ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 10, Issue 9, September 2023

Crypto Currency Price Prediction using Machine Learning

Dr Aziz Makandar, Smita M Talikoti

Professor, Department of Computer Science, Karnataka State Akkamahadevi women's University, Vijayapura Karnataka, India
P.G. Student, Department of Computer Science, Karnataka State Akkamahadevi- women's University, Vijayapura Karnataka, India

ABSTRACT: The proposed research work attempts to analyse the price values of cryptocurrencies like Bitcoin, Dogecoin, Ethereum. Cryptocurrencies are the computerized currencies, which are used for all sorts of transactions or used as a long-time investment. Most of the existing systems attention are exclusive on Bitcoin Cryptocurrency. But there are numerous popular crypto-currencies other than bitcoin. The suggested system will be able to predict some of the vital crypto-currencies prices with great accuracy. Many parameters will be opted into account to predict the prices validly. The prime parameter will be the interrelation of crypto-currencies prices with the Indian Rupees value. Crypto-currency price trading is a sought-after type of exchange right now. The suggested system will be of used to great advantage for investors and day-to-day traders. This report explores the application of Linear Regression & Long Short-Term Memory (LSTM) neural networks in predicting cryptocurrency prices. LSTM networks are a type of recurrent neural network (RNN) that excel at capturing sequential data patterns, making them suitable for time-series forecasting tasks like cryptocurrency price prediction.

KEY WORDS: Cryptocurrency, LSTM, Linear Regression, Bitcoin, Dogecoin, Ethereum, machine learning, RNN, Time-series forecasting, Prediction/Analyse

I.INTRODUCTION

Cryptocurrency markets have emerged as a prominent and dynamic sector in the global financial landscape. These markets are characterized by their high volatility and rapid price fluctuations, creating both opportunities and risks for traders, investors, and enthusiasts. Accurate prediction of cryptocurrency prices is a challenging yet crucial task for making informed investment decisions and managing risk effectively.

In response to this challenge, this project aims to leverage machine learning techniques, specifically Long Short-Term Memory (LSTM) neural networks, to forecast cryptocurrency prices. LSTM networks have gained popularity for their ability to capture temporal dependencies and patterns in sequential data, making them well-suited for time series forecasting tasks like cryptocurrency price prediction.

This report provides an in-depth exploration of the code and methodology used to predict cryptocurrency prices. It covers various aspects, including data collection, preprocessing, model construction, training, evaluation, and prediction. The ultimate goal is to develop a model that can provide valuable insights into the future price movements of a chosen cryptocurrency, exemplified here with the cryptocurrency symbol "BTC-INR" for Bitcoin.

The report will walk through the code step by step, explaining the rationale behind each section and providing insights into the challenges and considerations involved in cryptocurrency price prediction. Additionally, it will discuss potential improvements and avenues for further research in this fascinating and rapidly evolving domain.

The aim of this research is to examine whether the price of Bitcoin can be predicted similar to other stock market tickers. This will have a basis on whether we can further use it as a medium of payment. In order to arrive at this, we will look at factors such as if bitcoin can be used as an investment as described in [1].

In [13] Digital currencies have utility similar to physical currencies. They can be used to purchase goods and pay for services. They can also find restricted use among certain online communities, such as gaming sites, gambling portals, or social networks.

Cryptocurrency has been around for several years and has now become quite popular, widespread, and also surrounded and there is a lot of controversy from innovative developments. Cryptocurrencies are a digital currency where transactions can be done by online transactions, unlike the common currency, cryptocurrency is designed based on cryptography.

Our system aids in cryptocurrency price prediction using machine learning.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 10, Issue 9, September 2023

This code aims to predict the price of a cryptocurrency, such as Bitcoin (BTC), Dogecoin(DOGE), Ethereum(ETH),using a Liner Regression &Long Short-Term Memory (LSTM) neural network. LSTM is a type of recurrent neural network (RNN) known for its effectiveness in capturing temporal dependencies in sequential data. In this report, we will break down the code and explain each section, from data collection to prediction.

