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Research Paper

Crypto currency Price Forecaster

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ABSTRACT:
This research paper depicts the brief note about cryptocurrency prices. Here, we use Supervised Machine Learning algorithm called KNN(KNearestNeighborsRegression) to predict cryptocurrency coins prices include Bitcoin (BTC), Ethereum(ETH), Binance(BNB), Matic(MATIC),Tronix(TNX),Dogecoin(DOGE),Solana(SOL), Cosmos(ATOM).Our Machine learning model helps to predict the crypto currency future prices based upon the past data by training and testing with help of ML models, where investor can go through our model and can invest in the crypto currencies. The accuracy of this proposed model observed to be 97%. This model will help the investors for making proper investment decisions by knowing the future prices of the cryptocurrencies before investing which leads to acquire huge profits. It allows people to send money without the interference of banks and its attraction lies in their transferability, ability to not be duplicated or manipulated, and their security. One of the primary reasons for people to dive into the crypto market is that it's very easy and simple to buy and sell assets via trading platforms like Coinbase, Binance, Wazrix, CoinSwitch, ZebPay and many other. Not all ecommerce sites allow purchases using cryptocurrencies. Cryptocurrencies are the digital currencies and are also considered as digital assets. They enable secure online payments without the use of third-party intermediaries/decentralized manner. "Crypto" refers to the various encryption algorithms and cryptographic techniques that safeguard these entries such as elliptical curve encryption, public-private key pairs, and hashing functions. Cryptocurrencies require strong, secure mining algorithms and they rely on miners to validate transactions.

KEYWORDS: *KNN Regression, Supervised Learning, Machine Learning, Cryptocurrency Price, Forecaster, Blockchain, Time-series.*

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I. INTRODUCTION

Cryptocurrency is a digital currency which use decentralized control as opposed to a centralized control. It works based on Blockchain technology where transactions are recorded in public ledger. Now-a-days everyone is showing interest in investing cryptocurrency instead of stock markets due to rapid increase in the profits. A **cryptocurrency**, **crypto-currency**, or **crypto** is a digital currency designed to work as a medium of exchange through a computer network that is not reliant on any central authority, such as a government or bank, to uphold or maintain it. It is a decentralized system for verifying that the parties to a transaction have the money they claim to have, eliminating the need for traditional intermediaries, such as banks, when funds are being transferred between two entities. The first cryptocurrency was Bitcoin, which was first released as open-source software in 2009. As of June 2023, there were more than 25,000 other cryptocurrencies in the marketplace, of which more than 40 had a market capitalization exceeding $1 billion.

Cryptocurrency idea was introduced in the year 1983 by American cryptographer David and later in the year 1995, Chaum built on his early ideas and developed a Digicash. In the beginning(2008-2010) on October 31 2008 Satoshi Nakamoto published the bitcoin paper, describing the functionality of Bitcoin blockchain network. In the year 2010 the first bitcoin transaction has occurred. In 2010 April the value of one BTC was just 14cents and by early November it increased to 29cents. Later in the year 2011 led to creation of altcoins like Ethereum, Litecoin, Ripple, Namecoin and the traders began using technical analysis, examining price charts and trading volumes to predict price movements. In the year 2014 cryptocurrency exchanges like Coinbase emerged making it easier to buy and trade cryptocurrencies. In the year 2017 cryptocurrency markets experienced rapid growth with Bitcoin reaching an all-time high. In the year 2018-2020 cryptocurrency markets underwent a prolonged bear market, with prices falling significantly from previous highs.

In the year from 2020-present Institutional investors, such as hedge funds and large corporations started showing interest in cryptocurrencies. The rise of decentralized finance(DeFi) platforms and non-fungible tokens(NFTs) brought new use cases to blockchain technology such as unique digital asset ownership and decentralized lending.

Cryptocurrencies are digital or virtual currencies underpinned by cryptographic systems. They enable secure online payments without the use of third-party intermediaries. "Crypto" refers to the various encryption algorithms and cryptographic techniques that safeguard these entries, such as elliptical curve encryption, public-private key pairs, and hashing functions. Cryptocurrencies can be mined or purchased from cryptocurrency exchanges. Not all ecommerce sites allow purchases using cryptocurrencies. In fact, cryptocurrencies, even popular ones like b, are Bitcoin, hardly for retail transactions. However, the skyrocketing value of cryptocurrencies has made them popular as trading instruments. To a limited extent, they are also used for cross-border transfers.

II. LITERATURE SURVEY

Three different machine learning algorithms are developed and applied to forecast the prices of three different cryptocurrency types: BTC, ETH, and LTC. Various models' in [1] accuracy has been verified by performance measurements. We then contrasted the actual and estimated prices. The results show that GRU fared better than the other algorithms, with MAPEs for ETH, BTC, and LTC of 0.8267%, 0.2454%, and 0.2116%, respectively. For ETH, BTC, and LTC, the RMSE for the GRU version was found to be 26.59, 174.129, and 0.825, respectively. The GRU model for the targeted cryptocurrency may be regarded as dependable and effective in light of those outcomes. This approach is regarded as the appropriate model. But bi-LSTM exhibits much worse accuracy than GRU and LSTM with large differences between actual and expected spending for BTC and ETH. The test results show that the artificial intelligence algorithm is suitable and reliable for predicting cryptocurrencies. GRU's cryptocurrency price prediction is better than bi-LSTM and LSTM, but all algorithms demonstrate excellent prediction results.

The foremost goal is to acquire a line that nice suits the records. A line is stated to be nice suit whilst it possesses a smaller overall prediction error [2]. Distance among factors in regression line is known as an error. To make the version examine we want to cognizance on LSTM & RNN to permit identity of smaller series patterned records and the price of the following day is predicted. The training of the records wishes a big quantity of filtered records sets. When the records reach the stability factor it does not increase the result performance so with the help of using this feature we will improve it with the help of using the function loss feature, enable feature and optimizer. The results are based on training records which can then be verified using the current price statistical significance test.

