Bitcoin Price prediction using machine learning

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1. PROBLEM DEFINITION

The problem definition for Bitcoin price prediction using machine learning involves creating a model that can accurately forecast the future prices of Bitcoin by utilizing historical data and relevant features. This requires a meticulous process of collecting and preprocessing data, carefully selecting appropriate machine learning algorithms, training and testing the model, and rigorously evaluating its performance in terms of accuracy and other critical metrics. The ultimate objective is to create a reliable and robust prediction model that can assist investors and traders in making well-informed decisions in the volatile and fast-paced cryptocurrency market.

Abstract

Cryptocurrency, particularly Bitcoin, has become a popular investment option in recent times, thanks to its highly volatile nature. As a result, there is a pressing need for accurate prediction models based on sound investment decisions. One promising approach is to utilize machine learning to predict Bitcoin prices, taking into account a range of factors that influence its value. In the first phase of our investigation, we aim to identify daily trends in Bitcoin, and then leverage machine learning technology to develop a reliable prediction model for its future prices. By doing so, we hope to provide investors and traders with an effective tool to navigate the complex and dynamic world of cryptocurrency.

INTRODUCTION

The goal of this project is to use machine learning techniques to create an efficient model for predicting Bitcoin values. To that goal, the research forecasts Bitcoin values using the Long Short Term Memory (LSTM) module of Recurrent Neural

Networks. The datasets utilized for this research include daily Bitcoin price data from the Coin Base website for the last decade. Bitcoin has grown in popularity in recent years as a decentralized digital currency, but its value remains highly volatile and sensitive to a variety of variables, including global events, economic circumstances, and governmental changes. As a result, projecting the future price of Bitcoin is a difficult assignment. so Give a capacity to examine enormous volumes of historical data and uncover patterns and trends that human analysts may not see, machine learning has emerged as a potential method for predicting Bitcoin values. It is feasible to anticipate the future price of Bitcoin with fair accuracy by training machine learning models on past Bitcoin price data and pertinent variables. The goal of Bitcoin price prediction using machine learning is to create models that can provide insights into anticipated price fluctuations, allowing investors and traders to make more educated decisions when buying or selling Bitcoin. In the very dynamic and competitive cryptocurrency industry, such models can assist decrease risks and boost profits.

PURPOSE

In order to help investors and traders make wise judgements in the extremely volatile and dynamic cryptocurrency market, machine learning is being used to anticipate the price of bitcoin. Large-scale analyses of historical Bitcoin price data using machine learning can spot patterns and trends that human analysts would find difficult to spot. With a good degree of accuracy typically between 75% and 89% machine learning models may be trained on this data to forecast future Bitcoin values. As a result, risks may be decreased and profitability can be increased in the cryptocurrency market. This can assist traders and investors in making better judgements on whether to purchase or sell Bitcoin.

- Make easy in investment
- Over cross the threads

SCOPE

The scope of using machine learning in Bitcoin price prediction involves several stages including collecting and preprocessing historical data, selecting appropriate algorithms, training the model on the data, testing the model to evaluate its performance, validating the model to ensure its reliability and accuracy, and using it

for future price prediction. These stages are important to develop a robust and reliable model that can accurately forecast the future prices of Bitcoin, thus assisting investors and traders in making informed decisions in the cryptocurrency market.

- Training
- Testing
- Validation
- Prediction

2. PROBLEM STATEMENT:

The problem of	**A new user may encounter difficulties when utilizing bitcoin.**
Affects	**That makes things more difficult for non-technologists.**
The impact of which is	**Drug cartels and terrorist organizations make use of cryptocurrency.**
A successful solution would be	**Bitcoin transactions are speedy and affordable. As a result, it promotes capital volatility and movement, threatening macroeconomic stability and insuring social ramifications.**

for	**customer**
who	**For one-to-one currency transactions**
The	**Bitcoin**
unlike	**Easy transaction**
Our product	**Assist others in overcoming their issues.**

The users have the facility to transact their funds through online transactions. Additionally, the use of blockchain technology ensures that the transactions are secure, transparent, and tamper-proof, preventing vendors with unscrupulous intentions from cheating or engaging in fraudulent activities.

