Cairo University
Faculty of Computers and Artificial
intelligence Department of Computer Sciences

Crypto Manager

Supervised by

Dr. Samar Hesham

TA. Hussein Khaled

Implemented by

20186004	*Adham Alaa Eldin*
20186006	*Andrew Emad*
20186027	*Marwan Ayman*
20186018	*Omar Tarek*
20186047	*Abdulrahman Ayman*

Graduation Project
Academic Year 2021-2022
Final project documentation

CRYPTO MANAGER

Adham, Andrew, Omar, Marwan, and Abdulrahman

Supervisor: Dr. Samar Hesham

Abstract

Cryptocurrencies are getting more relevant than ever in the financial and trading world and is considered as a new emerging market. This has encouraged investors from all over the world to enter this field. The investment in cryptocurrency has been proven more difficult than the normal stock market due to its high volatility and unpredictable nature of its market. So as result investors are constantly searching for ways to minimize risk and maximize the profit from investing. One such way is using AI and DSS to help the investor to make a decision based on data history of cryptocurrencies.

Introduction

Since cryptocurrencies have the potential to be extremely detrimental to society, it is essential to understand the primary motives of the project that we are doing. The blockchain technology underlying bitcoin and other cryptocurrencies has been hailed as a potential gamechanger for a large number of industries, from shipping and supply chains to banking and healthcare and this is our way of approaching a solution to the problem of having a lack of knowledge about the field by providing a user friendly prediction system that helps tackle this problem

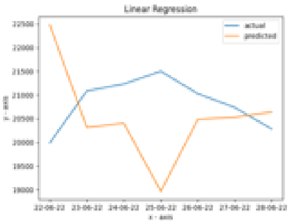
Methods

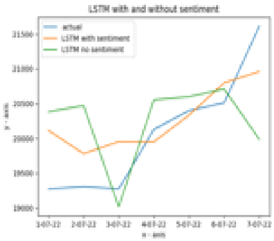
We made a live simulation to a real trading environment and this is a safe approach which helps new users to trade freely and gain more knowledge about cryptocurrencies without risking their actual money while doing it

In this project we uses LSTM(Long Short Term Memory) LSTMs are widely used for sequence prediction problems and have proven to be extremely effective. The reason they work so well is that LSTM can store past important information

We also used flask-sql alchemy is the Python SQL toolkit and Object Relational Mapper that gives application the flexibility of SQL we used it in the backend database implementation to be able to deal with it using python functions

LSTM with sentiment final result





Primarily Design

We first compared traditional machine learning algorithms like linear regression and SVM for prediction of coins prices and then they gave poor results as shown in the figures above so then we decided to move on to the LSTM sentiment analysis which later gave much better more accurate results

Conclusion

In conclusion we aim to solve the problem of the lack of knowledge about cryptocurrencies and raise more awareness about how important it is becoming nowadays through our system which helps predict the crypto currencies prices accurately as we conducted a traditional machine learning algorithm used in time series forecasting and LSTM with sentiment analysis which performed way better and gave better more accurate predictions

Contact us: cryptomanageragent@gmail.com

Table of Contents

Contents

List of tables

List of figures

List of abbreviations

TC_ID = Test case number
LSTM = Long Short-Term Memory
API = Application Programming Interface
SVM = Support Vector Machine
XGBoost = Extreme Gradient Boosting
SQL = Structured Query Language
BTC =Bitcoin
ETH = Ethereum
SARIMA = Seasonal Autoregressive Integrated Moving Average
REST = Representational State Transfer
RMSE= Root Mean Square Error
LR = Linear Regression
GUI = Graphical User Interface
ERD = Entity Relationship Diagram
OCHLV = Open, High, Closed and Volume values

1.Introduction

1.1 Motivation

Since cryptocurrencies have the potential to be extremely detrimental to society, it is essential to understand the primary motives of the project that we are doing. The blockchain technology underlying bitcoin and other cryptocurrencies has been hailed as a potential gamechanger for a large number of industries, from shipping and supply chains to banking and healthcare.

This makes investment in crypto currencies more attractive for its decentralized nature, protection form inflation and High Security as it is way more secure than the normal transactions which include more people than technology. For people who believe in that promise, investing in cryptocurrency represents a way to earn high returns while supporting the future of a rising technology that is booming nowadays.

The motivation for idea of this project is the oblivious rise of cryptocurrency trading field which is happening more rapidly than it ever was and with increase of its popularity it becomes more important for investors to enter this field the application would help those new investors in making decisions about buying selling or holding the cryptocurrencies and also to spread awareness about how important the cryptocurrencies have become in our daily life and to shine a light on that.

The main application idea is to provide the investor with all the possible tools to help him make a sound decision in investment, we will be displaying live data for the cryptocurrencies, providing the user with the latest news, using machine learning to predict the rise and fall of cryptocurrencies within the next days and training him through a live simulation.

1.2 Problem definition

Crypto currency investment: These days, crypto currency is becoming more and more important in our lives. It is the new way of trading and will soon replace normal currencies for its transparency and ease to trade. The main problem is the lack of knowledge when investing or trading in crypto that makes people lose a lot of money or be afraid of even trying to invest in it although it can be more profitable than normal investments and gives high revenues. Our job is to help and support the user with decision making tools to guide him through the crypto world to decrease the risks involved as much as possible with:

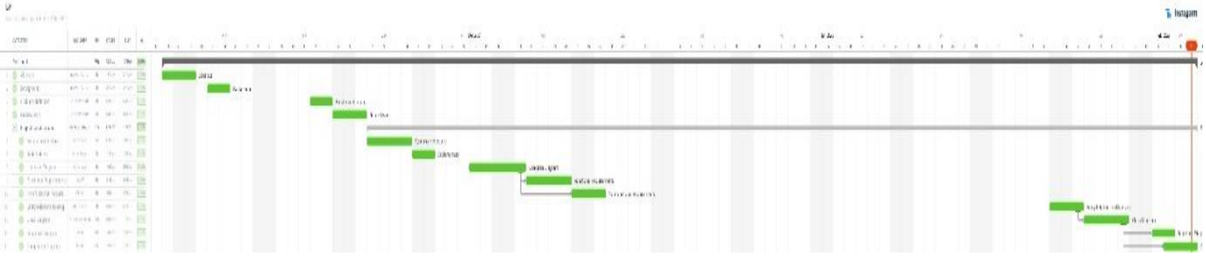
1- Live data on crypto currencies
2- giving news and updates of how a certain currency is faring
3- prediction tools that predict if a currency will go up or down
4- A live simulation to familiarize the user with the real trading environment