The author in [3] proposed machine learning algorithm for better accuracy of the Bitcoin price prediction, only some seem to have concentrated on the usefulness of making use of a variety of methods to inspect with various data structures, as well as elemental characteristics. The authors of the paper, in order to estimate Bitcoin prices on various recurrences making use of ML approaches, initially classified the Bitcoin value by various parameters, such as daily price, high frequency price. A cluster of multi-dimensional characteristics, that include network and property, market and trading, gold spot price and attention have been made use of for Bitcoin everyday value forecast, whereas, the basic trading characteristics obtained from a cryptocurrency exchange have been used for the value estimation in between a 5-minute intermission value. It was also observed that, while comparing with the standard outcomes for prediction of the daily price, they accomplished an enhanced efficiency, with the maximum accuracy rates of 66% and 65.3% for the statistical methods as well ML algorithms, accordingly. One of the main observations made was that some Machine Learning techniques that include Random Forest (RF), XGBoost (XGB), Quadratic Discriminant Analysis (QDA), Support Vector Machine (SVM) and Long Short-term Memory (LSTM) for a 5-minute estimation of Bitcoin surpassed the statistical methods, with accuracies heading towards a rate of 67.2%. It is also noted that their analysis of Bitcoin rate prediction can be considered an important mini-survey in ML methods. Overall, it should be noted that logistic regression and less discriminative analysis methods outperform other ML systems over daily price datasets, demonstrating that multidimensional feature groups are Correct selection can compensate for system arbitrariness. to predict daily Bitcoin value. The article seems to have some limitations, one of which is that it only considers two types of forecast data, when in reality it is necessary to collect price data with many different characteristics, having many more aspects.

In this article, several techniques such as ANN (Artificial Neural Network) and RF (Random Forest) appear to have been used to estimate the next day's closing price for five companies belonging to different service areas. Here, financial related data related to stocks has been used to construct new variables that are used as input to the system in [4]. Systems are ranked using strategic benchmarks, such as MAPE and RMSE. The lower ratio for the two indices mentioned above demonstrates the system's ability to estimate the closing price of a stock. The article notes that, for stock market analysis in particular, to process this type of data, an optimal system is needed that can recognize certain underlying trends and complex relationships for with a data set of

this size. Additionally, ML methods in this area appear to have been shown to improve efficiency rates by about 60% to 86% compared to previous methods. To further the analysis, historical data of 5 companies was collected through Yahoo Finance. Additionally, this dataset includes 10 years of information from various companies, including stock insights. It is worth noting that the stock's own daily closing price seems to have recovered at . Correlation study based on MBE, RMSE and MAPE values seems to indicate that ANN has given a correct estimate more accurate about stock prices, compared to RF. The result shows better speed extracted from the ANN (Artificial Neural Network) model, giving a root mean square error value of 0.42, MAPE of 0.77, and MBE is 0.013. Some limitations of this paper are that fewer than parameters were considered, excluding some factors that might yield better results.

In the article "Deep Neural Network for Cryptocurrency Price Prediction",[5] a model combining RNN, MLP and LSTM was used for prediction. LSTM was found to have the highest accuracy in , predicting the directional movement of cryptocurrencies. However, the limitation is that the trend prediction neural network does not understand the economic cost of misclassification.

Authors in [16-20] collectively provide insights into various aspects related to our Project. Specifically, authored by Swathi Gowroju and Sandeep Kumar, these publications cover diverse topics within the domain of deep learning, image processing, and secure cloud storage. authors delve into the application of a Deep Neural Network, specifically the Optimized UNet model, for accurate age group prediction using pupil information. Finally, presents research on robust Indian currency recognition using deep learning, showcasing the authors' expertise in diverse applications of machine learning techniques. Overall, these publications contribute valuable knowledge to the fields of computer vision, deep learning, and secure data storage, forming a foundation for understanding and potentially implementing related concepts in our project.

III. PROPOSED SYSTEM

The price of cryptocurrency Forecaster is a vs code application that can also be used in a machine learning program for a web application that is trained on clinical datasets. The user or consumer must choose the desired cryptocurrency and the necessary number of days in order to receive a future price prediction for cryptocurrency. By examining historical data, the algorithm will forecast cryptocurrency prices in the future. The output will be shown as the result, and it will vary based on the information the user provides.This lowers the cost and time associated with price prediction. The data format is important in this machine learning model because the model must take the attributes into account.
Our system will be implementing the following algorithms:

3.1 KNN Regression

The real-time data found in the yfinance (a Python library) will be used to train the algorithms that will be put into practice. Eighty percent of the data set will be used to train the algorithm, and the remaining twenty percent will be used to test the algorithm's accuracy. In addition, a number of measures will be implemented to optimize the algorithms in order to increase their accuracy. Two of these steps are preprocessing the data and cleaning the dataset. The main program computes the output by using the user's different parameters as input. A forecast is displayed with the result.

