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PRICE PREDICTION AND ANALYSIS FOR CRYPTOCURRENCIES

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Abstract: ***The advancement of financial technology resulted in the invention of digital money, which opened up the possibility of profitable cryptocurrency investment. Investors are looking for a dependable approach to forecast market fluctuations in cryptocurrency values in order to support their investing plan. Numerous research on various cryptocurrencies have been undertaken in order to precisely anticipate values. Based on the aforementioned argument, The advanced hybrid model combines the strengths of Gated Recurrent Units (GRU) and Long Short Term Memory (LSTM) to anticipate Bitcoin, Ethereum and Ripple values in this paper. Because it has been properly trained and validated using generally accessible data sets, the suggested model can be used in real-time applications. The results demonstrate that the model estimates prices more precisely than earlier models.***

Key words : Cryptocurrency, price prediction, GRU, LSTM, Neural Network

1.INTRODUCTION

1.1 Background

The rise of financial technology and the advent of cryptocurrencies have revolutionized the concept of digital money. Cryptocurrencies operate on decentralized blockchain technology, providing secure and transparent transactions. The potential for profitable investments in cryptocurrencies has motivated researchers to explore effective price prediction approaches.

1.2 Introduction

Cryptocurrencies have emerged as a popular investment asset class, attracting the attention of investors worldwide. The dynamic and volatile nature of cryptocurrency markets necessitates accurate price prediction models to guide investment decisions. This aims to develop a robust model for forecasting the values of Bitcoin, Ethereum, and Ripple.

Benefits of Cryptocurrencies

The following are some benefits of digital currencies:
1.Quick transaction and transfer times
2.No physical production is necessary.
3. Implementing Monetary and Fiscal Policy
4.Less Expensive Transaction Costs
5.Decentralised
6.Privacy
7.Around the World Accessible

Problems with Digital Currencies

The following are some drawbacks of digital currencies:
1.Issues with Storage and Infrastructure
2.Hacking Possibilities
3.Variable Value
4.Limited Adoption
5. Irreversibility

1.3 Purpose

The purpose of this model is to create an accurate and effective model for predicting changes in market cryptocurrency values. To give investors a reliable tool to complement their bitcoin investment plans, deep learning techniques and a hybrid approach using GRU and LSTM networks are used.

1.4 Scope

The scope of this model is to use historical data to make predictions about the future values of Bitcoin, Ethereum, and Ripple. In order to train and validate the hybrid model, common datasets relevant to these cryptocurrencies will be used. The model's effectiveness will be assessed in real-world situations, showcasing its accuracy and usefulness for guiding investors in making wise decisions.

1.5 Problem Statement

Investors face tough hurdles as a result of the volatile values and dynamic
qualities of cryptocurrencies. Current methods for predicting cryptocurrency values frequently don't work in the present. Therefore, it is necessary to create a forecasting model that is accurate and effective and can be used in real-world circumstances.

1.6 Need

Investors in the bitcoin industry need a trustworthy strategy to predict market swings and precisely forecast cryptocurrency values. This demand results from the desire to optimize investing methods based on trustworthy predictions and the inherent dangers involved with bitcoin investments.

1.7 Objectives

The following are the objectives:

- Create a hybrid deep learning model using GRU and LSTM networks.

- Assemble and prepare historical Bitcoin, Ethereum, and Ripple data.
- Using the gathered datasets, train and validate the suggested model.
- Compare the hybrid model's performance to other current methods to gauge its effectiveness.
- Show how the suggested methodology can accurately and immediately predict the value of a coin.
- Assist investors in their cryptocurrency investment ideas by giving them a solid tool.

1.8 Existing System

Numerous studies have been conducted. However, the bulk of current approaches are limited in their capacity to be applied in real-time. Sometimes, this leads to less accurate projections since the dynamic character of bitcoin values is neglected.

1.9 Proposed system

The system suggests a hybrid deep learning model that blends Long Short Term Memory (LSTM) and Gated Recurrent Units (GRU) networks. By combining the benefits of the GRU and LSTM architectures, the hybrid model solves the drawbacks of previous methods. Using typical datasets relevant to Bitcoin, Ethereum, and Ripple, it has been trained and validated. A useful tool for investors, the suggested model exhibits accuracy in predicting bitcoin values and real-time application.

2. LITERATURE SURVEY

Numerous research is being undertaken to forecast cryptocurrencies prices using a range of classifiers and methodology.Here are a handful in more depth.

Rathan, Venkat Sai & Sai Manikanta(2019) et al. [1] concentrated on determining the Bitcoin forecast accuracy using several machine learning algorithms and comparing their precision. Comparison of decision tree and regression model experiment results. The crypto-currency market's exchange techniques are heavily impacted by high volatility. Gathered the data (live data from 2011 to the present was gathered from quandl.com) and used machine learning techniques like regression and decision trees for price forecasting.The accuracy for Decision Tree and Regression is 95.88 and 97.59.

