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Novel Approach for Cryptocurrency Price Prediction using Machine Learning

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ABSTRACT: In recent years, Bitcoin has emerged as the most prominent cryptocurrency in the market. However, its prices are characterized by high volatility, making accurate predictions challenging. Therefore, this research aims to identify the most efficient and accurate model for predicting Bitcoin prices using various machine learning algorithms. The study utilized 1-minute interval trading data obtained from the Bitcoin exchange website Bitstamp, covering the period from January 1, 2012, to January 8, 2018. Several regression models were experimented with using the scikit-learn and Keras libraries. The best-performing models achieved a Mean Squared Error (MSE) as low as 0.00002 and an R-Square (R²) as high as 99.2%.

KEYWORDS: model, data, result, accuracy

I. INTRODUCTION

The market is influenced by a wide range of factors, including recent political and economic developments, the fact that cryptocurrencies are in addition to stocks and foreign exchange (forex), and other factors that make market price forecasting both fascinating and challenging for researchers and investors. A cryptocurrency, according to ODO, is a digital currency that functions without the assistance of a central bank and controls the creation of new units while utilizing encryption techniques to confirm financial transactions. Bitcoin was the first cryptocurrency and it started trading in January 2009. The most well-known cryptocurrency worldwide is called Bitcoin. Through the internet, payments may be transmitted directly between parties using this peer-to-peer electronic currency system. Bitcoin's price changes like stock, although it is different. There are many algorithm used for price prediction in stock data. The limitations that apply to bitcoin, however, are distinct.

A. LITERATURE SURVEY

[1] The study deals with various time intervals, including 10-minute, 10-second, and daily time series data, preparing three datasets for 30, 60, and 120 minutes. GLM/Random Forest techniques were applied, resulting in the creation of three linear models used for predicting Bitcoin prices. The author evaluates previous endeavors to forecast the U.S. stock market [2], concluding that the mean square error of the prediction network equaled the standard deviation of excess returns. However, the author suggests that several fundamental financial and economic variables could be utilized to forecast market excess returns.

In [3], rather than predicting the future price of stocks explicitly, the authors forecast their trends, akin to identifying patterns. Short-term (days or weeks) and long-term (months) forecasts were made, with the latter yielding more accurate results 79% of the time. The paper also introduces an intriguing methodology for evaluating the network's performance, determining whether to buy, sell, or hold stocks based on the expected output.

According to [4], the Non-linear Autoregressive Exogenous (NARX) model and the Multi-Layer Perceptron (MLP) model are compared. Although MLP doesn't outperform the NARX model in price prediction, it demonstrates potential for stock market prediction. The authors developed and evaluated the network's performance using the neural network toolkit in MATLAB.

[5] compares linear regression models with polynomial regression models, including KNN regression and Support Vector regression. Based on RMSE, it concludes that KNN models outperform vector models.

II. METHOD AND TECHNIQUES

This section outlines the methodology employed for forecasting Bitcoin prices. To mitigate uncertainty in Bitcoin projections, both social and financial factors were considered. Two machine learning algorithms, namely Long Short-Term Memory (LSTM) and Support Vector Machine (SVM), were utilized to estimate Bitcoin prices.

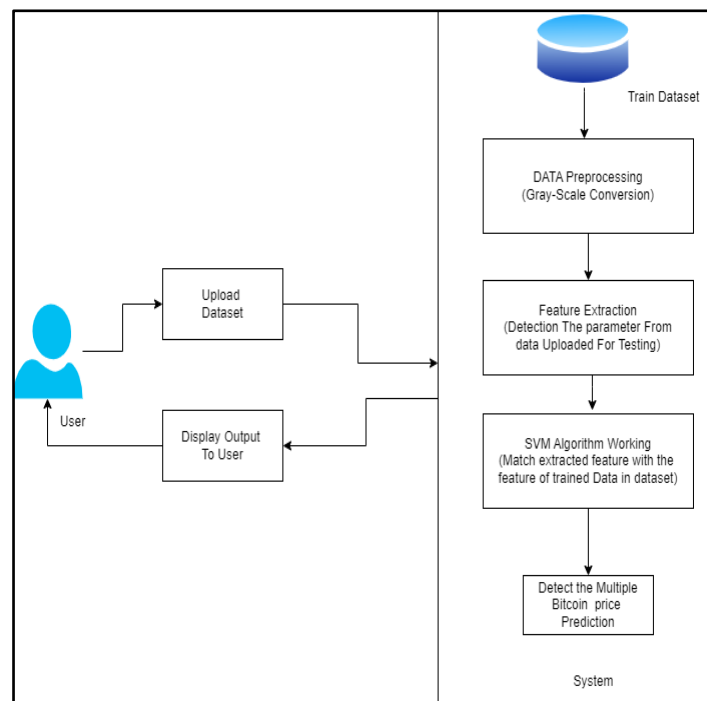


Fig 1. System Architecture

A. Support Vector Machine (SVM)

Support Vector Machine (SVM) stands out as a robust machine learning technique applicable to regression, outlier identification, and both linear and nonlinear classification tasks. Its versatility extends to various applications such as face recognition, image classification, text classification, and anomaly detection.

Support Vectors: In SVM, support vectors refer to the crucial data points utilized in determining the optimal decision boundary (hyperplane) that separates different classes.

Hyperplane: The primary objective of SVM is to identify the hyperplane that maximizes the margin, or the gap between the hyperplane and the nearest data points (support vectors), in binary classification tasks. This hyperplane ensures the most distinct separation of classes.

Kernel Trick: SVM leverages a kernel function to effectively handle non-linear decision boundaries. By transforming the input data into higher-dimensional space, the kernel function simplifies the task of finding a hyperplane that effectively separates the classes.