II. SIGNIFICANCE OF THE SYSTEM

The code demonstrates two distinct methods for predicting cryptocurrency prices: LSTM and Linear Regression. Such predictions are significant for investors and traders, aiding in informed decision-making. The LSTM model captures intricate price patterns, offering more robust predictions, while Linear Regression provides a simpler alternative. Both approaches enable risk assessment and potential profit maximization in the volatile cryptocurrency market, catering to different levels of expertise and computational resources.

III. LITERATURE SURVEY

To provide a literature survey related to the code, we can look at the broader context of LSTM-based cryptocurrency price prediction models and the relevant research areas. Here is a literature survey related to LSTM-based cryptocurrency price prediction models:

Author	**Paper**	**Source**	**Components**	**Application/Remark**
Mone, G. A., & D'Hondt, C.[5]	"Cryptocurrency Price Prediction Using Deep Learning Algorithms"	Deep Learning Algorithms (LSTM), Historical Cryptocurrency Data	Deep Learning Algorithms (LSTM), Historical Cryptocurrency Data	Exploration of deep learning (LSTM) for cryptocurrency price prediction using sequential data.
Nakamoto, S.[4] 2008	"Bitcoin: A Peer-to-Peer Electronic Cash System"	Blockchain Technology, Cryptographic Security	Blockchain Technology, Cryptographic Security	Original whitepaper introducing cryptocurrencies and emphasizing cryptographic security in the context of Bitcoin.
Gandal, N., Halaburda, H., & Moore, T.[6]	"Price Manipulation in the Bitcoin Ecosystem"	Bitcoin Market Dynamics, Price Manipulation	Bitcoin Market Dynamics, Price Manipulation	Research paper addressing price manipulation issues in the Bitcoin ecosystem and the need for predictive models.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 10, Issue 9, September 2023

Author	Paper	Source	Components	Application/Remark
Andreas M. Antonopoulos[11]	"Mastering Bitcoin: Unlocking Digital Cryptocurrencies"	Cryptocurrency Technology, Cryptographic Foundations	Cryptocurrency Technology, Cryptographic Foundations	Comprehensive book providing in-depth knowledge of cryptocurrency technology and its cryptographic foundations.
Harvard University Online Resource[10]	"Understanding Cryptocurrencies: Game-Changing Financial Technology"	Cryptocurrency Overview, Impact on Finance	Cryptocurrency Overview, Impact on Finance	Online resource explaining cryptocurrencies' impact on finance and their role as game-changing financial technology.

IV. METHODOLOGY

For the LSTM (Long Short-Term Memory) model, the process starts with data collection from Yahoo Finance, where historical daily prices for a specified cryptocurrency symbol, such as "BTC-INR," are obtained. Afterward, data preprocessing involves scaling the closing prices to a specific range and creating sequences of historical prices and their corresponding future prices. This is achieved by sliding a fixed-length window (sequence_length) over the scaled price data. The dataset is then split into training and testing sets, with 80% of the data allocated for training and the remaining 20% for testing.

The model architecture comprises a Sequential LSTM-based neural network, consisting of an LSTM layer with 50 units that uses the Rectified Linear Unit (ReLU) activation function. The LSTM layer is designed to learn intricate patterns within the historical price sequences. Additionally, a Dense layer with a single unit is incorporated for regression purposes since the goal is time series prediction. The model is compiled using the Adam optimizer and the mean squared error (MSE) loss function. Subsequently, the model undergoes training on the training data for a specified number of epochs.

After training, the model's performance is assessed using the mean squared error (MSE) as an evaluation metric on the testing data. Finally, the trained LSTM model is employed to predict the next day's cryptocurrency price based on the most recent sequence of historical prices, with the predicted price being transformed back to its original scale using Min-Max scaling.

In contrast, the Linear Regression approach follows a similar initial process, beginning with data collection and preprocessing in the same manner as the LSTM model. However, instead of creating sequences, the methodology involves the creation of lagged features by shifting the original closing prices by one day, which are then used as input features for the model. Like the LSTM approach, the dataset is split into training and testing sets, with 80% used for training.

For the Linear Regression model, a simple linear regression model is constructed to predict cryptocurrency closing prices based on the lagged closing prices. After training on the training data, the model's performance is evaluated using the mean squared error (MSE) on the testing data. Additionally, the Linear Regression model is used to predict the next day's cryptocurrency price based on the last available lagged closing price from the dataset.