1.3 Project objective

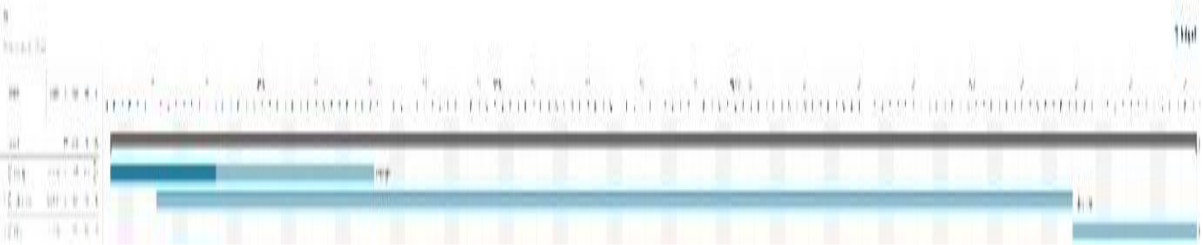
Our main objective is to deliver a reliable predictor by applying the development skills that we learnt using machine learning techniques and help attract more users into crypto investments and erase the fear of new investors and providing more knowledge to general people about what crypto investment is and how is works and keeping the users updated through daily live news about cryptocurrencies and providing accurate predictions to the users because not only will it help our project but it also will help enlighten a greater number of people who might have certain fears when thinking about investing in cryptocurrencies as the more people invest in reliable secure crypto currencies the less banking problems that will happen as the transactions and currencies will be more technology oriented avoiding the human error that normally happens in normal banking transactions and this is our objective

Suggested solutions for crypto predictions: we first tried Traditional Machine learning techniques in time series Forecasting to predict the crypto prices, in order to choose the perfect algorithm for each coin we calculated the root mean square error for each one for each coin

1.4 Gantt chart of project time plan



Figure(1): gantt chart of time plan



Figure(2): progress milestones

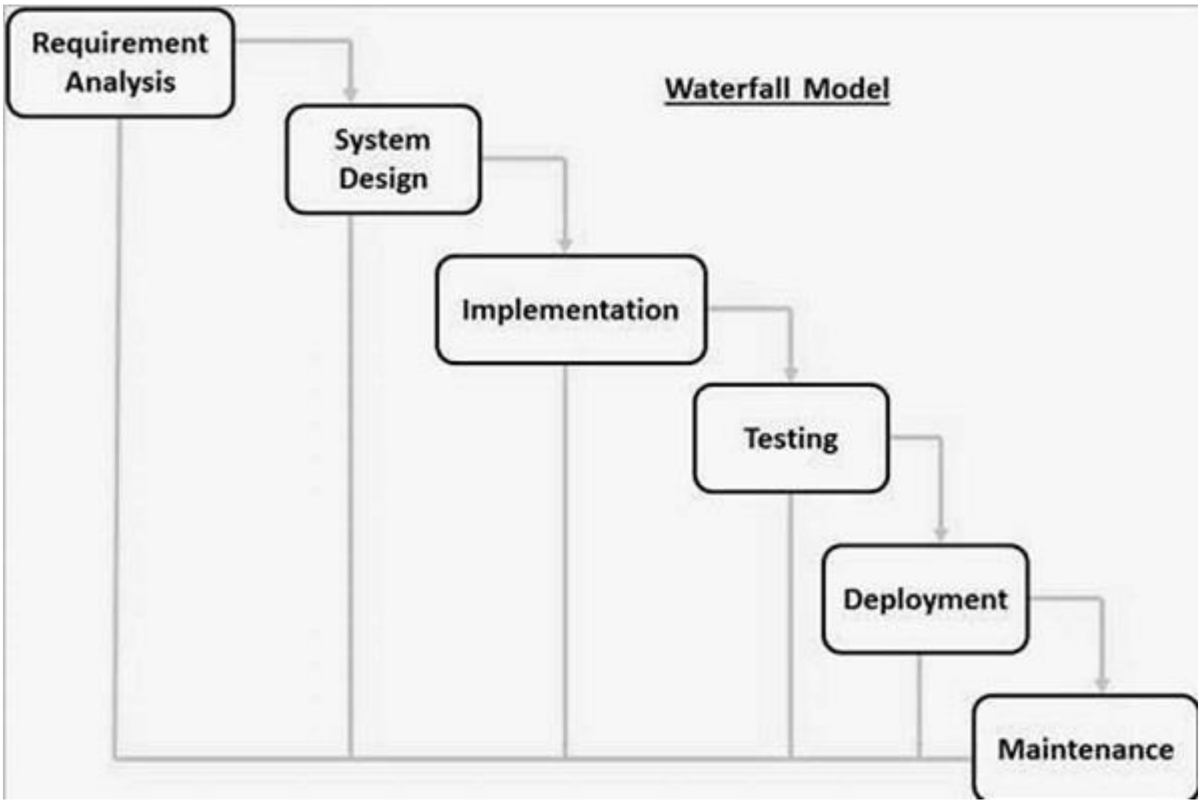
Task	Task Title	Description	Task status
1	Abstract	The existing problem is that the determination of investing in cryptocurrency and we are trying to solve it by providing a reliable software that has a decent accuracy in decision making whether to invest or not.	(Due 21/11/2021) Completed
2	Background	The main area is the crypto field, and the motivation is to help people not waste money by providing an accurate decision maker for them. Techniques are machine learning related techniques.	(Due 24/11/2021) Completed
3	Problem definition	Our app will be tackling two problems: **1-Crypto currency investment:** The problem is the lack of knowledge when investing or trading in crypto that makes people lose a lot of money or be afraid of trying to. **2-stock market investment:** Stock market is a popular way to invest money though it comes with a lot of risks. Lack of knowledge on the subject can be detrimental.	(Due 03/12/2021) Completed