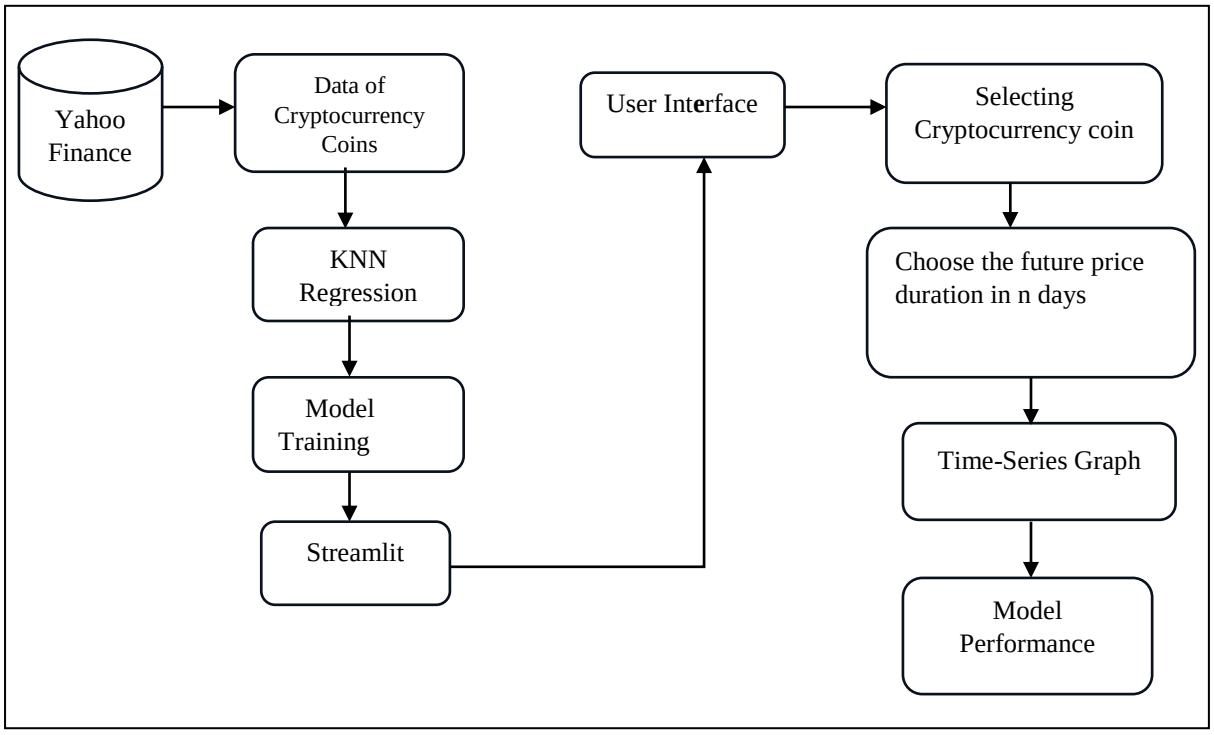


Fig.1.Proposed System Architecture

1. **Yahoo Finance:** Yahoo Finance is a financial news and data platform provided by Yahoo. It offers a wide range of financial information, including stock quotes, news, financial reports, and historical price data for various financial instruments such as stocks, bonds, commodities, and cryptocurrencies. Yahoo Finance is widely used by investors, traders, and financial analysts for research and market analysis.

2. **Data of CryptocurrencyCoins**: Here, we are collecting data that is prices of different cryptocurrency coins for our model from Yahoo Finance using yfinance api.

3. **KNN Regression :** In our project we are training our model using this algorithm.

4. **Model Training :** In training we split dataset into training and testing. 80 % is for training and 20% is for testing.

5. **Streamlit :** Streamlit is an open-source Python library that simplifies the process of creating web applications for data science and machine learning projects. It is designed to allow developers to create interactive and visually appealing apps with minimal effort and a simple syntax. Streamlit is particularly popular for its ease of use and fast prototyping capabilities.

6. **User Interface :** It is made up of using Streamlit.

7. **Selecting Cryptocurrency coin :** In the user interface user need to select the type of coin like whether it is Bitcoin, Litecoin etc.

8. **Choose the future price duration in n days :** Here, user need to choose the number of prediction days he wants. So, that he can invest in future.

9. **Time-Series Graph :**A time series graph is a graphical representation of data points in a time-ordered sequence. It is particularly useful for visualizing how a variable change over time. In the context of your project, a time series graph would likely display the historical cryptocurrency prices over a specified time period.

10. **Model Performance :** Model performance refers to how well a machine learning model is able to make accurate predictions on new, unseen data. It is a crucial aspect of any machine learning project as it provides insights into the effectiveness of the model in making predictions and informs decision-making regarding the model's utility.In the context of our project, where we are forecasting cryptocurrency prices using a K-Nearest Neighbors (KNN) regression model, model performance can be assessed through various metrics. Here are some common performance metrics for regression models:

R-squared (R2) Score: R-squared measures the proportion of the variance in the dependent variable (target) that is predictable from the independent variable(s) (features). It ranges from 0 to 1, where 1 indicates a perfect fit.

3.2 KNN AS REGRESSION

The algorithm K-Nearest Neighbors (KNN) is supervised. Finding the K nearest data points to the new data point in the training space and classifying the new data point according to the majority class among the K nearest data points is the fundamental idea behind KNN**.**

KNN is a straightforward supervised algorithm that is non-parametric and effective for both classification and regression applications. In order to predict the value or class that the new data point belongs to, this method locates the K closest neighbors of the newly acquired, unlabelled data. The K-Nearest Neighbors (KNN) algorithm operates on the principle of similarity, where it predicts the label or value of a new data point by considering the labels or values of its K nearest neighbors in the training dataset.

KNN regressor is quite different from the classifier. As in a regressor, the dependent variable is continuous, it is scattered throughout the coordinate plane. When there is a new data point, the number of neighbors (K) is found by any of the distance metrics. After finding the neighbors, the predicted value of the new data point is the average of all the neighbor's values combined. For example, consider House price prediction. There is price as the dependent variable and the square feet of the house as an independent variable. Now after mapping all the data points on the Cartesian plane, when there is a new data point in square feet feature, the K neighbor's average price value of their square feet of the house is the price of the new data point. So instead of predicting a class, the regressor uses the average of all the neighbor values.