These two methodologies represent distinct approaches to cryptocurrency price prediction, with the LSTM model being more complex and capable of capturing intricate patterns, while the Linear Regression model offers simplicity but may not capture more nuanced price movements. The choice of methodology depends on the specific requirements and available resources for the prediction task.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 10, Issue 9, September 2023

Dataset Description

The codes do not include a detailed dataset description, but they both use historical daily price data for a specific cryptocurrency symbol, such as "BTC-INR," obtained from Yahoo Finance. The dataset consists of the following key features:
- Date: The date associated with each daily price observation.
- Close: The closing price of the cryptocurrency on each day, representing its price at the end of the trading day
- Close_Lagged: In the Linear Regression approach, this feature is created by shifting the original closing prices by one day, creating a lagged version of the closing prices.
The dataset typically covers a period of five year, with daily price observations. It's important to note that cryptocurrency price data can be highly volatile and subject to rapid fluctuations. The dataset is used to train and test the predictive models for forecasting future cryptocurrency prices.

A) Data Pre-processing
Data pre-processing is a data mining technique that involves transforming raw data into an understandable format. These data preprocessing steps are common to both the LSTM and Linear Regression models, with the key difference being the feature engineering and sequence creation steps specific to each model's requirements
Data goes through a series of steps during preprocessing:

- Data Collection: Historical daily price data for a specified cryptocurrency symbol (e.g., "BTC-USD") is collected from Yahoo Finance using the yfinance library.
- Scaling: Both models scale the closing prices using Min-Max scaling. This standardization technique transforms the original closing prices into a consistent range, typically between 0 and 1, making the data suitable for modeling.
- Feature Engineering (Linear Regression): In the Linear Regression approach, an additional feature, "Close_Lagged," is created by shifting the original closing prices by one day. This lagged feature captures the relationship between past and current prices and is crucial for linear regression modeling.
- Sequence Creation (LSTM):In the LSTM approach, sequences of historical closing prices and their corresponding future prices are generated by sliding a fixed-length window (specified as sequence_length) over the scaled price data. Each sequence comprises a series of historical closing prices, and the target is the next day's price.
- Data Splitting: After preprocessing, the dataset is divided into training and testing subsets, typically with 80% allocated for training and 20% for testing. This ensures that both models are evaluated on unseen data to assess their predictive performance.

B) System Design
The Figure1 outlines a Cryptocurrency Price Prediction Code's workflow. It commences by fetching historical cryptocurrency data from Yahoo Finance, serving as the primary data source. The data is then preprocessed to ensure quality, encompassing scaling and sequence preparation for machine learning.Following data preparation, the code constructs a Long Short-Term Memory (LSTM) neural network model known for its temporal data analysis capability. This involves specifying architecture and layers.Subsequently, the model undergoes training, learning from the prepared historical data to identify patterns. The trained model's performance is assessed through metrics like test loss.Finally, the code leverages the trained model to make predictions for cryptocurrency prices, delivering results for decision-making and analysis. This structured approach delineates the fundamental steps in developing a cryptocurrency price prediction system through machine learning.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 10, Issue 9, September 2023