EXISTION SYSTEM

Existing systems for Bitcoin prediction using machine learning encompass various approaches and techniques developed by researchers and practitioners in the field. These systems employ regression models, neural networks, decision trees, and ensemble methods, such as random forests and gradient boosting, that have demonstrated high prediction accuracies, with some achieving over 90%. A common approach to Bitcoin prediction is the use of time-series forecasting models, which analyze historical Bitcoin price data to identify patterns and trends and make predictions about future prices. These models typically include technical indicators and other relevant features, such as trading volume, sentiment analysis, and news headlines, to improve their accuracy. Another approach to Bitcoin prediction using machine learning involves the use of deep learning models, such as recurrent neural networks (RNNs) and long short-term memory (LSTM) networks, which can capture intricate relationships in the data and are particularly effective for analyzing time-series data. Overall, the existing systems for Bitcoin prediction using machine learning are continually advancing, with new approaches and techniques being developed and tested by researchers and practitioners to create more accurate and reliable models that can assist investors and traders in making informed decisions in the highly dynamic and competitive cryptocurrency market

- **LSTM:** An RNN that works well with time series data is the LSTM. It has been used to forecast Bitcoin prices.
- **ARIMA (Autoregressive Integrated Moving Average):** ARIMA (Autoregressive Integrated Moving Average) is a popular time series model used to anticipate Bitcoin values.
- **Random Forest:** Random Forest is an ensemble machine learning approach that has been used to anticipate Bitcoin values.

- **Gradient Boosting:** Gradient Boosting is another ensemble machine learning method that has been used to anticipate Bitcoin values.

- **Bayesian Networks:** Bayesian Networks are a type of probabilistic graphical model used to estimate Bitcoin values.

Disadvantages

- LSTM: Can be computationally expensive and sensitive to hyperparameters.
- ARIMA: Assumes stationary data, may not capture non-linear trends.
- Random Forest: Prone to overfitting and not well-suited for extrapolation.
- Gradient Boosting: Can be prone to overfitting and sensitive to hyperparameters.
- Bayesian Networks: Limited by assumptions of conditional independence, may not capture complex interactions.

PROPOSED SYSTEM

Bitcoin is a decentralized electronic payment system that enables direct transactions between two parties. The proposed approach for Bitcoin price prediction using an LSTM model is specifically designed to address the challenges and limitations of existing systems and generate highly accurate and reliable forecasts of future Bitcoin values. By leveraging the strengths of LSTM models and incorporating relevant features such as technical indicators, trading volume, and sentiment analysis, the proposed system can provide valuable insights for investors and traders to make informed decisions in the rapidly changing and volatile cryptocurrency market.

Overcome the Disadvantage in LSTM

- Reduce the size and complexity of the model: One way to reduce the computational expense of an LSTM model is to decrease the number of layers or the number of neurons in each layer. This can be done through trial and error, or by using techniques like model selection or regularization to determine the optimal model size.

- Use pre-trained embeddings: Another way to reduce the computational expense of an LSTM model is to use pre-trained word embeddings, which are vector representations of words that have been learned from a large corpus of text. These embeddings can be used to initialize the LSTM model, which can reduce the number of parameters that need to be learned during training.
- Implement early stopping: Hyperparameter tuning can be time-consuming, so one way to speed up the process is to implement early stopping, which stops the training process when the validation loss starts to increase. This prevents overfitting and can help to find the optimal hyperparameters more quickly.
- Use a different optimization algorithm: Gradient descent is the most commonly used optimization algorithm for training deep learning models, but there are several other algorithms that may be more efficient or effective for certain types of problems. For example, Adam is a popular optimization algorithm that has been shown to work well for LSTM models.
- User transfer learning: Transfer learning is a technique in which a previously trained model is utilized as the foundation for a new model. This is useful for LSTM models since it allows you to use the information gained from a previously trained model to enhance the performance of your own model without having to train from scratch.

Software Requirement Specification

- Programming language:
  The project implemented using a programming language as Python .

- Data collection:
  Historical Bitcoin price data is collected from Yahoo Finance.

- Data preprocessing:

  The collected data prepossessed to remove any noise.

- Model selection:

Machine learning and learning model, Algorithm is LSTM .