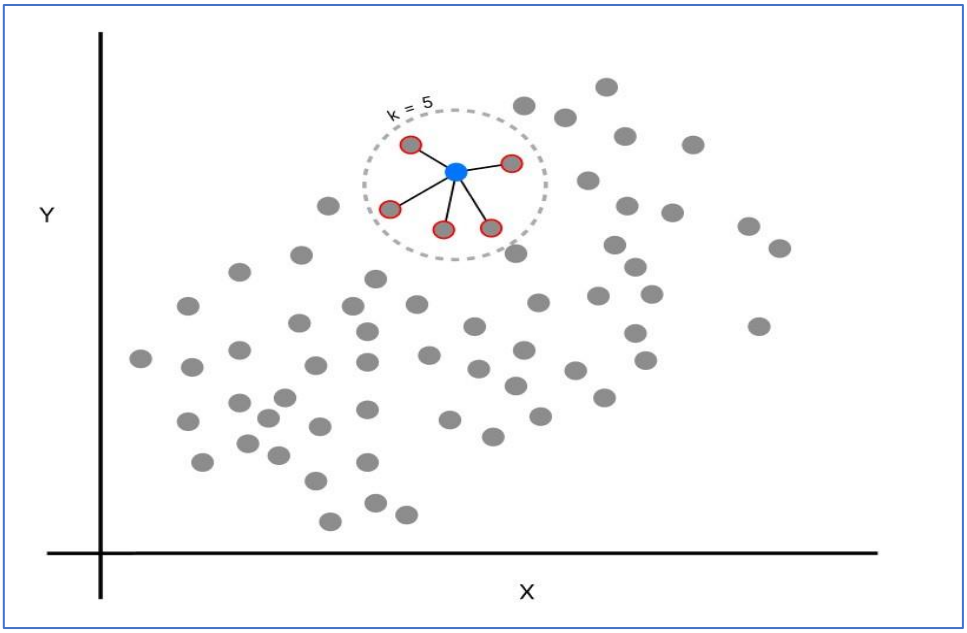


Fig.2.Selecting of Neighbors in KNN

To make predictions, the algorithm calculates the distance between each new data point in the test dataset and all the data points in the training dataset. The Euclidean distance is a commonly used distance metric in K-NN, but other distance metrics, such as Manhattan distance or Minkowski distance, can also be used depending on the problem and data. Once the distances between the new data point and all the data points in the training dataset are calculated, the algorithm proceeds to find the K nearest neighbors based on these distances. The specific method for selecting the nearest neighbors can vary, but a common approach is to sort the distances in ascending order and choose the K data points with the shortest distances.

After identifying the K nearest neighbors, the algorithm makes predictions based on the labels or values associated with these neighbors. For classification tasks, the majority class among the K neighbors is assigned as the predicted label for the new data point. For regression tasks, the average or weighted average of the values of the K neighbors is assigned as the predicted value.

Let X be the training dataset with n data points, where each data point is represented by a d-dimensional feature vector X_i and Y be the corresponding labels or values for each data point in X. Given a new data point x, the algorithm calculates the distance between x and each data point X_i in X using a distance metric, such as Euclidean distance.

The algorithm selects the K data points from X that have the shortest distances to x. For classification tasks, the algorithm assigns the label y that is most frequent among the K nearest neighbors to x. For regression tasks, the algorithm calculates the average or weighted average of the values y of the K nearest neighbors and assigns it as the predicted value for x.

3.2.1 Understanding the KNN algorithm

Choosing the k value : The K value is the main part of KNN and choosing the right k value might be troublesome. But there are some methods to find the best and optimal k value:

1. Split the dataset as training and testing.
2. Choose a range of k values: select a range of k values. You can start from k = 1 and increase the value.
3. Train the model: Train the KNN model for each k value.
4. Evaluate the performance: Evaluate the performance of the model that has been trained using a range of k values. We can use precision, Accuracy, recall, F1 score, etc, to measure the performance. It is important to note that the choice of the k value depends on the dataset and the problem. A smaller k value can lead to overfitting, while a larger value of k can lead to underfitting. Therefore, it is recommended to experiment with different values of k to find the optimal value for a specific dataset.

3.2.2 DISTANCE METRIC USED

Euclidean

This is the default distance metric for the Python SKLearn library and the most commonly used distance metric in KNN. This is the Euclidean space straight-line distance between two data points. It is the data point sum squared times its square root.

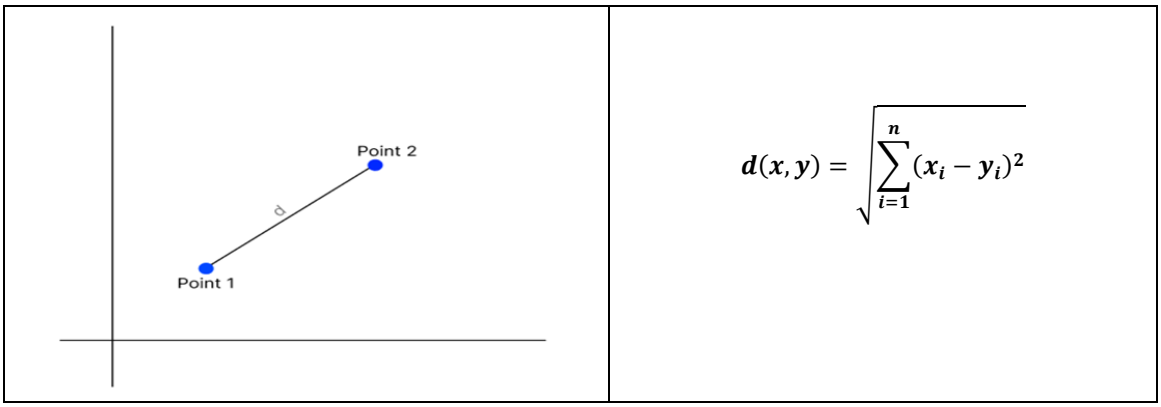


Fig.3.Formula for Calculating Distance Between Points

IV. RESULTS

In this project, our web application helps people and investors to know the various kinds of cryptocurrency prices in advance. so, that they can gain maximum profit out of it by investing in a secure and profitable platform. This application help's people to gain knowledge about the digital currency and its importance over the coming years. Our model is giving 97 percent accuracy among other models which we have implemented.