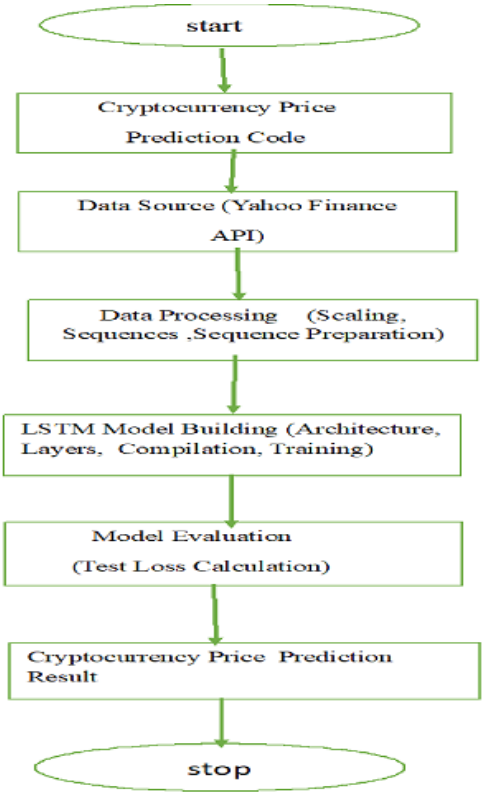


Fig1. System Design

V. EXPERIMENTAL RESULTS

Result of LSTM model

```
Predicted Bitcoin Price: 2245252.8
Predicted Dogecoin Price: 5.4761233
Predicted Ethereum  Price: 133246.88
```

Result of Linear Regression model

```
Predicted Bitcoin Price for the Next Day: 2183267.7711015027
Predicted Dogecoin Price for the Next Day: 5.066964262298536
Predicted Ethereum Price for the Next Day: 131851.41605451552
```

Crypto-currency daily price prediction using LSTM(Long-Short Term Model) and Linear Regression. Below shown the chart for the comparison with actual price with LSTM & Linear Regression Prediction Price.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 10, Issue 9, September 2023