4	Related work	Similar researches that faced the same problems we are trying to solve.	(Due 06/12/2021) Completed
5	Stakeholders	Determining Person who can affect or be affected by the system.	(Due 10/12/2021) Completed
6	System architecture	Defines the structure of a software system.	(Due 12/12/2021) Completed
7	Use-case Diagram	Shows the use cases for the system (the actors and the relationships between the actors and use cases).	(Due 20/12/2021) Completed
8	Functional Requirements	Defines the functionalities of the system.	(Due 24/12/2021) Completed
9	Non-functional Requirements	Define system attributes such as security, reliability, performance, maintainability and usability.	(Due 27/12/2021) Completed
10	Entity Relationship Diagram	Shows the relationships of entity sets stored in the database.	(Due 07/02/2022) Completed
11	Class Diagram	Describes the structure of the system by showing the system's classes, their attributes, operations and the relationships among objects.	(Due 11/02/2022) Completed
12	Sequence Diagram	Describe the interactions among classes in terms of an exchange of messages over time.	(Due 15/02/2022) Completed
13	Component Diagram	Shows how the components are wired together to form the system.	(Due 17/02/2022) Completed
14	Implementation	In this phase we implement our system functionalities. at the beginning we create our DL model (like LSTM, Linear regression.) then perform training and testing on it until a we reach a satisfying result.	(Due 29/06/2022) Completed
15	Testing	**The testing will be done in two phases:** 1- Designing the test cases 2- Applying system testing	(Due 15/07/2022) Completed
16	Technologies we need to learn	**What we have learned:** Python, Java Script, HTML, NN **What we are planning to learn:** Machine learning topics.	(Due 30/03/2022) Completed

Table(1): The project plan

1.5 Project development methodology

We used the waterfall model development methodology



Figure(3): waterfall model

We used the waterfall development are that it allows for easier control as a schedule can be set with deadlines for each stage of development and a product can proceed through the development process model phases one by one.

We also chose the waterfall model as the requirements were clear and easy to understand

We first started with defining what we want our system to do then we clearly wrote down the requirements based on the actual needs to solve a real-world problem

We then moved to the design phase of the project, and we chose the three-layered architecture as we found it the most suitable architecture for the project

We then moved to the implementation phase in which we developed each set of functionalities within a certain schedule and deadline

We then moved to the testing phase which we used the equivalence partitioning testing approach

Then finally we moved to the deployment phase, and we did some maintenance and tweaks for our project to be as stable as possible

Also, the waterfall model is simple and easy to understand and use

Easy to manage as for each phase we had specific deliveries and a review process.

Phases are processed and completed one at a time so that gave us more time to optimize each of the functionalities of each phase.

The waterfall model has clearly defined stages so in each stage we knew what need to be completed and when it was needed to be

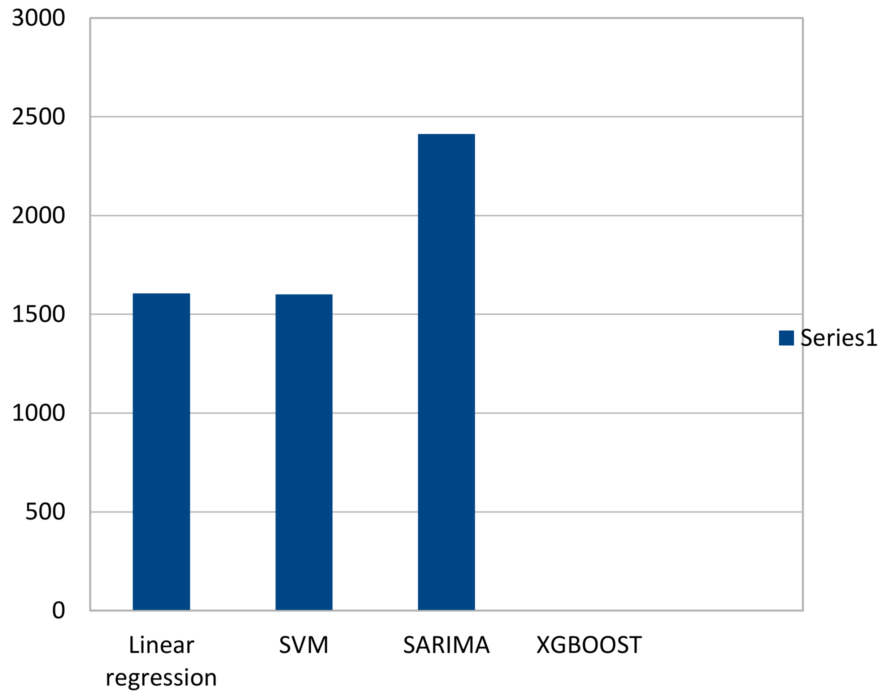
We also had well understood milestones that we wanted to achieve so we put our best in delivering a complete and stable product

Also, we had little issues with documenting the results of the process and the process itself to keep track of how far we have come through the project and if there are any fixes needed to be done

In this project we will use some of the machine learning techniques like sentiment analysis and LSTM (Long Short-Term Memory) aiming to predict the price movement of the cryptocurrency.

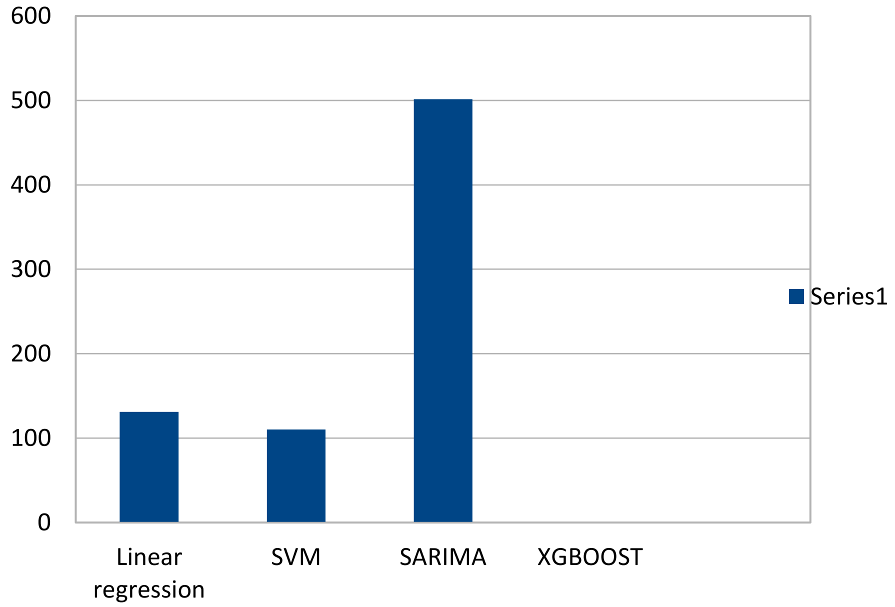
The following graphs are comparisons of traditional machine learning algorithms on different coins:

Bitcoin

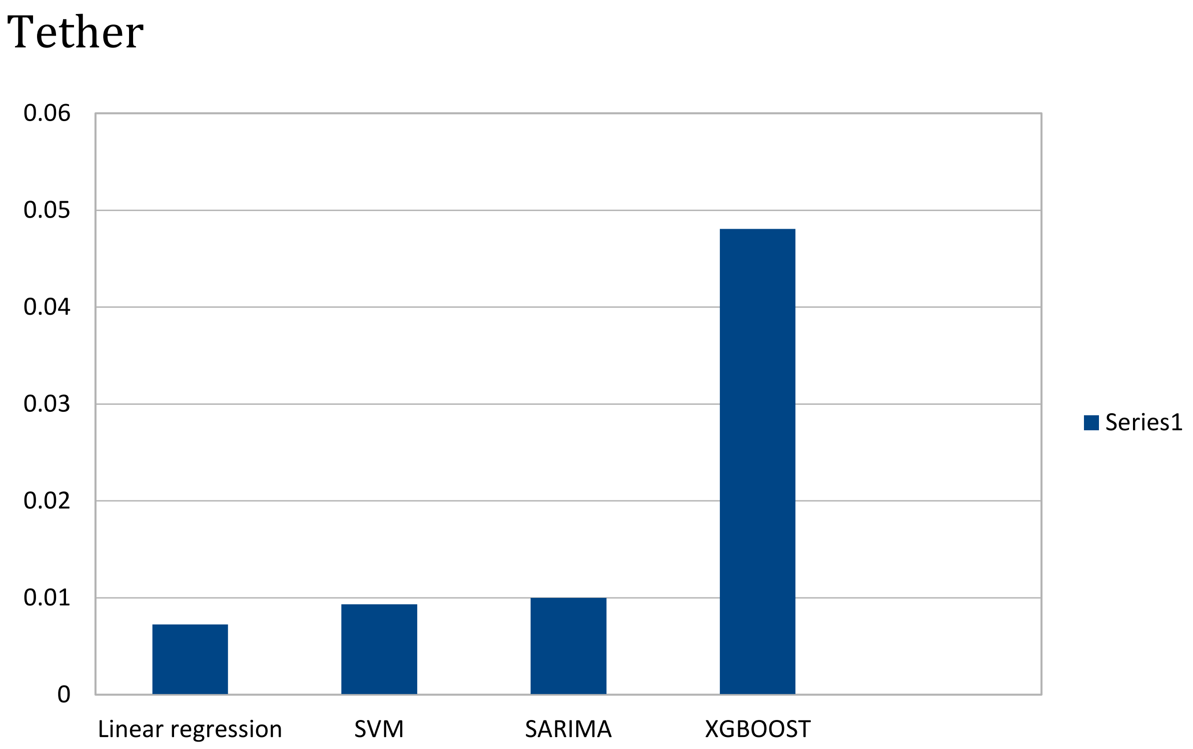


Figure(4): Algorithms comparison for bitcoin

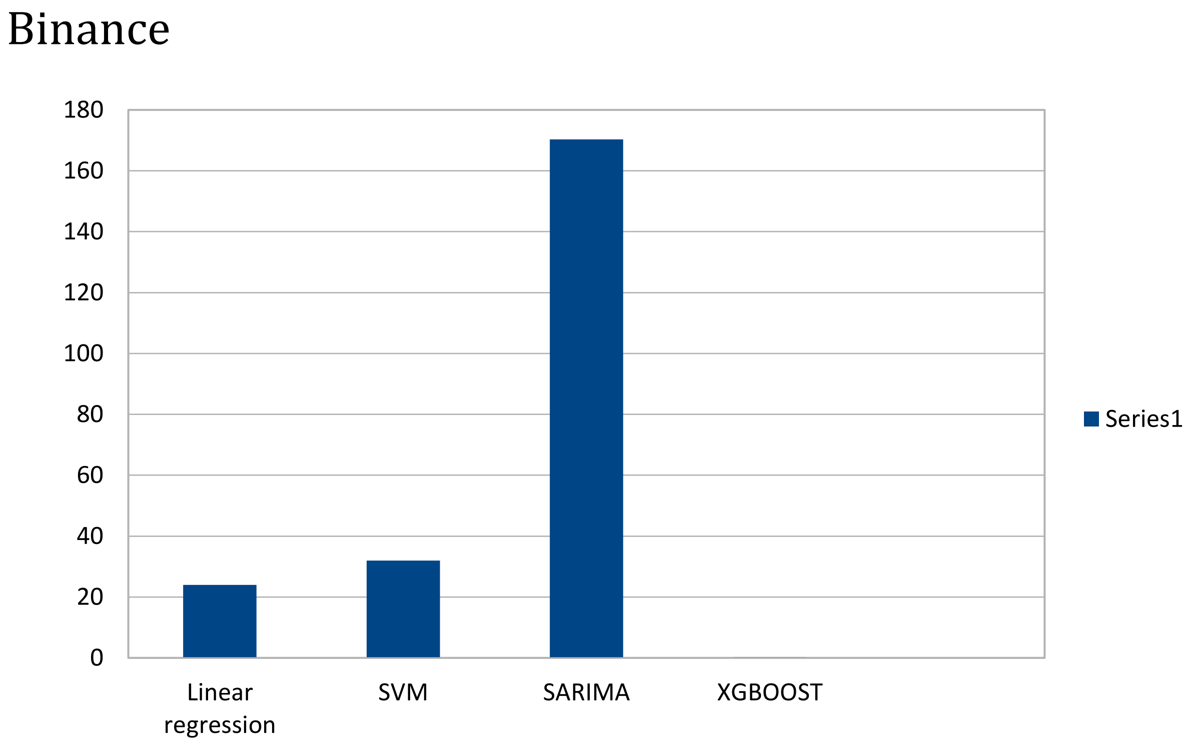
Ethereum



Figure(5): Algorithms comparison for Ethereum

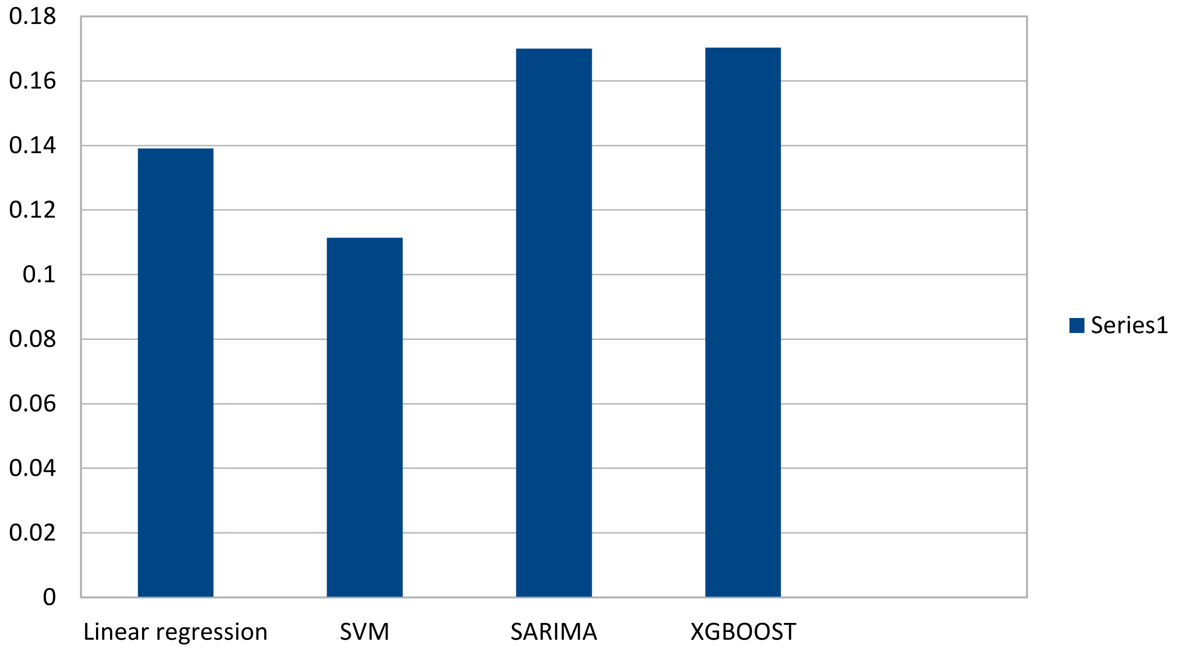


Figure(6): Algorithms comparison for Tether



Figure(7): Algorithms comparison for Binance

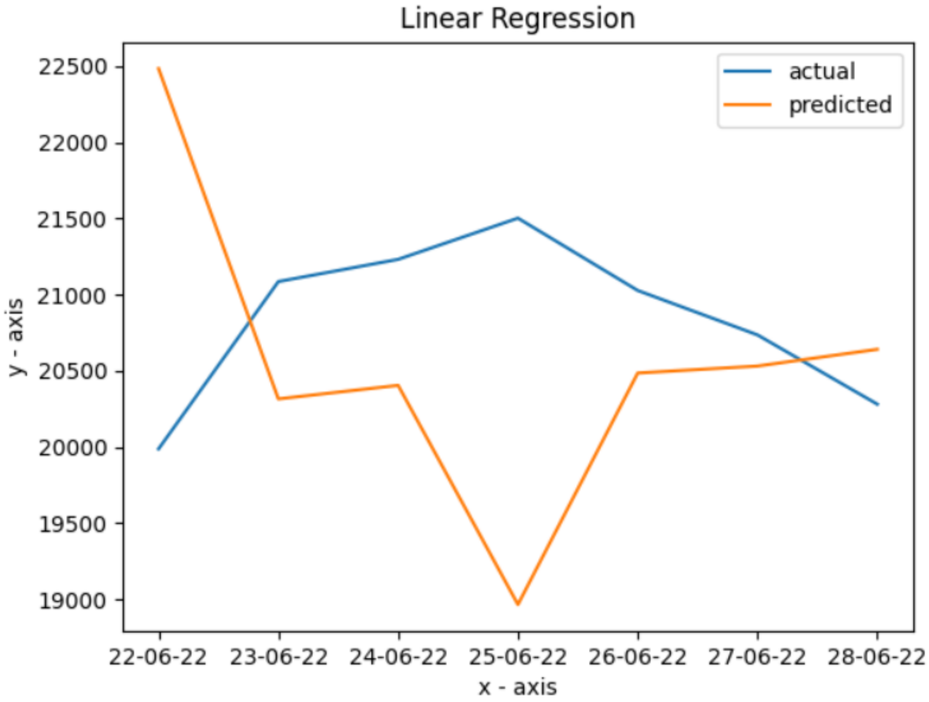
XRP



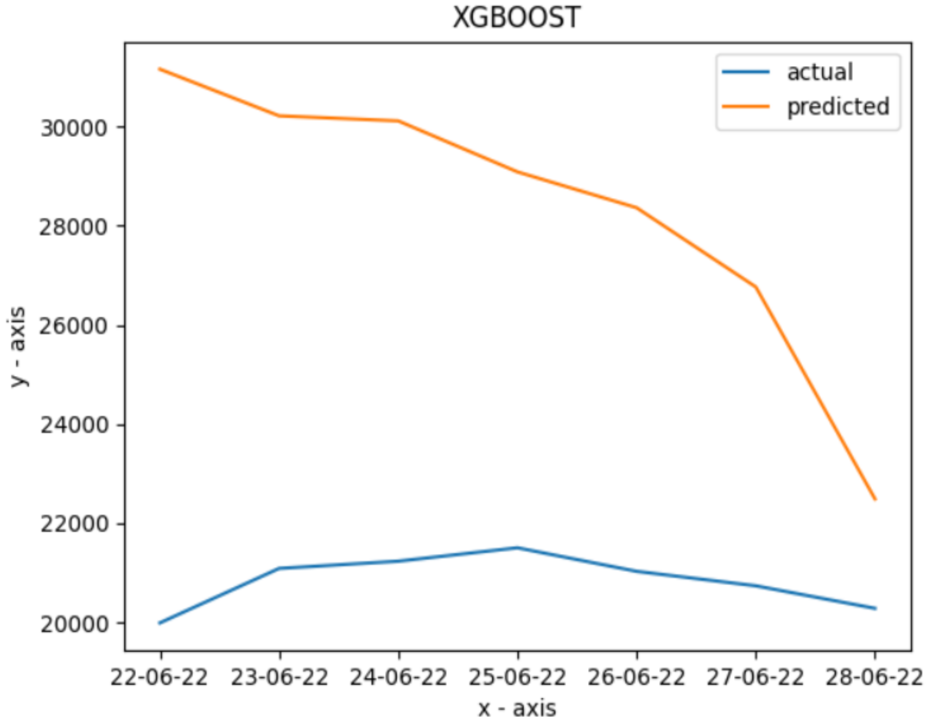
Figure(8): Algorithms comparison for XRP

although we got good results in training and testing, the actual performance was poor as shown in the figures below

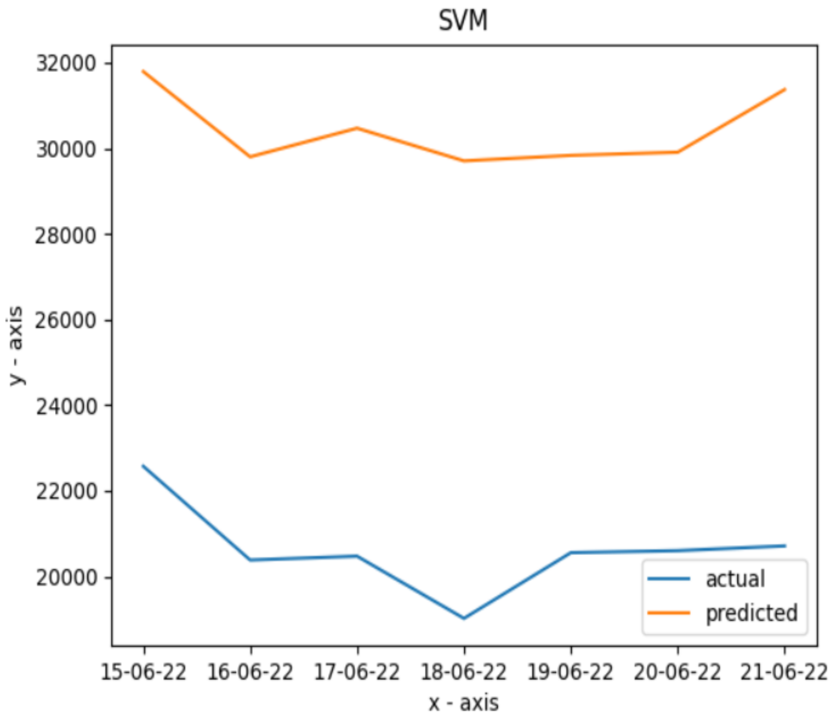
The following graphs are bitcoin actual vs predicted prices:



Figure(9): Linear regression results

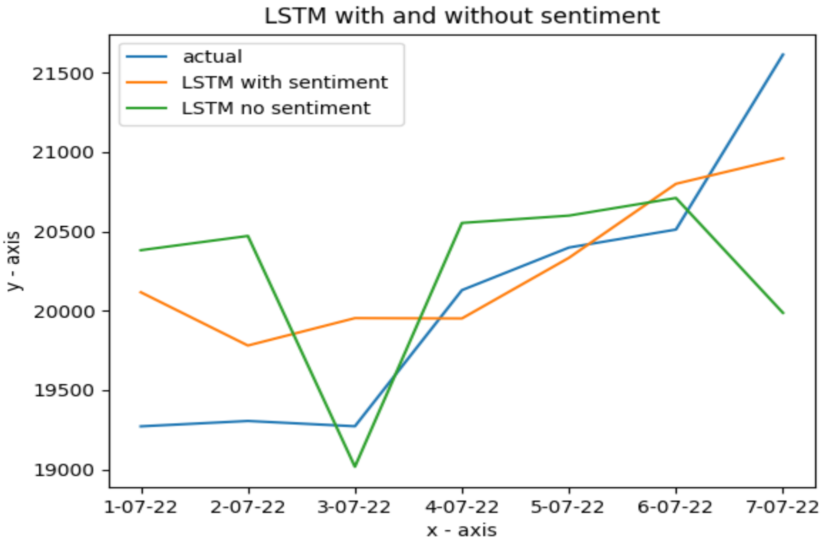


Figure(10): XGBoost results



Figure(11):SVM results

We then tried to use the LSTM algorithm to predict crypto currency prices but we still did not get good results as the model overfitted since our data was small but eventually we tried using LSTM with sentiment analysis and we got better results



Figure(12):LSTM with & without sentiment analysis results

