**Research Article: Prediction of Bitcoin Price Using Bi-LSTM Network**

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**1. Summarize of the Research**

**Objective**

The research objective is to predict daily Bitcoin price variations using neural networks, specifically a Bi-LSTM (Bi-directional Long Short-Term Memory) model. And the main goal is to assist investors in decision making by providing a more accurate prediction of price trends in the cryptocurrency market.

**Methodology**

* Data collection: The dataset includes historical Bitcoin market data from January 2012 to September 2020. The dataset was downloaded from Kaggle. This data includes price metrics such as opening, closing, high, and low prices.
* Model integration: Bi-LSTM neural network model was used for time series prediction. And the method leverages the memory capabilities of Bi-LSTM to analyze temporal patterns in price trends.
* Data processing: To increase prediction accuracy, the data was transformed into a time series windows and normalized.
* Performance comparison: Bi-LSTM model was compared with the forecasting techniques of XG Boost and linear regression. The evaluation metrics included the Mean Absolute Percentage Error (MAPE) to assess prediction accuracy.

**Findings**

* Bi-LSTM model achieved better accuracy compared to linear regression and XG Boost, with Mean Absolute Percentage Error of 13%.
* The slope of the predicted price curve can provide valuable insights for investors. A positive slope indicates a potentially good investment opportunity, guiding decision-making.
* The study highlights challenges of forecasting Bitcoin prices due to the inherent volatility of the cryptocurrency market and need for advanced predictive techniques.

**Conclusions**

The Bi-LSTEM model demonstrated strong potential in Bitcoin price prediction and aiding investment decisions. It outperformed other approaches, highlighting the effectiveness of advanced deep learning techniques for financial predictions.

**Key contributions**

* The research introduces the use of a Bi-LSTM network to predict Bitcoin prices.
* Improved prediction accuracy: The model achieved MAPE of 13%, outperforming traditional models.
* The model offers to assist investors in making useful decisions regarding Bitcoin investments.
* A clear framework for using historical data to predict future trends.

**Limitations**

* The dataset was aggregated daily, potentially losing fine-grained temporal information.
* The model's performance might not generalize well in highly volatile market conditions.
* The reliance on historical data limits its ability to adapt to unprecedented events like regulatory changes or technological disruptions.

**2. Identify Research gaps**

**Identified Research gaps**

* The study used daily aggregated data, which may not capture short term price fluctuations. Minute level or second level data could be explored to enhance model precision.
* Global financial news, geopolitical events, or regulatory changes factors were not incorporated into the model. These variables might improve the prediction’s robustness.
* The model was trained and validated on Bitcoin data alone.
* The study does not address the influence of market investor sentiment, which can significantly impact cryptocurrency prices.

**Opportunities for further studies**

* Integrate external data such as social media trends or blockchain network metrics.
* Develop a real time prediction model for intraday trading.
* Evaluate model performance during extreme market conditions.