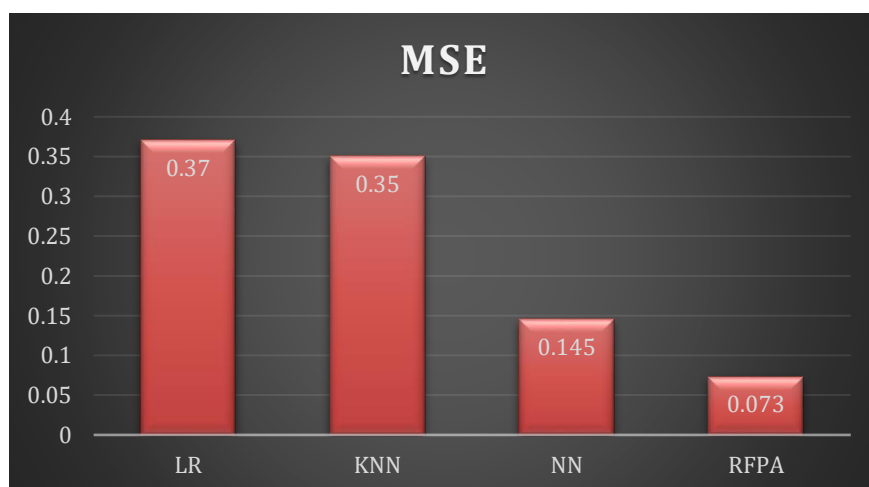| MSE	Algorithm
0.37	LR
0.35	KNN
0.145	NN
0.073	RFPA

Figure 4: RFPA vs LR, KNN, and NN

5. Conclusions

This paper has discussed the impact of cryptocurrency on the world payment system using Random Forest. Cryptocurrency is a relatively new payment option, and users are naturally drawn to it because it offers privacy. To measure the impact of cryptocurrency on the world payment system, we use a Cryptocurrency extra data – Bitcoin. The proposed algorithm uses Random Forest Algorithm for prediction. The RFPA has achieved a 0.073 MSE. The RFPA has achieved the best results as it can handle huge datasets with a lot of dimensionality. It improves the model's accuracy and eliminates the problem of overfitting. When compared to other algorithms, it takes less time to train. In the future work, we can use OCNN [15] to achieve better results as it achieved a good performance in [16] and in [17][18][19][20]. We can also use correlation methods like [21].

Conflicts of Interest: "The authors declare no conflict of interest."

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