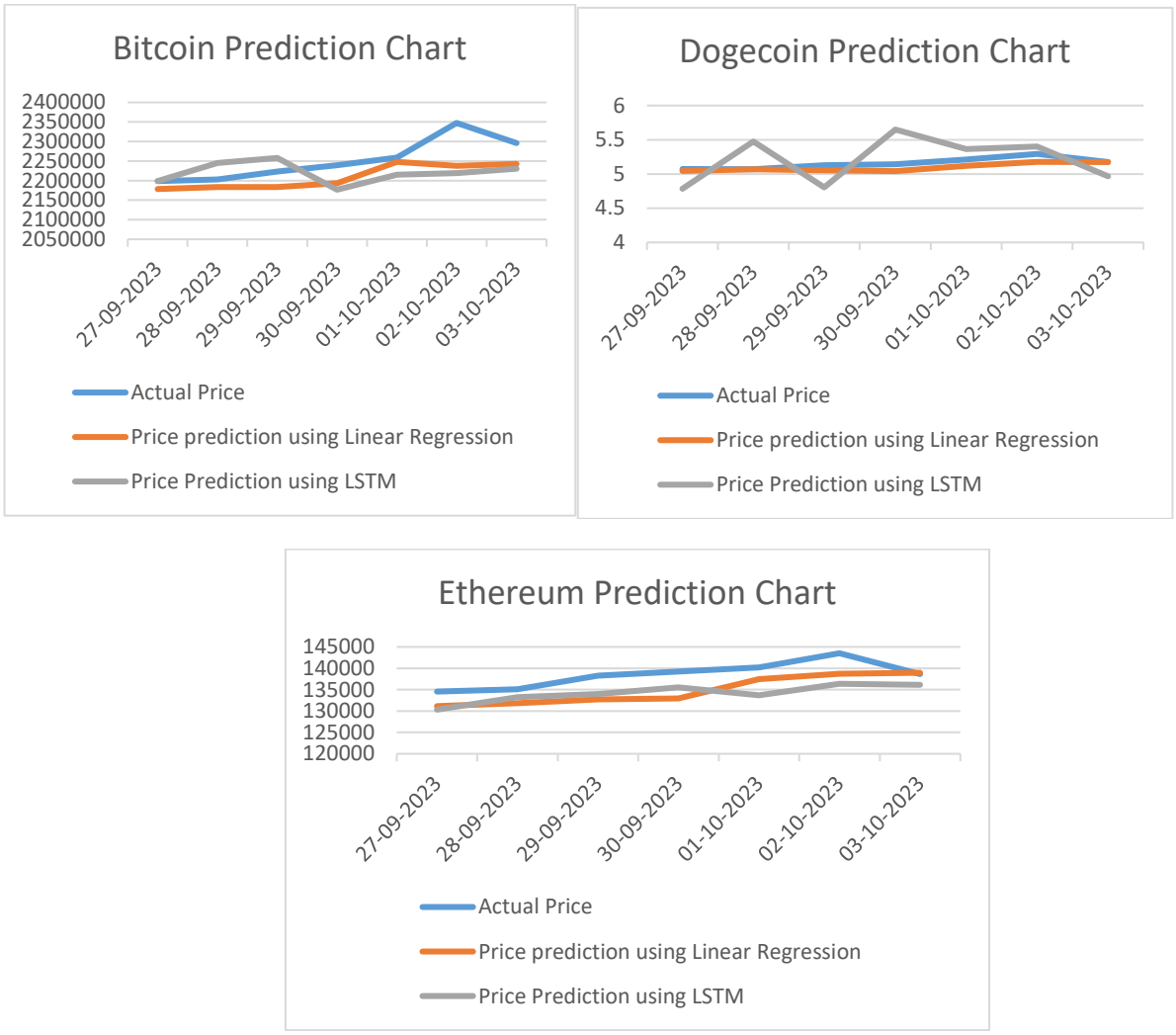
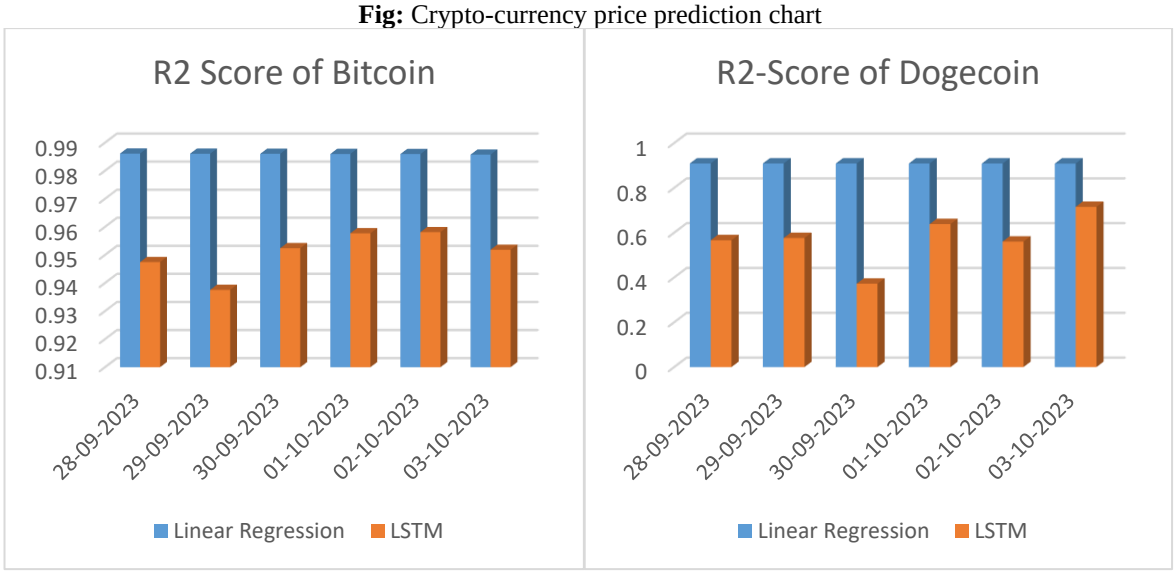
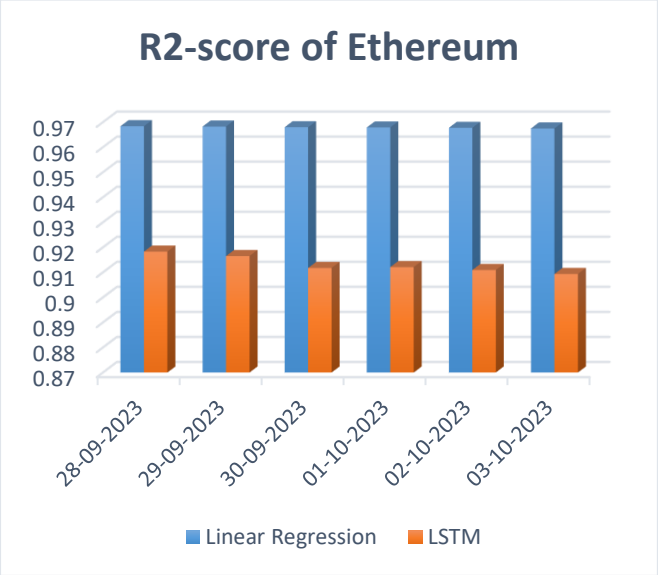