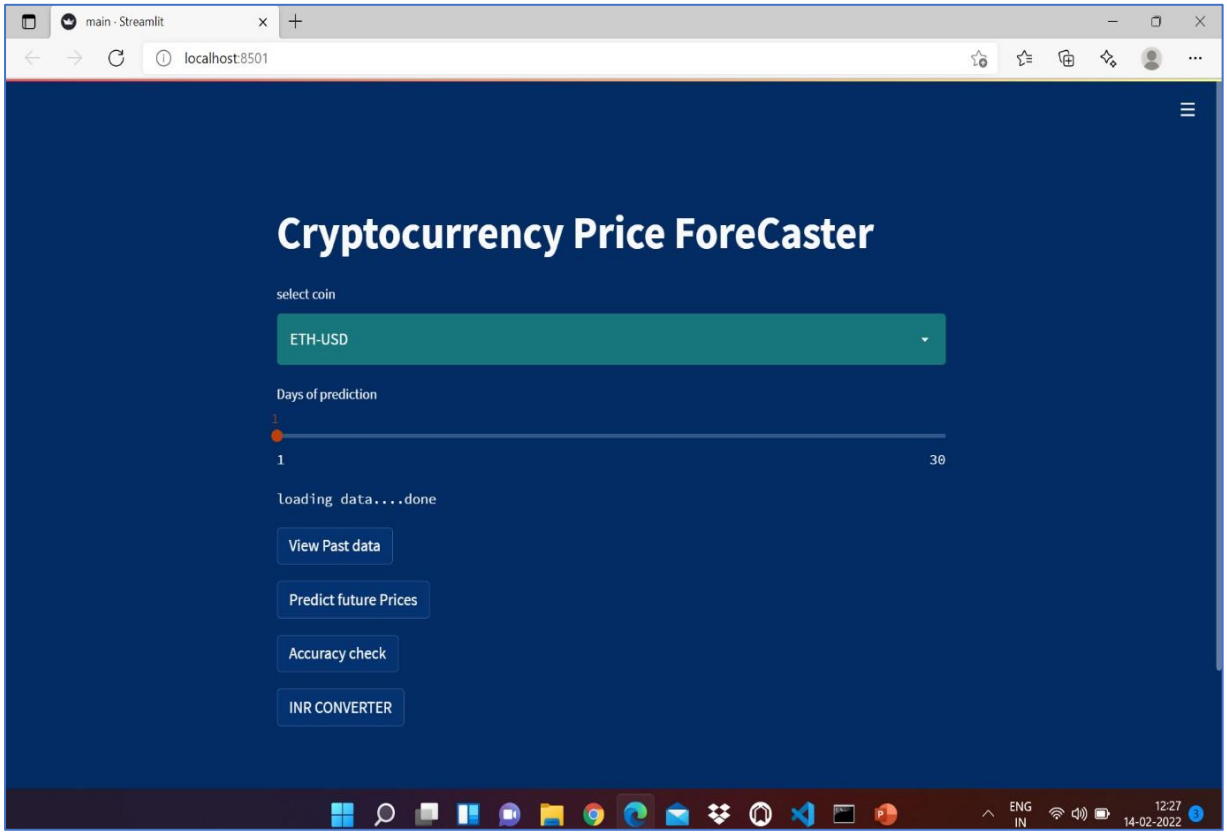


Fig .4.User Interface

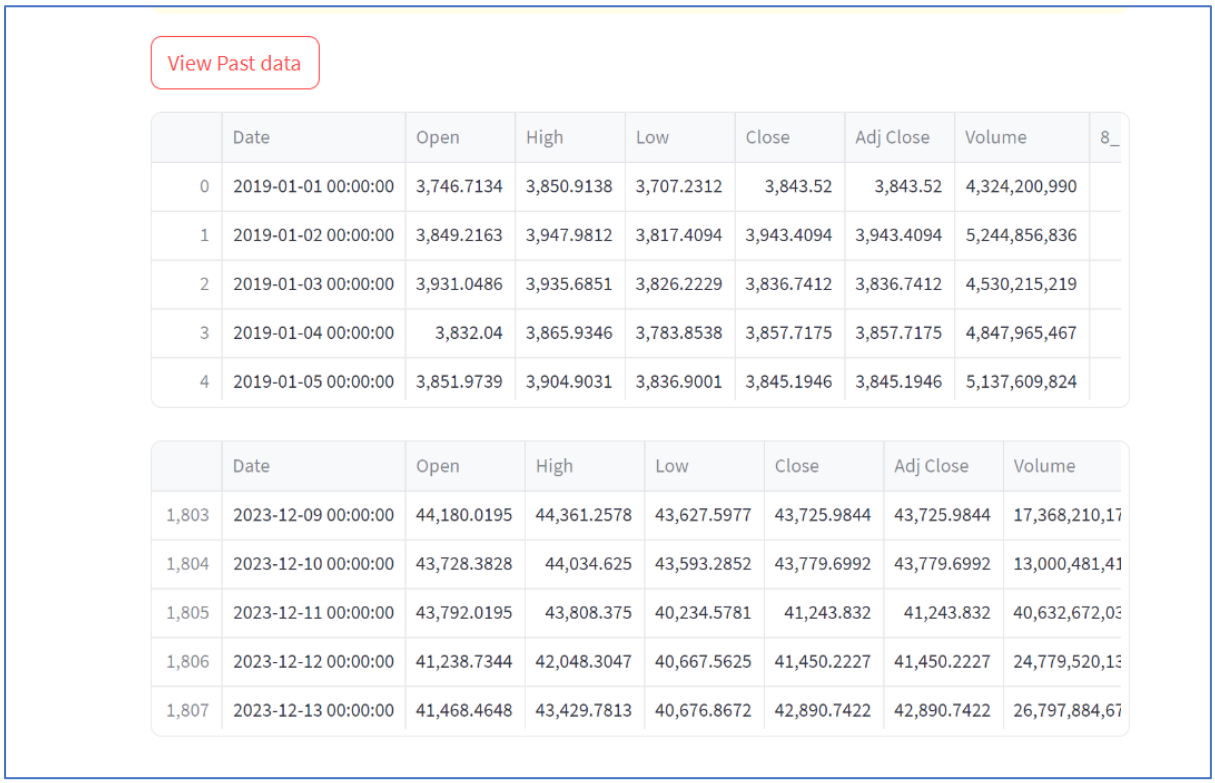
Fig 4 describes about the how the user interface looks like. Here, Use interface consists of different types of Cryptocurrency Coins, Days of Prediction, Future prices based on input, Accuracy check and INR converter.

