Cryptocurrency Analysis using Machine Learning and Deep Learning

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Unlike typical banking transactions, blockchain-assisted cryptocurrencies are touted as the currency of the future, allowing peer-to-peer transactions without the need for an intermediary [1]. According to investors, the crypto share market has grown significantly in terms of market capacity, increasing by 300 percent in a year to approximately 1.6 trillion dollars [2]. Crypto investments, on the other hand, are thought to be dangerous given the crypto market's extremely volatile, latent, and non-stationary nature [3]. Stakeholders and investors may be able to easily incorporate crypto into their investment strategy if they can accurately predict the temporal change of the market price over time. In order to anticipate future prices, machine learning (ML) and big data analytics are extremely effective in deciphering stochastic and nonlinear patterns within market data [4].

Cryptocurrencies are some of the most valuable and widely used currencies in the world economy, and on their own might allow users to make millions of dollars. The blockchain is used for documenting transactions between participating groups. This technology has been used in such domains as supply chains, healthcare, logistics, and identity management [5]. Cryptocurrency transactions create a large amount of data that can be used to make automated investing recommendations based on artificial intelligence (AI), data science, and big data [6]. Cryptocurrencies have a high level of volatility, which increases the dangers associated with crypto trading. Price variations are expected throughout the day, but if accurately forecast, these might allow crypto traders to make a consistent income. A large quantity of data must be processed to determine the continually changing encryption patterns, which is where AI and machine learning systems come in handy. High working speed and accuracy are the primary benefits of AI and machine learning.

Cryptocurrencies and traditional currencies both serve the same purpose, but their underpinnings are different. The elimination of the necessity for intermediate currency holders is one of the motivations for cryptocurrencies. Cryptocurrencies follow five qualities (fungible, durable, portable, stable, and recognized) as well as three money functions (Unit of Account, Store of Value, and Standard of Deferred Payment) [7]. Cryptocurrencies are a type of digital money that may be used to make more secure transactions. Traditional currency, often known as fiat currency, is controlled by the government and is thought to symbolize debt. Cryptocurrency avoids debt and measures its value in terms of what someone is willing to pay for it. Cryptocurrency is not regulated or controlled by anyone and can be used by anyone. Because it's based on a blockchain, it's nearly impossible to fake, and the transactions are mostly private.

For the simulation experiment purpose, we collected publicly available data from Yahoo Finance and Kaggle for various trending cryptocurrencies like Bitcoin (BTC), Dogecoin (DOGE), Ripple (XRP), Ethereum (ETH), and Cardano (ADA). Further, we preprocessed the data using the MinMax Scaler function and fed it into the Long Short-Term Memory (LSTM) machine learning model with a dropout rate of 0.2, 30 epochs, and a batch size of 32.

Figure 1 shows the actual price and predicted price for ETH and ADA. We observed a qualitative match between these values over 175 days. The code and plots are available in our GitHub repository where we

Figure 1. Actual and predicated price for ETH and ADA.
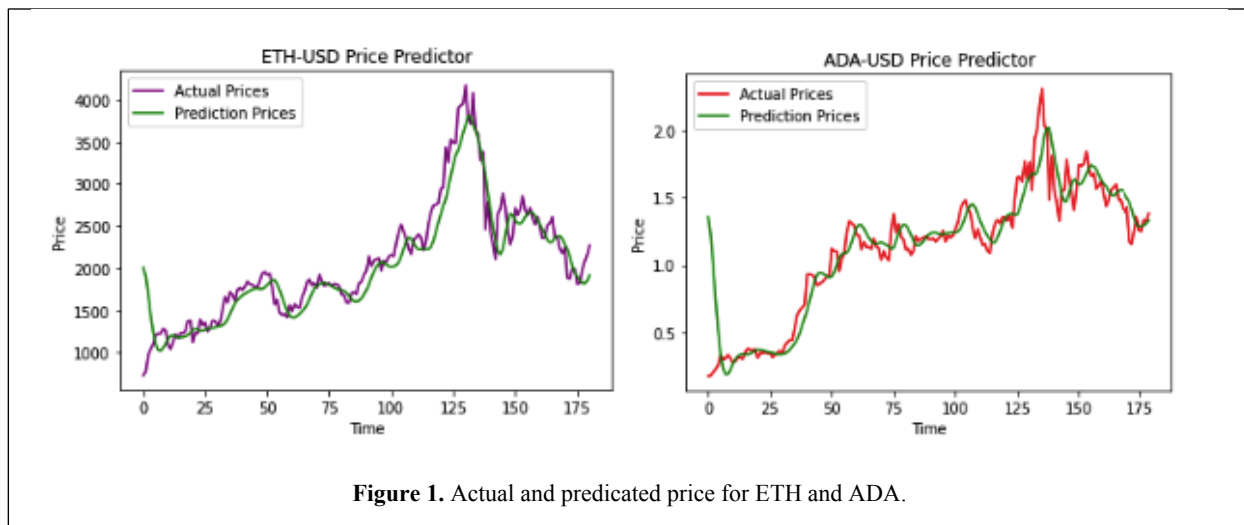
have simulations for other trending cryptocurrencies.

In addition, similar to SWIFT, cryptocurrency products can be utilized for payment settlement, asset exchange, and remittance systems. Some of them are pre-mined or have a simpler mining procedure. Huge financial institutions can use cryptocurrency because it is quickly settled, has cheap transaction fees, and can be used by large financial organizations.