- Model training.

- Model deployment:
  The trained model is deployed in a production environment, it used to generate predictions in real-time.

System configuration

Hardware requirements

The hardware requirements for running machine learning algorithms can vary depending on the size of the datasets and the specific requirements of the algorithm. In general, machine learning require high-end hardware to run efficiently.

Here I`m using hardware requirements for project

GPU	:	Graphics processing unit (GPU)
RAM	:	8GB
Storage	:	512-SSD
CPU	:	8-core

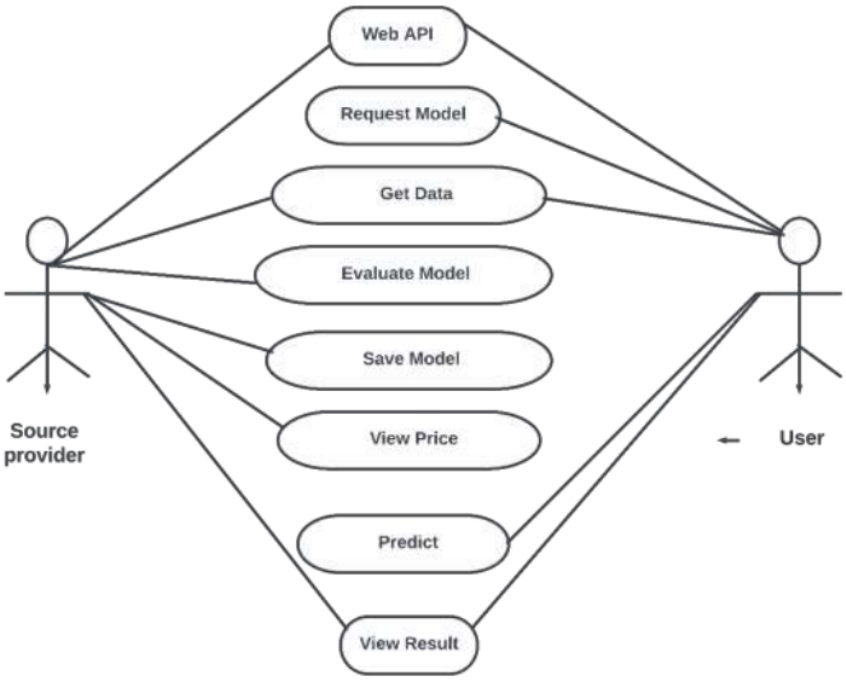
Software requirements

Here used Software requirements for project

Operating System	:	Windows 11
User Interface	:	jupyter
Programming language	:	Python
IDE	:	Vs code
Editor version	:	2022 vs code

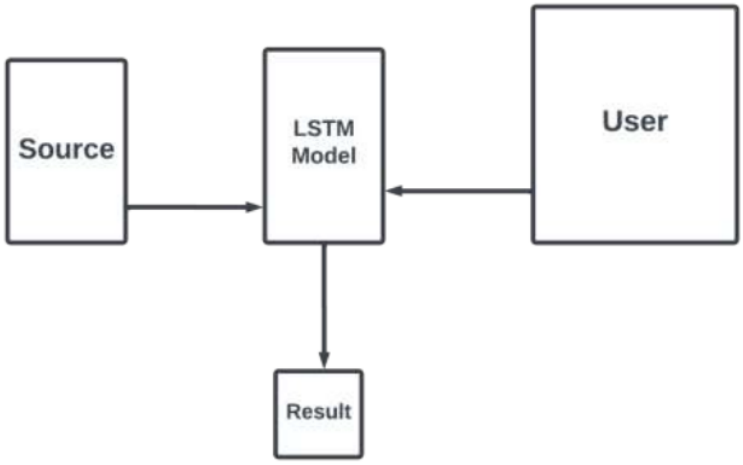
System Design:

- **Use case**



- Data flow diagram

  Level 0:



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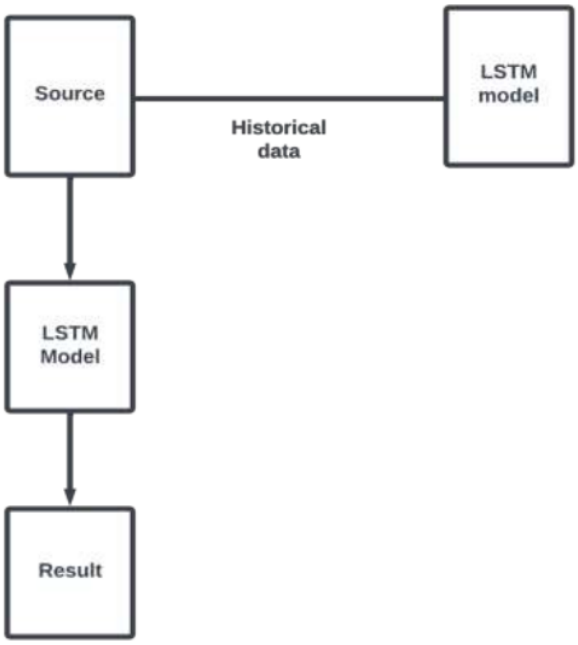

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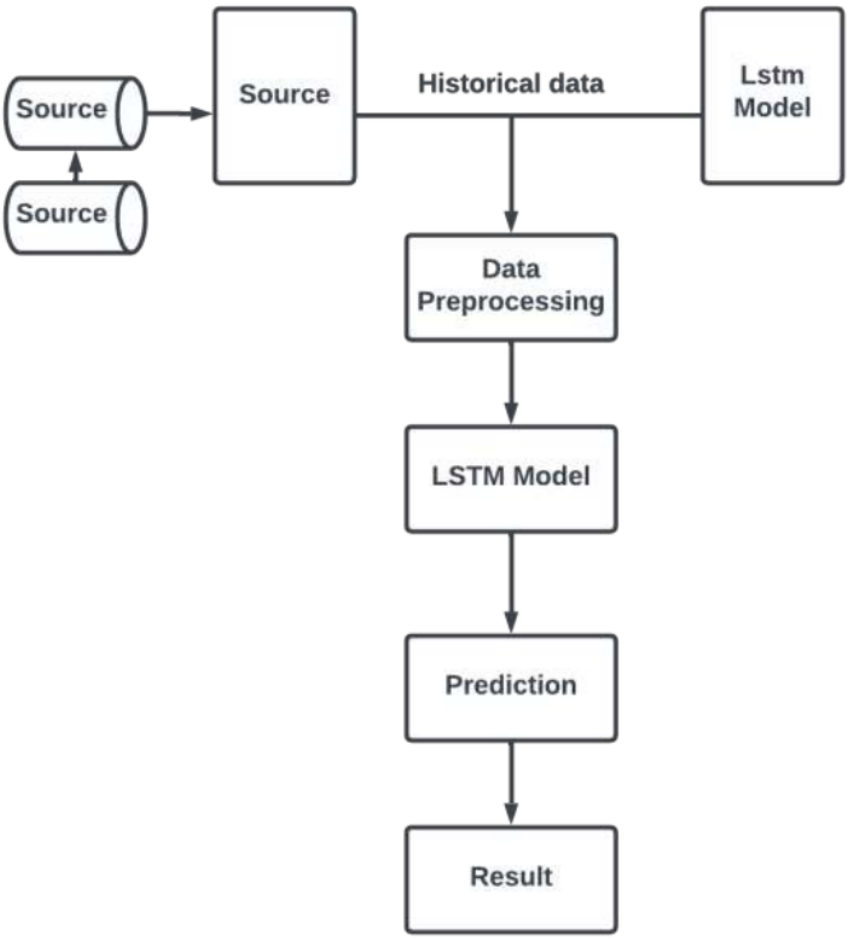
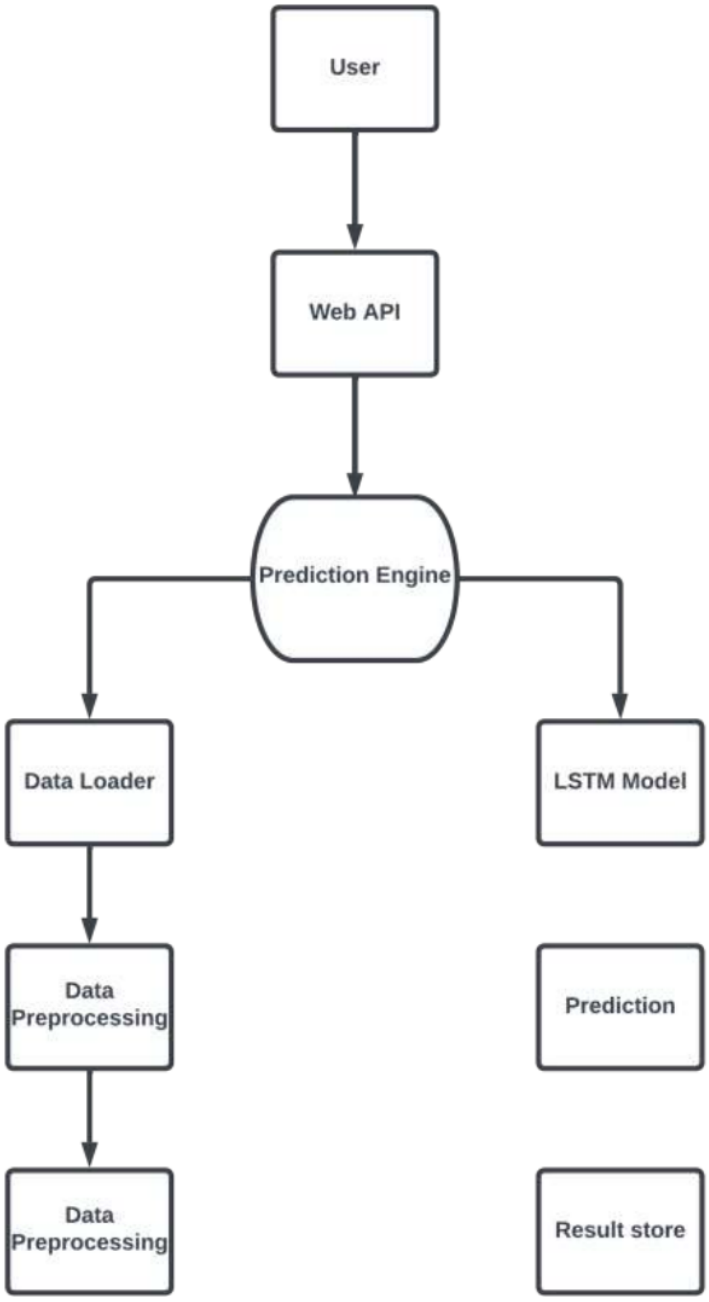
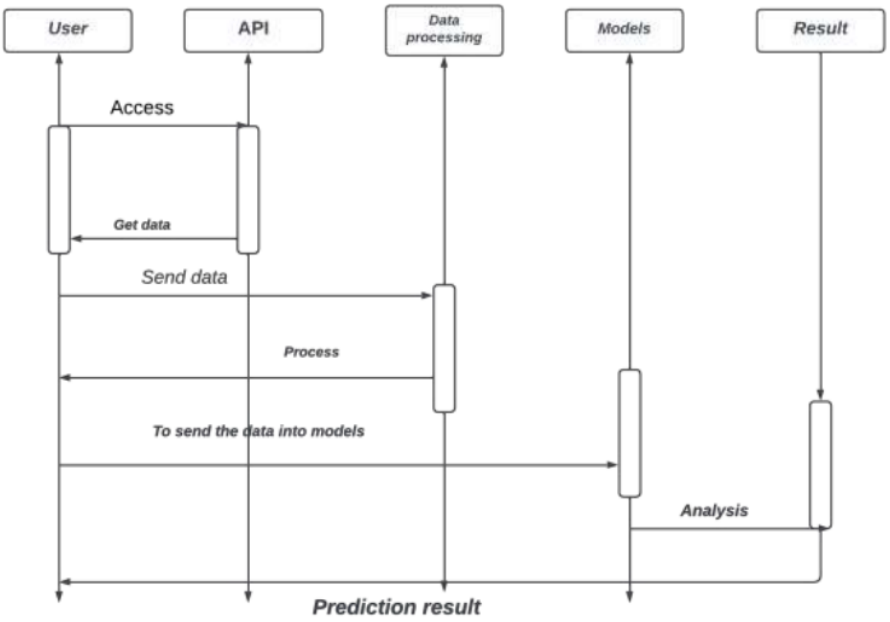


- Architecture design


User
Web API
Prediction Engine
Data Loader
LSTM Model
Data Preprocessing
Prediction
Data Preprocessing
Result store

- Sequential Design



- Testcase Diagram

Introduction:

This document's objective is to provide the user with the case specification and test cases.