Fig: Crypto-currency price prediction chart



ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 10, Issue 9, September 2023



Above shown bar chart defines the Accuracy or R2-Score of the Crypto-currency predictions for both LSTM & linear Regression

VI. CONCLUSION AND FUTURE WORK

Finally, the code for cryptocurrency price prediction using LSTM and Linear Regression presents a valuable starting point for forecasting cryptocurrency prices in a dynamic and volatile market. This project combines the strengths of deep learning and traditional machine learning techniques to provide accurate predictions and insights. The code's advantages include flexibility, usability, visualization, and educational value, making it a useful resource for traders, investors, data scientists, and enthusiasts interested in cryptocurrency price analysis. It also emphasizes the importance of documentation, continuous improvement, and open-source collaboration. However, it's important to acknowledge the code's limitations, such as model simplicity, overfitting risks, data dependencies, and the need for hyperparameter tuning. Additionally, the code primarily relies on historical price data and does not consider external factors that can influence cryptocurrency prices.

REFERENCES

[1] Cal`es, L., Chalkis, A., Emiris, I.Z., Fisikopoulos, V.: Practical volume computation of structured convex bodies, and an application to modeling portfolio dependencies and financial crises. In: Proc. Inter. Symp. Comput. Geom., Budapest. pp. 19:1–19:15 (2018)
[2] Rashika Bangroo; Utsav Gupta; Roshan Sah; Anil Kumar; "Cryptocurrency Price Prediction using Machine Learning Algorithm" 14 Oct. 2022 https://ieeexplore.ieee.org/document/9964870
[3] M. M. Patel, S. Tanwar, R. Gupta, and N. Kumar, "A deep learning-based cryptocurrency price prediction scheme for Financial Institutions," Journal of Information Security and Applications, vol. 55, p. 102583, 2020.
[4] Nakamoto, S. "Bitcoin: A Peer-to-Peer Electronic Cash System." - The original Bitcoin whitepaper by Satoshi Nakamoto, which introduced the concept of cryptocurrencies and blockchain technology.2008
[5] Mone, G. A., & D'Hondt, C.. "Cryptocurrency Price Prediction Using Deep Learning Algorithms." - An academic paper that discusses the use of deep learning algorithms for cryptocurrency price prediction.2019
[6] Gandal, N., Halaburda, H., & Moore, T. "Price Manipulation in the Bitcoin Ecosystem." - A research paper that discusses price manipulation in the Bitcoin ecosystem, highlighting the need for prediction models.2018
[7] Cho, K., van Merrinboer, B., Gulcehre, C., Bougares, F., et al.: Learning phrase representations using RNN encoder-decoder for statistical machine translation (Jun2014). https://doi.org/10.3115/v1/D14-1179
[8] Saad, M., Mohaisen, A.: Towards characterizing blockchain-based cryptocurrencies for highly accurate predictions. In: Proc. IEEE Conf. Computer Communications (Infocom) Workshops. pp. 704– 709 (2018)
[9] M. Saad and A. Mohaisen, "Towards characterizing blockchain-based cryptocurrencies for highly-accurate predictions," IEEE INFOCOM 2018 - IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS), 2018.
[10] "Understanding Cryptocurrencies: Game-Changing Financial Technology" by Harvard University - This online resource provides an overview of cryptocurrencies, their impact, and controversies.
[11] Junwei Chen , Analysis of Bitcoin Price Prediction Using Machine Learning Graduate School of Economics, Kobe University, Kobe 657-8501, Japan*J. Risk Financial Manag.* 2023, *16*(1), 51; https://doi.org/10.3390/jrfm16010051Received: 28 December 2022 / Revised: 10 January 2023 / Accepted: 11 January 2023 / Published: 13 January 2023
[12] By JAKE FRANKENFIELD Digital Currency Types, Characteristics, Pros & Cons, Future Uses Updaterd April20,2023