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Introduction

Unlike typical banking transactions, blockchain-assisted cryptocurrencies are touted as the currency of the future, allowing peer-to-peer transactions without the need for an intermediary . Virtual forms of currency have open new doors within the software industry in finance, data storage and data collection. Cryptocurrency (Crypto) in is very volatile in terms of market value, which carries a host of unknowns that make it difficult to predict and analyze the future prices of crypto. However, cryptocurrency behaves similarly to stocks, which allows for the use of linear regression models to make predictions about price levels.

Two types of linear regression models, least squares and auto regression, as well as predictors such as social media and economic data to calculate the volatility of a given cryptocurrency and its prices. Using high performance computing techniques will allow regression models to predict relatively accurate crypto prices and past available cryptocurrency price data will be used to verify our results.

$$y = mx + b + V$$

$$(V)olatility = C_1T + C_2R + C_3G + C_4S$$

$y = cryptocurrency\ predicted\ price$
$m = slope\ of\ the\ curve$
$x = value\ of\ cryptocurrency\ at\ a\ given\ point\ in\ time$
$b = inital\ price\ of\ the\ specific\ cryptocurrency$
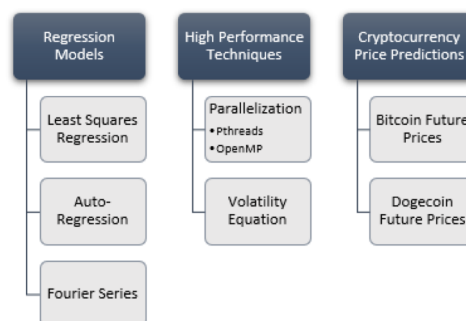
$T = Twitter$
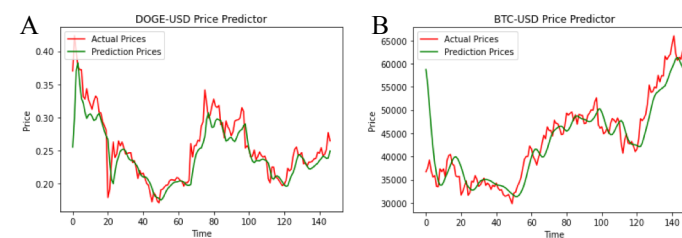$R = Reddit$
$G = Google$
$S = S\&P\ 500\ Index$
$C = Coefficient\ for\ each\ social\ media\ term$

Methods


Figure 1. Methods—The diagram shows what regression models will be used and types of High Performance Computing Techniques that will be used to execute the future price predictions of Bitcoin and Dogecoin.

Results

Figure 2. Linear regression using Least Squares without Volatility equation incorporated to check data for best fit curve within the data set. A) The number of days this model predicts is 7 days into the future for Dogecoin B) The number of days this model predicts is 7 days into the future for Bitcoin and this model does not fit all data points preventing over plotting of the regression
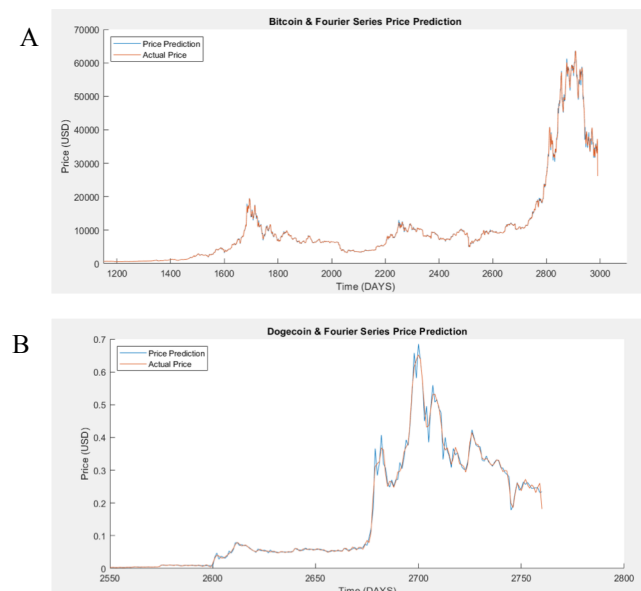
Figure 3. Fourier Series Model without Volatility equations incorporated to check data for best fit curve within data set. The Fourier Series where k = 200, k represents the number of terms within the series to make the curve more precise without over plotting. As the k value increases the more precise the fitting and prediction becomes. However, there is a limited to how accurate the prediction will be before over fitting the data, skewing the results. A) Graph A depicts the actual prices of Bitcoin (USD) in red and the Fourier Series best fit curve in blue over the span of 3000 days. B) Graph B depicts the actual prices of Dogecoin (USD) in red and the Fourier Series best fit curve in blue over the span of 2780 days.

Preliminary Results

● Ordinary Least Squares Regression model plotted without Volatility plots relatively accurate best fit curve to both Bitcoin and Dogecoin

● Non-linear regression may be able to provide more precise price prediction but would not provide context in the process of the price prediction

● Fourier Series model can yield higher precision due to the number of iterations that can be added to the series

● Models such as Auto-regression still need to be implemented in additional to the volatility equation being implemented back into Least Squares regression and Fourier Series Model

Next Steps

● Determine other parameters that contribute the volatility of these specific cryptocurrencies
● Continue to train the model to become more precise and accurate with price predictions
● Apply model to other cryptocurrency giants such as Ethereum, Litecoin and Cardano
● View other types of models and algorithms such as neural networks and non-linear regression for more precise price predictions

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