B. Long Short Term Memory

LSTMs are particularly well-suited for handling sequential data, which includes speech, natural language, and time series. Their versatility has led to extensive use across various applications, including time series prediction, speech recognition, and language modeling.

Sequential data, such as speech, natural language, and time series, are examples where LSTMs excel. They have found widespread application in tasks like time series prediction, speech recognition, and language modeling.

The gate input (t_i) is determined by computing " $t_i = \sigma(W_i * [h_{(t-1)}, x_t] + b_i)$."

The gate forget (t_f) is calculated using the formula " $t_f = \sigma(W_f * [h_{(t-1)}, x_t] + b_f)$."

III. IMPLEMENTATION

We have implement the project by training the model and by using the live dataset. We used the following database in the model:

Database Requirements:

The Database Requirements calls for the usage of a large amount of data, some of which will be needed repeatedly. A database is the most suitable format for storing this data. In this way, information entered into the database requirements will be preserved and then retrieved for usage by the requirements. The utilisation of the Time Control System is a crucial component of this project. This section evaluates a number of databases to determine which ones are appropriate for this project.

IV. ANALYSIS OF RESULT

The outcomes of SVM and LSTM bitcoin price prediction utilising bitcoin parameters are displayed in Figs. 2, 3, and 4.

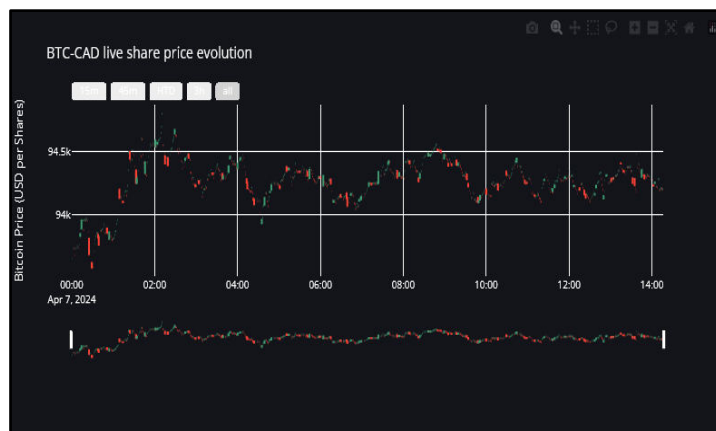


Fig 2. Recent Bitcoin Price

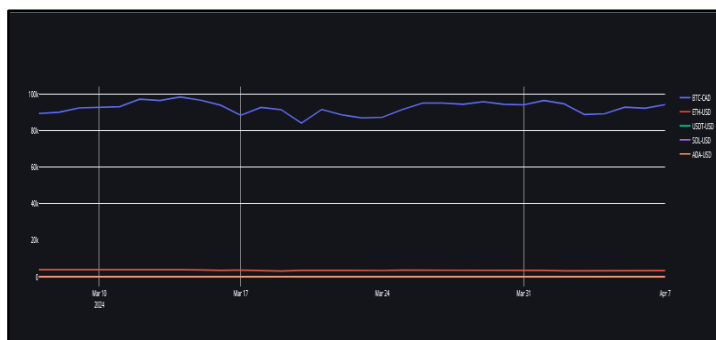


Fig 3. Active Bitcoin Market

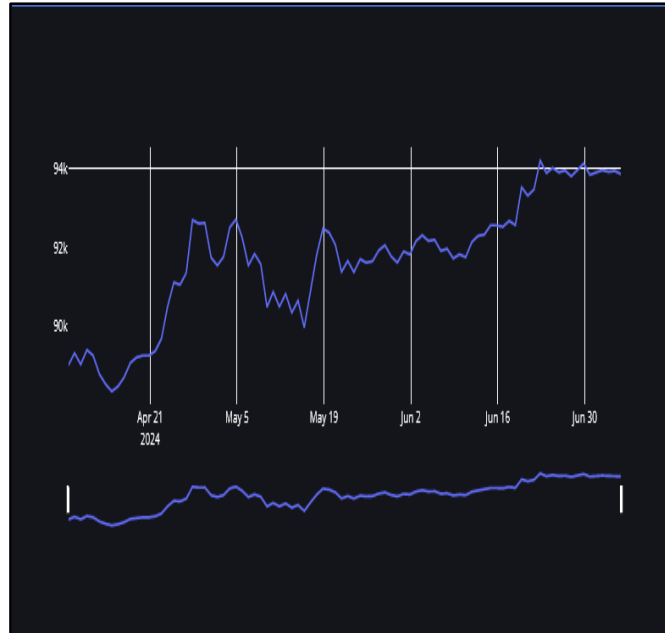


Fig 4. Predicted Bitcoin Price

V. SUMMARY AND NEXT WORK

We intend to implement both of the aforementioned strategies. Following the construction of the learning framework and completion of normalization, we will evaluate which strategy is most effective for addressing the Bitcoin prediction challenge.

In this study, we assessed the performance of MLP and RNN models in predicting changes in Bitcoin prices. Both MLP and RNN models outperformed shorter-term predictions with their long-term projections. Similar to stock price prediction, long-term cryptocurrency price forecasting demonstrates high accuracy, typically ranging between 60 and 80% of the actual value.

In this study, the Multilayer Perceptron model achieved 81.3% accuracy, 81% precision, and 94.7% recall over a timeframe spanning three and 200 epochs. Further research can be conducted by exploring additional features.

RECOGNITION

We express our gratitude to Prof. Priya Ujawe, our project guide, for motivating us to work on this project.

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