1.6 The used tools in this project

Binance API which is a method that allows you to connect to the Binance servers via Python or several other programming languages. Which with we can automate your trading. More specifically, Binance has a RESTful API that uses HTTP requests to send and receive data we used Binance API to retrieve live real time prices in order to be used in our live simulation

flask-sql alchemy is the Python SQL toolkit and Object Relational Mapper that gives application the flexibility of SQL we used it in the backend database implementation to be able to deal with it using python functions

Nomics API: A cryptocurrency index that provide wide range of cryptocurrency data and meta data

CryptoCompare API: is a platform providing data about the crypto like the data for cryptocurrencies to comparisons of the various crypto exchanges, to recommendations for where to spend your crypto assets we used it for returning the current price of any cryptocurrency and all the trading info for the requested currencies to be compared

1.7 Report Organization

So far, we have talked about the motivation for our project, problem definition and the project main objective
We have also displayed the Gantt chart of the project time plan and we talked about the project development methodology and the used tools in this project

The next chapters will cover:
The work that's been done with relation to our project and examples will be stated

The system analysis which will include the functional and non-functional requirements and the use case diagrams

The system design which will include:

- System Component Diagram
- System Class Diagrams
- Sequence Diagrams
- Project ERD
- System GUI Design

The implementation and testing of our project and the results

Finally, the references

2. Related Work

A research by the author Vatsal H. Shah: It revolves around applying machine learning techniques to stock market predictions Algorithm used: Decision Stump, Linear Regression, Support Vector Machines, Boosting Conclusion: Of all the Algorithms we applied, we saw that only Support Vector Machine combined with Boosting gave us satisfactory results. Linear Regression gave lower mean squared errors while predicting the EMA pattern.