Fig.5.Types of Different Cryptocurrency Coins

Fig 5 shows us the different types of Cryptocurrency Coins used in our Project. User need to select any one of eight coins to know the prices of it in future.

Fig.6.Selecting Days of Prediction

Fig 6 describes us about how user is selecting the number of days for prediction. Here, the range bar consists of 30 days to choose.



	Date	Open	High	Low	Close	Adj Close	Volume	8_
0	2019-01-01 00:00:00	3,746.7134	3,850.9138	3,707.2312	3,843.52	3,843.52	4,324,200,990	
1	2019-01-02 00:00:00	3,849.2163	3,947.9812	3,817.4094	3,943.4094	3,943.4094	5,244,856,836	
2	2019-01-03 00:00:00	3,931.0486	3,935.6851	3,826.2229	3,836.7412	3,836.7412	4,530,215,219	
3	2019-01-04 00:00:00	3,832.04	3,865.9346	3,783.8538	3,857.7175	3,857.7175	4,847,965,467	
4	2019-01-05 00:00:00	3,851.9739	3,904.9031	3,836.9001	3,845.1946	3,845.1946	5,137,609,824	

	Date	Open	High	Low	Close	Adj Close	Volume
1,803	2023-12-09 00:00:00	44,180.0195	44,361.2578	43,627.5977	43,725.9844	43,725.9844	17,368,210,17
1,804	2023-12-10 00:00:00	43,728.3828	44,034.625	43,593.2852	43,779.6992	43,779.6992	13,000,481,41
1,805	2023-12-11 00:00:00	43,792.0195	43,808.375	40,234.5781	41,243.832	41,243.832	40,632,672,03
1,806	2023-12-12 00:00:00	41,238.7344	42,048.3047	40,667.5625	41,450.2227	41,450.2227	24,779,520,13
1,807	2023-12-13 00:00:00	41,468.4648	43,429.7813	40,676.8672	42,890.7422	42,890.7422	26,797,884,67

Fig.7.Past Prices of selected Crypto coin

Fig 7 describes about the past prices in the dataset which we have collected from Yahoo Finance using yfinance library.

Fig.8.Graph of Year vs Open and Close values

Fig 8 shows us the time series graph which describes us about the open and close values of selected crypto coin from the year 2019 to 2023.

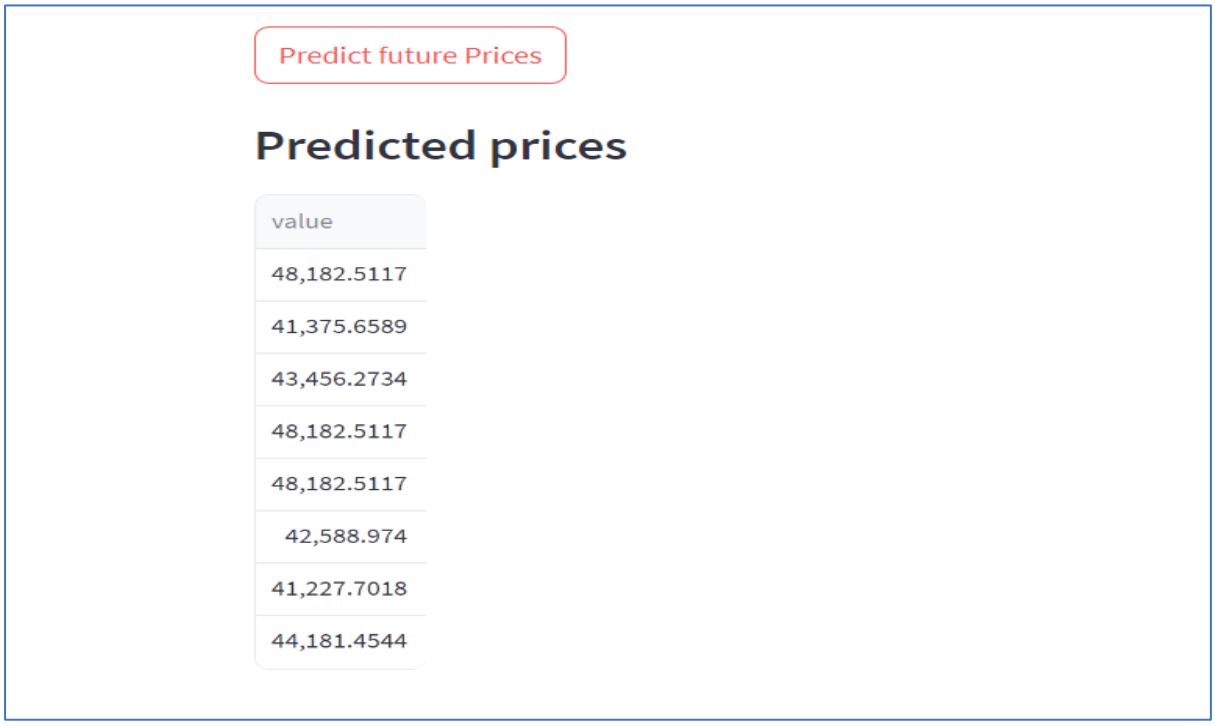


Fig.9.Predicted Prices of Selected Coin By User

Fig 9 It tells us about the predicted prices of selected Crypto Coin by a ML Model based on the input given that is number of days by user.