The price fluctuations of bitcoin as a result of buy and sell orders were discussed by Tian et al. [12]. Dealt with moving average values and regression methods and created a time series model.

In summary, the literature survey highlights the diverse range of methodologies and techniques employed in cryptocurrency price prediction. Deep learning models, such as LSTM and GRU networks, have shown promising results due to their ability to capture temporal dependencies. Additionally, incorporating sentiment analysis and considering external factors, such as regulatory events, can provide valuable insights into cryptocurrency price movements. The suggested model aims to contribute to the existing body of literature by introducing a hybrid model for predicting the values of Bitcoin, Ethereum, and Ripple.

3. SYSTEM ANALYSIS

The system analysis is strongly related to the requirements analysis. It is also a clear formal investigation done to help someone come up with a much better plan of action and choose a much better course of action than they otherwise would have.

This process entails breaking down the system into various sections to investigate things, analyzing system goals, breaking down what must be built, and attempting to communicate with users in order to specify definite needs.

3.1 EXISTING SYSTEM

For price forecasting and prediction, machine learning methods like regression and decision trees were used after obtaining the dataset for the article from quandl.com.

There will be a tonne of statistics available for all time periods. Quandl.com to gather real-time data from 2011 to the present, and it provided us with the most comprehensive date-by-date analysis of the bitcoin price. The data set is converted into a CSV file.The execution is completed using the steps below.

For 20% of the test input,Regression was used to predict the price trend. The projected values were shown and their accuracy was evaluated.

3.2 PROPOSED SYSTEM

The hybrid model addresses the shortcomings of prior techniques by combining the advantages of the GRU and LSTM architectures. It has been trained and validated using common datasets relevant to Bitcoin, Ethereum, and Ripple. The model, which is a helpful tool for investors, shows accuracy in predicting bitcoin values and real-time application.

Data Collection:

The historical prices data for cryptocurrencies were collected from yahoo finance website from 2016 to till date. Real time data is collected.The opening, high, low, and closing prices made up the four components of the price data. Ripple, Ethereum, and Bitcoin are three of the most popular cryptocurrencies, and their prices are all analyzed.

Models:

Deep neural networks have been used in some studies to forecast the financial markets. Used a popular deep learning model— Hybrid LSTM GRU model—to examine and forecast the price dynamics of cryptocurrencies.

4. SYSTEM ARCHITECTURE

4.1 System Architecture

Fig 4.1., System Architecture of Hybrid GRU-LSTM model

The structure and arrangement of the various elements and procedures that make up a machine learning system is known as machine learning architecture .How data is handled, models are trained and evaluated, and predictions are made are all outlined in the machine learning architecture.

It acts as a model for creating an ML system.Here our architecture consists of Data Collection, Data Exploration, Data Preprocessing, Selecting machine learning models, Training the model using data, Data Evaluation/Testing and Displaying results.

4.2 Data flow Diagram

Data flow diagrams (DFDs) illustrate the flow of information inside a system or process.

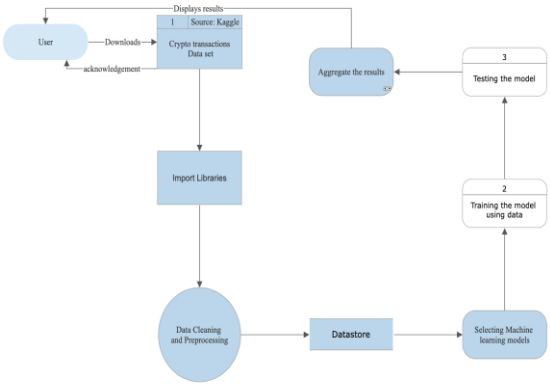

Fig 4.2., Data flow diagram of Hybrid GRU-LSTM model

Transactions in the dataset are analyzed before being categorized based on characteristics. Data is sent for evaluation, where we evaluate the transactions using a deep learning model. After testing, it is possible to compare the outcomes of the various models.

5. IMPLEMENTATION

Modules to be implemented are:

- Real time Crypto currency transactions data set from yahoo finance website
- Import libraries
- Clean/ Preprocess the data
- Feature Extraction
- Feature Selection
- Run Hybrid GRU- LSTM model
- Hyper tuning Parameters
- Predict the results
- Accuracy of hybrid models.

Model Architecture:

To forecast cryptocurrencies values, the organized hybrid model combines the advantages of Gated Recurrent Units (GRU) and Long Short Term Memory (LSTM). The model's design, which is composed of stacked GRU and LSTM layers, enables it to recognise both short- and long-term dependencies in the data.The model is designed to learn from historical patterns and make accurate predictions.