A research whose authors are JG Agrawal, V Chourasia, A Mittra: State-of-the-Art in Stock Prediction Techniques Algorithm used Multinomial Logistic Regression (MLR)isotonic regression function Multi-Layered Feed Forward, Adaptive Neuro-Fuzzy Inference System, Multilayer perceptron network Conclusion: the existing techniques are not suitable for prediction of stock market trends as well as price of different socks. There exists a gap between technologies and user requirement for a safe and accurate stock prediction system.

A research whose authors are Xiao Ding, Yue Zhang ,Ting Liu and Junwen Duan :deep learning method for event driven stock market prediction Algorithm used : bags-of-words, Support Vector Machines ,feed forward neural network, convolutional neural network prediction model Conclusion: deep learning is useful for event-driven stock price movement prediction by proposing a novel neural tensor network for learning event embeddings, and using a deep convolutional neural network to model the combined influence of long-term events and short-term events on stock price movements.

Pintelas et al conducted interesting research, evaluating sophisticated deep learning models for predicting cryptocurrency prices and movements. Their research revealed the significant limitations of deep learning models for exhibiting reliable forecasts.
Based on their experimental analysis, the authors highlighted the need for adopting more advanced algorithmic approaches for the development of efficient and reliable cryptocurrency models.

Patel et al proposed a hybrid cryptocurrency prediction approach, which focuses on Litecoin and Monero cryptocurrencies. The proposed model is based on a recurrent neural network architecture which utilizes LSTM and GRU layers. The data in their study contained daily Litecoin data from 24 August 2016 to 23 February 2020 and Monero data from 30 January 2015 to 23 February 2020 concerning average price, open price, close price, high and low prices, as well as the volume of trades. The reported experiments demonstrated that the proposed hybrid model outperforms traditional LSTM networks exhibiting some promising results

Along this line, Livieris et al considered improving the forecasting performance and reliability of deep learning models utilizing three widely utilized ensemble strategies, i.e., averaging, bagging, and stacking. The authors utilized hourly prices of Bitcoin, Ethereum, and Ripple from 1 January 2018 to 31 August 2019. Additionally, they conducted an exhaustive performance evaluation of various ensemble models using several Conv-based and LSTM-based learners as base models. Their analysis highlighted that deep learning and ensemble learning may efficiently be adapted to develop strong, and reliable cryptocurrency prediction models, but with significant computational cost.

The main thing the differentiates our project that we will try to predict the price movement of cryptocurrencies accurately also we will take user related information to recommend for the user best investment by providing reliable decision support mechanism. unlike other cryptocurrency websites, which only gives the users screeners and charts, we will provide our investors with accurate price predictions to aid them in their investment decisions and we will train the newcomers in our live trading simulation

3. System analysis

3.1 project specification

3.1.1 Functional requirements

1. **Sign-up**: The system shall allow users to create a new account and be added to the system database.
2. **Log in**: The system shall allow users to log into his account the system will check the validity of his credentials.
3. **Log out**: The system shall allow users to log out of his account the system will redirect the user to the login screen.
4. **Show live market**: The system shall display the live cryptocurrencies data.
5. **Predict prices**: The system shall display prediction for price movements of the cryptocurrencies within next week.
6. **Give overview on coin**: The system shall display a visualization for price movements of the cryptocurrencies within last year as well as an overview about the coin.
7. **Display news**: The system shall display news about the cryptocurrencies and provide direct link to these articles.
8. **Display historical data**: The system shall display a table of history data for cryptocurrencies the table will contain the OCHLV values
9. **Display market exchanges**: The system will display data on the some of the available exchanges as well as provide a link to them
10. **Run trading simulation**: the system shall allow the user to train on a simulation that mimic how real market would work perform actions like buy and sell
11. **Search**: the system will allow user to search for a coin by name or by its symbol
12. **Subscribe to newsletter**: system will allow the user to subscribe to newsletter and receive emails about coins prices
13. **Add coins to watchlist**: system shall allow user to put specific coins to watchlist to show more interest in them for which emails and home page will be customed to.
14. **Convert cryptocurrencies:** The system shall allow users to convert cryptocurrencies into different currencies to know it values.

3.1.2 Non-functional requirements

Usability: An English literate should be able to use system within few seconds by reading the command and hints displayed on buttons and panels the visual representation of price movement will be at least 50*50 pixels and explanation will be written under it.