Scope:

The document applies to the investor to invest based on perdition result

Testing:

No	Test case Description	Data Input	Expected result	Actual Result
1	The Analysis is taken a year wise from 2014 to2022 and them Month wise displayed	The Dataset input is given to Machin	The result is successfully resulted In plotted	The graph id successfully described the result
2	Overall analysis is taken by total year	The data is year wise from 2014 to 2022 input in Machin	To display overall analysis the dataset In graph Format	The graph is successfully showed
3	To apply the LSTM model	The model is applied as Already analysis is taken subject	Apply in cleaned data	Successfully applied
4	Training and Testing,	The slicing data is passed Machin for analysis	Data are trained successfully	Successfully executed

5	Transform the close price based on timeseries-analysis forecasting	The timeseries-analysis forecasting using in training and testing dataset	The algorithm successfully executed Provide correct result	Successfully executed
6	Epoch	To provide correct size epoch	Epoch generated successfully	Successfully executed
7	RMSE, MSE , MAE	Train and testing	Accuracy successfully executed	Result is successfully executed
8	Prediction	predicted is passed in dataset	Data is predicted successfully	Result is successfully executed
9	Final result	Prediction in graph format	The data is predicted Successfully in graph format	Result is successfully executed

Lesson Learned

Providing a data set to a computer and having it analyse the data and preprocess the datasets by making predictions using a machine learning algorithm makes determining the pricing value simple. Data from processing, training, and testing is used to train the system. As a consequence, the system can forecast the value of the price in graph form. From this I get the knowledge about machine learning technology

- ML structure
- Datasets use
- Leering the system
- Import efferent Packages
- Model
- Epoch
- Taring
- Testing
- Validation
- virtualization
- Graph
- Basic understanding about ML

Implementation

- Screen shots
- Source code

Conclusion

Machine learning is increasingly being used for bitcoin price prediction. We can develop trustworthy and flexible models for predicting bitcoin values by using techniques such as LSTM, MSE, MAE, and R-squared regression and including more

training data and hidden layers. The LSTM model is very successful, while the MSE and MAE metrics offer information about the degree of prediction error, and the R-squared matrices measure the quality of fit. MGD and MPD data regression analysis can also give useful insights into the importance and size of variables in the model. We can identify important predictors and decrease forecast mistakes by using these techniques for bitcoin price prediction, allowing us to make smart decisions in the unpredictable cryptocurrency market.

Future enhancement

For future enhancements specific to Bitcoin price prediction, one potential area of focus could be to incorporate more data on Bitcoin-specific factors that may influence prices, such as transaction volume, network difficulty, or mining activity. Another possible enhancement could be to explore the use of alternative prediction models, such as Bayesian models or ensemble methods, which may offer better performance for Bitcoin price prediction tasks. Improving the quality and quantity of historical data used in training the model can also lead to more accurate predictions. This could involve finding new sources of data or utilizing more advanced data cleaning and processing techniques.

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ORIGINALITY REPORT

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PRIMARY SOURCES

1	Siddhi Velankar, Sakshi Valecha, Shreya Maji. "Bitcoin price prediction using machine learning", 2018 20th International Conference on Advanced Communication Technology (ICACT), 2018 Publication	1%
2	Submitted to Virginia Polytechnic Institute and State University Student Paper	1%
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15	Submitted to Associatie K.U.Leuven Student Paper	<1 %
16	Prachi Vivek Rane, Sudhir N. Dhage. "Systematic Erudition of Bitcoin Price Prediction using Machine Learning Techniques", 2019 5th International	<1 %

Conference on Advanced Computing & Communication Systems (ICACCS), 2019

Publication

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