The hybrid model is trained using the preprocessed data. The training process involves feeding the historical data into the model and adjusting its internal parameters to minimize the prediction errors. The model's performance is evaluated using appropriate evaluation metrics such as mean squared error (MSE) or mean absolute error (MAE). To ensure the model's reliability, it is validated using separate validation datasets.

Real-Time Application:

The trained and validated hybrid model is suitable for real-time applications. It can be integrated into systems that provide cryptocurrency investment services or market analysis tools. The model can take input data in real-time and generate predictions for future cryptocurrency values. Its ability to accurately forecast prices makes it a valuable tool for investors in making informed decisions.

6. RESULTS AND ANALYSIS

6.1 Results

The results of the hybrid model's predictions reveal a high degree of accuracy when compared to other existing models. The model successfully forecasts the prices of Bitcoin, Ethereum, and Ripple with remarkable precision. The accuracy of the predictions demonstrates the effectiveness of the deep-learning-based hybrid approach in capturing the dynamic properties and influences on cryptocurrency values.

6.2 Analysis

The superior performance of the hybrid model can be attributed to the combination of GRU and LSTM architectures. GRU units effectively capture short-term dependencies in the cryptocurrency data, while LSTM units excel at capturing long-term dependencies. By combining these architectures, the hybrid model successfully captures both short-term and long-term patterns, resulting in accurate predictions.

6.3 Screenshots

[**********100%**********] 1 of 1 completed

Date	Open	High	Low	Close	Adj Close	Volume
2017-11-09	0.217911	0.221791	0.214866	0.217488	0.217488	147916992
2017-11-10	0.218256	0.219068	0.205260	0.206483	0.206483	141032992
2017-11-11	0.205948	0.214456	0.205459	0.210430	0.210430	134503008
2017-11-12	0.210214	0.210214	0.195389	0.197339	0.197339	251175008
2017-11-13	0.197472	0.204081	0.197456	0.203442	0.203442	132567000
...	...	...	...	...	...	...
2023-05-25	0.453586	0.454629	0.445622	0.453734	0.453734	697466810
2023-05-26	0.453743	0.469571	0.453007	0.469140	0.469140	947890355
2023-05-27	0.469117	0.477721	0.466716	0.472245	0.472245	634937525
2023-05-28	0.472240	0.485815	0.470784	0.482889	0.482889	570647795
2023-05-29	0.482875	0.494352	0.477904	0.494151	0.494151	1039953786

2028 rows × 6 columns

Fig 6.1 ., Informatics of data

Data description has the details such as Open,High,Low,close,Adj close, Volume w.r.t Date.
It is clear that the dataset is largely uncluttered and devoid of null values.

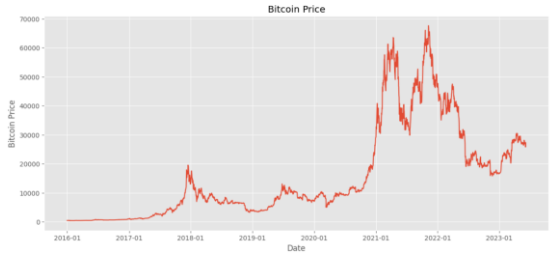

Fig 6.2., Bitcoin graph with prices

Partition of the data is performed along with min-max normalization. With composition, the data set was divided into training, validation, and test sets, with 70% of the data going to training, 10% to validation, and 20% to test sets.

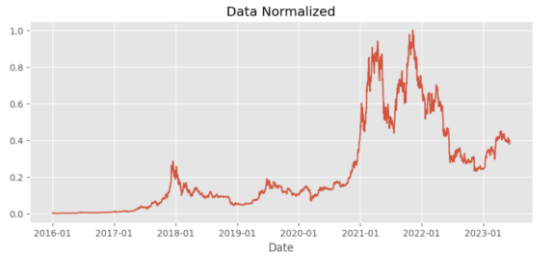

Fig 6.3 ., Min-Max normalization graph

Fig 6.4., Training data graph

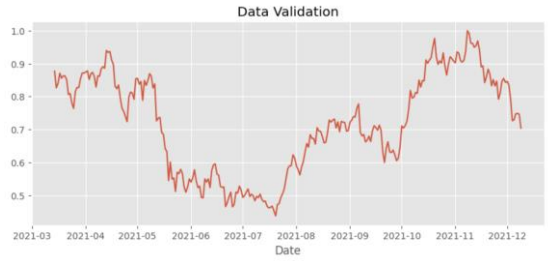

Fig 6.5., Validation data graph

	Data Test	Prediction Results
0	50098.335938	48541.460938
1	46737.480469	50368.683594
2	46612.632812	50136.570312
3	48896.722656	47483.785156
4	47665.425781	47936.792969
...	...	...
537	27249.589844	27187.792969
538	27075.128906	26977.736328
539	27119.066406	27274.310547
540	25760.097656	27147.236328
541	27238.783203	26847.242188

542 rows × 2 columns

Fig 6.6 ., Comparison data actual and data prediction values

The values of predicted values and the actual values are shown in the above image.