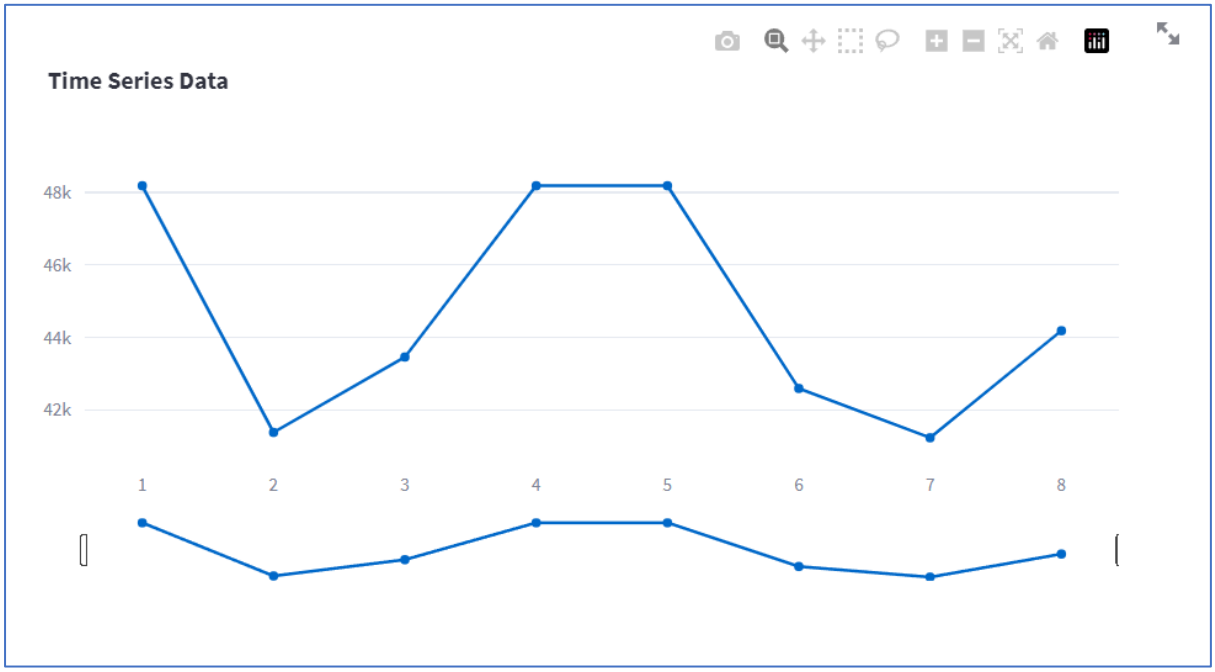


Fig.10.Graph of Days vs Predicted Prices

Fig 10 shows us about predicted days vs its prices on each day which was predicted by our Model.

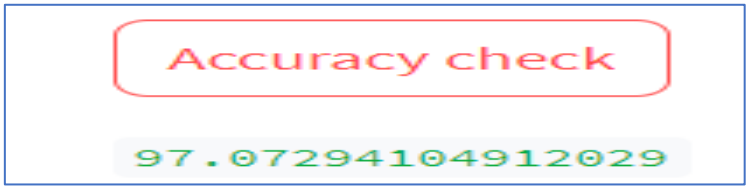


Fig.11.Accuracy of the Model

Fig 11 describes us about the accuracy of the model which was trained.