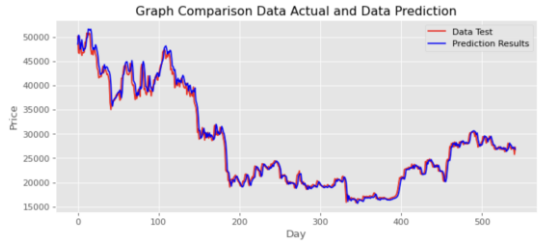

Fig 6.9., Bitcoin Graph comparison data actual and data prediction

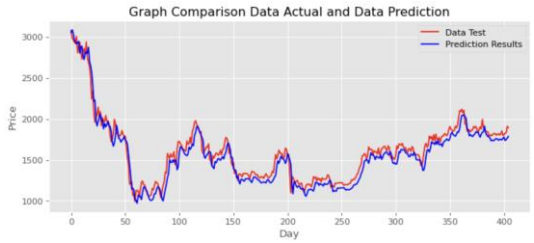

Fig 6.7., Ethereum Graph comparison data actual and data prediction

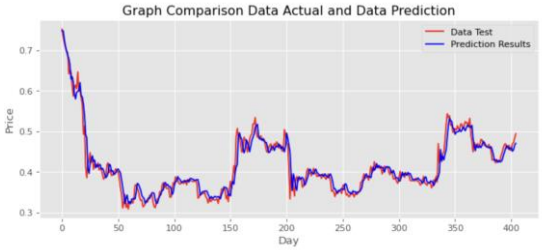

Fig 6.8., XRP Ripple Graph comparison data actual and data prediction

The graph shows that the prediction results can move in step with the test set. However, there are some prediction results that differ significantly from the real sets.

```
from sklearn.metrics import r2_score
r2_score=r2_score(datatest, datapred)
r2_score*100
```

```
98.38663087684738
```

Fig 6.9., Accuracy of Hybrid GRU-LSTM model

The accuracy obtained for the hybrid GRU-LSTM model is 98.3%.

Model	Percentage
LSTM	94 %
Hybrid GRU-LSTM	98.3 %

Table 6.1, Accuracy of models

The outcome demonstrates that hybrid GRU LSTM is effective for predicting bitcoin prices, with GRU achieving an accuracy of about 98.5% compared to LSTM's 94%.

Our suggested work performs better than current works in accuracy.

7. CONCLUSION AND FUTURE SCOPE

7.1 Conclusion

In conclusion, the advancement of financial technology has introduced digital money and paved the way for profitable cryptocurrency investments. Among various cryptocurrencies, Bitcoin has gained significant popularity and acceptance, transforming the financial system. However, the dynamic nature and unpredictability of cryptocurrency values pose challenges and increase investment risks. Suggested a hybrid model, combining Gated Recurrent Units and Long Short Term Memory, to accurately estimate the values of Bitcoin, Ethereum, and Ripple in real-time scenarios..

The hybrid model addresses the limitations of existing approaches by combining the strengths of GRU and LSTM networks. By leveraging the temporal dependencies and patterns captured by these architectures, the model can accurately forecast cryptocurrency values. The robust training and validation using common datasets ensure the reliability and effectiveness of the model.

7.2 Future Scope

While the intended deep-learning-based hybrid model for cryptocurrency value prediction shows promising results, there are several avenues for future research and enhancements

- Exploring Alternative Deep Learning Architectures: The field of deep learning is continuously evolving, with new architectures and techniques emerging. Investigating alternative architectures, such as Transformer models or graph neural networks, may further enhance the accuracy and efficiency of cryptocurrency value predictions.
- Cross-Validation and External Validation: To ensure the generalizability and reliability of the model, future studies can employ cross-validation techniques and external validation on unseen datasets. This will enhance its credibility.
- Incorporating Risk Analysis: Cryptocurrency investments come with inherent risks. Future research can incorporate risk analysis techniques within the hybrid model to provide investors with a holistic view of both the predicted values and associated risks. This will enable investors to make more informed decisions based on their risk appetite.

In summary, the intended hybrid model offers significant potential for predicting cryptocurrency values accurately. By further exploring the future scope mentioned above, researchers can continue to advance the field of cryptocurrency investment prediction and provide valuable tools for investors in an evolving financial landscape.

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