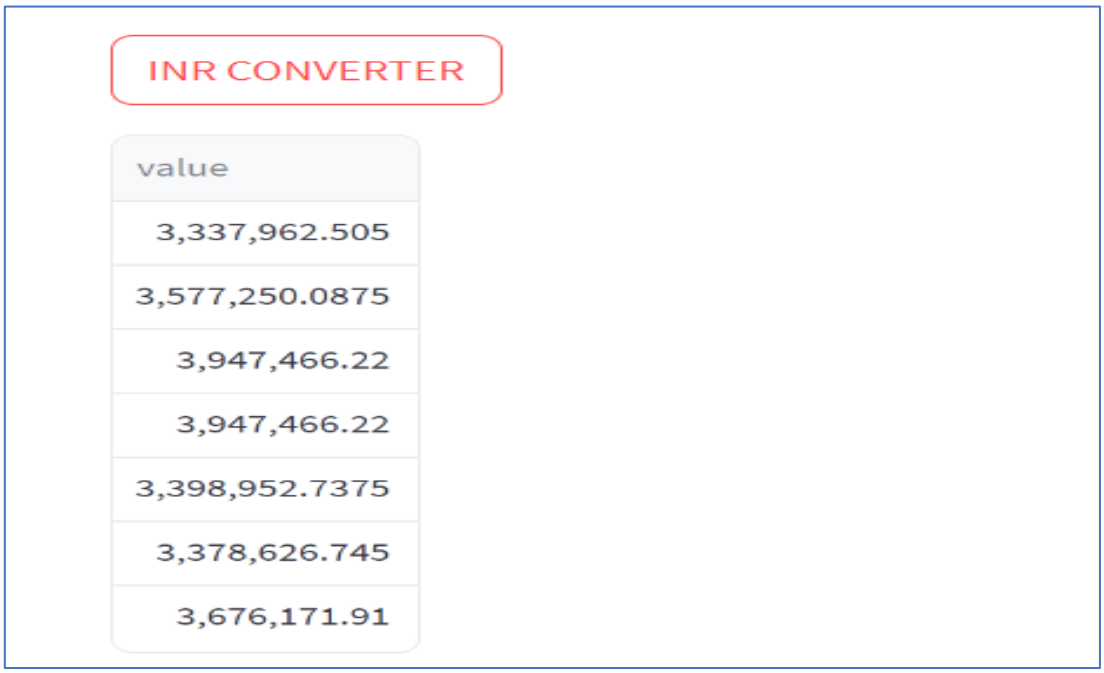


Fig.12.Prices of Crypto Coin selected in Indian Rupees

Fig 12 displays about the prices of selected coin in terms of Indian Rupees

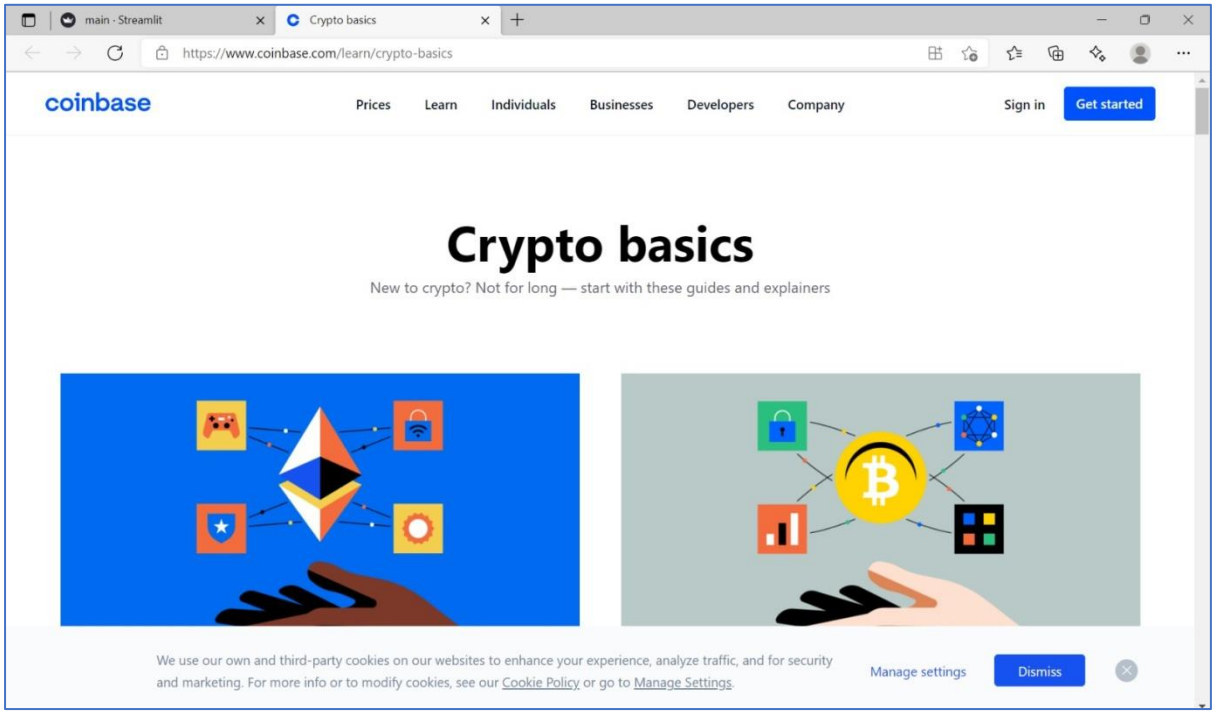


Fig.13.Crypto Currencies Investment Platform

Fig 13 describes us about the Coinbase Platform where Cryptocurrencies are invested. Coinbase, founded in June 2012 by Brian Armstrong and Fred Ehrsam and headquartered in San Francisco, California, is a prominent cryptocurrency exchange and platform. Renowned for its user-friendly interface, Coinbase facilitates the buying, selling, and management of various cryptocurrencies, catering to both novice and experienced traders. The platform provides a brokerage service for seamless transactions and a professional trading platform called Coinbase Pro. Users can link their bank accounts or use alternative payment methods to fund their accounts. Security is a top priority for Coinbase, implementing measures such as two-factor authentication and offline storage for user funds to mitigate the risk of hacking. The platform offers online wallets for users' convenience and a separate mobile wallet app, Coinbase Wallet, for those seeking more control over their private keys. With a commitment to education, Coinbase provides resources to help users understand cryptocurrencies and blockchain technology. Over the years, Coinbase has expanded its services globally, obtaining regulatory approval in various jurisdictions, solidifying its reputation as a trusted platform. Notably, in April 2021, Coinbase went public through a direct listing on the NASDAQ stock exchange under the ticker symbol COIN. It's important to note that developments may have occurred since my last update in January 2022, and users are advised to verify the latest information from reliable sources.

V. CONCLUSION

In this article, I demonstrated how to predict cryptocurrency prices in real time using Linear regression. I went through a four-step process of getting real-time cryptocurrency data, preparing data for training and testing, predicting the prices using Linear regression and visualizing the prediction results. Overall, the prediction models in this paper represent accurate results close to the actual prices of cryptocurrencies. The importance of having these models is that they can have significant economic ramifications by helping investors and traders to pinpoint cryptocurrency sales and purchasing.

We can see that the cryptocurrency market will thrive in 2020. But there are huge fluctuations in the cryptocurrency markets due to both downward and upward factors. It indicates that there is a high probability of dramatic changes in the direction of cryptocurrency in the upcoming days. The integration of new technologies into the banking systems may drive the prices of cryptocurrency to new heights. Some countries are already working on the implementation of cryptocurrency as their alternative currency. Many countries are testing the mechanism to control and provide the legal authority for such digital currency.

Analysts estimate that the global cryptocurrency market will more than triple by 2030, hitting a valuation of nearly $5 billion. Whether they want to buy into it or not, investors, businesses, and brands can't ignore the rising tide of crypto for long .In this project, our web application helps people and investors to know the various kinds of cryptocurrency prices in advance so that they can gain maximum profit out of it by

investing in a secure and profitable platform. This application help's people to gain knowledge about the digital currency and its importance over the coming years.

VI. FUTURE SCOPE

The future scope of the Cryptocurrency Price Forecasting project involves a multi-faceted approach to enhance predictive capabilities, model interpretability, and user engagement. To improve forecasting accuracy, advanced modeling techniques, including deep learning architectures such as recurrent neural networks (RNNs) and ensemble methods like stacking, should be explored and compared. Feature engineering and selection processes can be refined to incorporate additional relevant factors influencing cryptocurrency prices, and time series analysis methods like ARIMA or SARIMA can capture complex temporal patterns. Integrating sentiment analysis of news and social media data into the model could offer insights into market sentiment dynamics. Real-time data integration and continuous learning mechanisms are essential for adapting the model to evolving market conditions. Enhancements to the user interface, incorporating more interactive visualizations and explanatory tools, can provide users with a clearer understanding of the model's predictions. Addressing model explainability through methods like SHAP (SHapley Additive exPlanations) can increase user trust and understanding. Deploying the model as a web service, exploring integration with cryptocurrency trading platforms, and actively engaging with the cryptocurrency and finance communities for feedback and collaboration will contribute to the project's long-term success and relevance in the ever-changing landscape of cryptocurrency markets. Additionally, staying informed about evolving regulations, ensuring security and privacy compliance, and addressing ethical considerations are crucial aspects for the project's sustainable growth and societal impact.

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