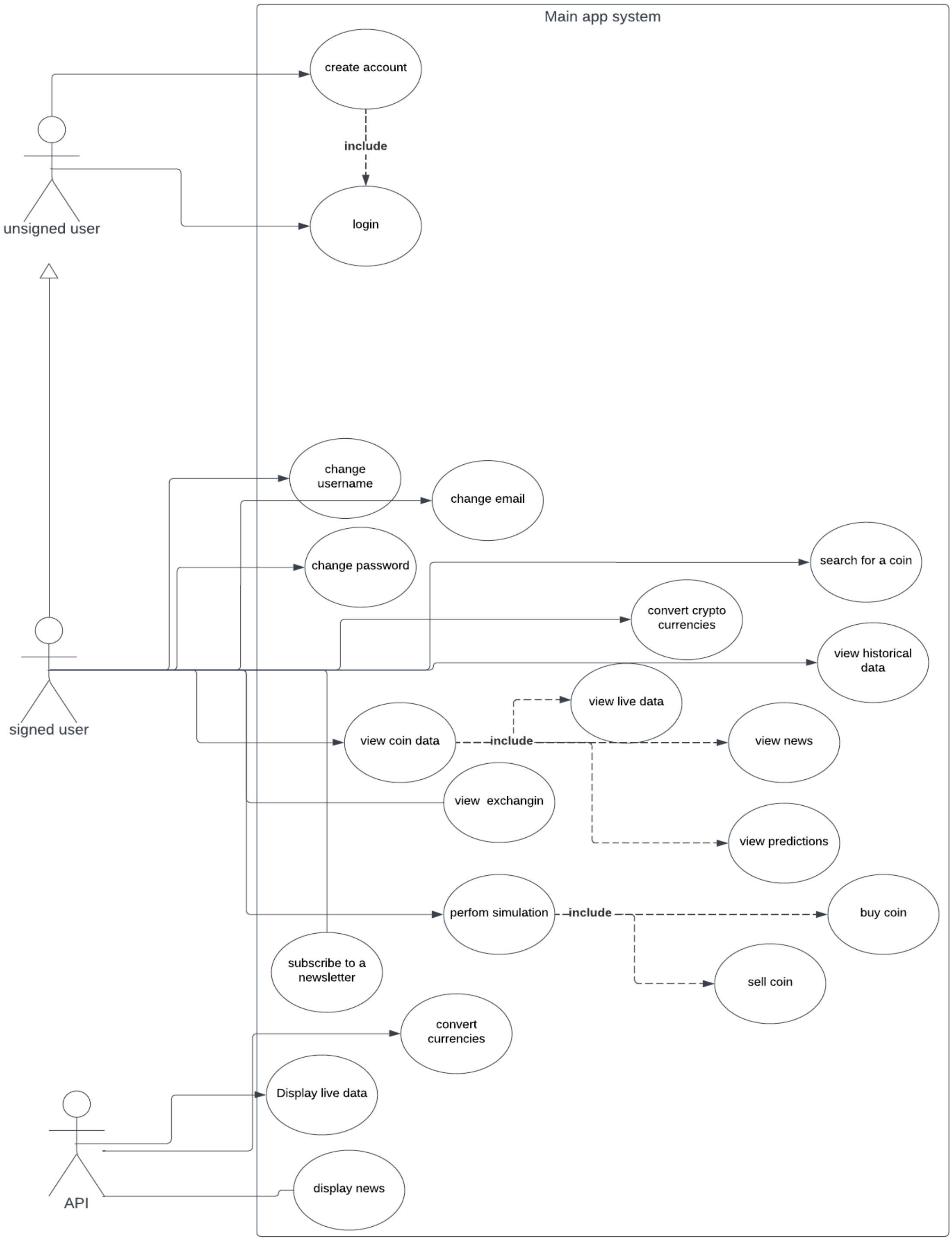
Performance: this software should take no longer than 5 seconds to display the pages and screens the predictions model should be executed and displayed in less than 10 seconds

Maintainability: the system must have the prediction execution model separated from the rest of the code and communicate with use of an API so if a better or a faster prediction model was found it can be replaced with it.

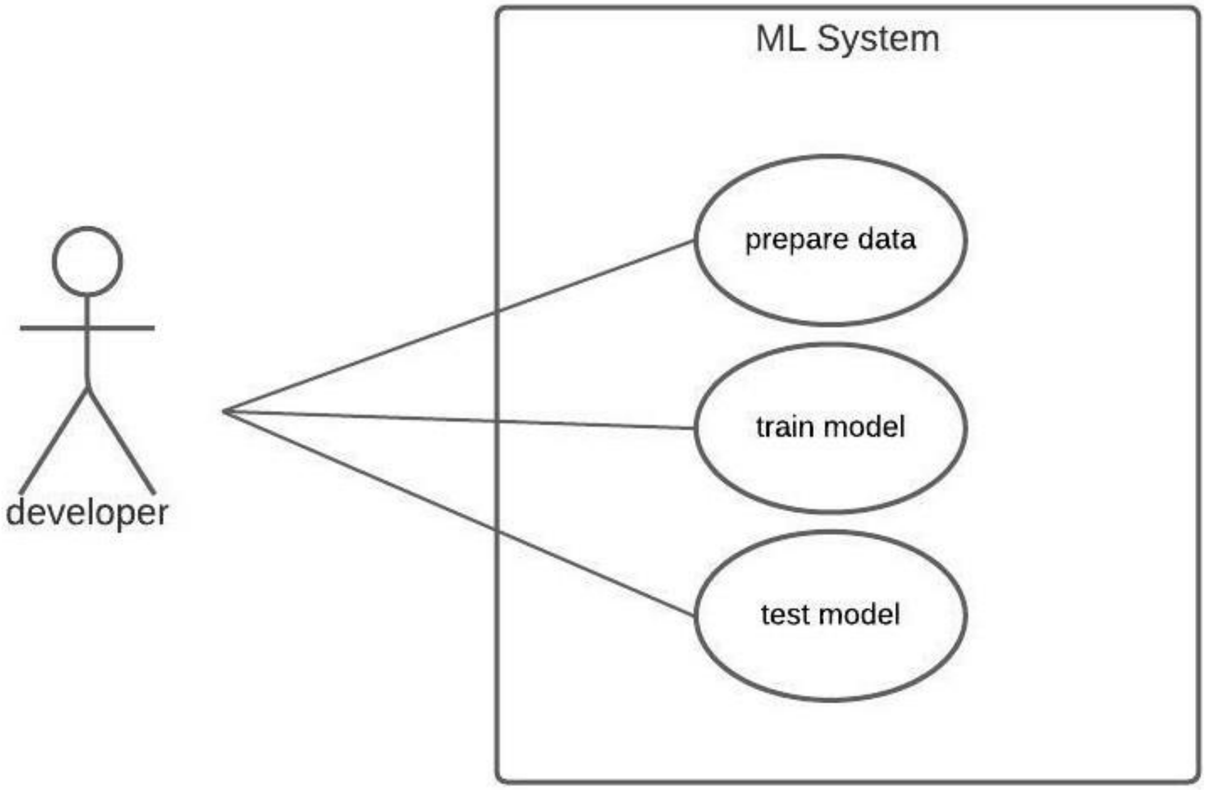
Security: the system shall encrypt the user passwords and will be stored in the database encrypted

Accuracy: This software will predict the right movement for a cryptocurrency with accuracy of at least 50%

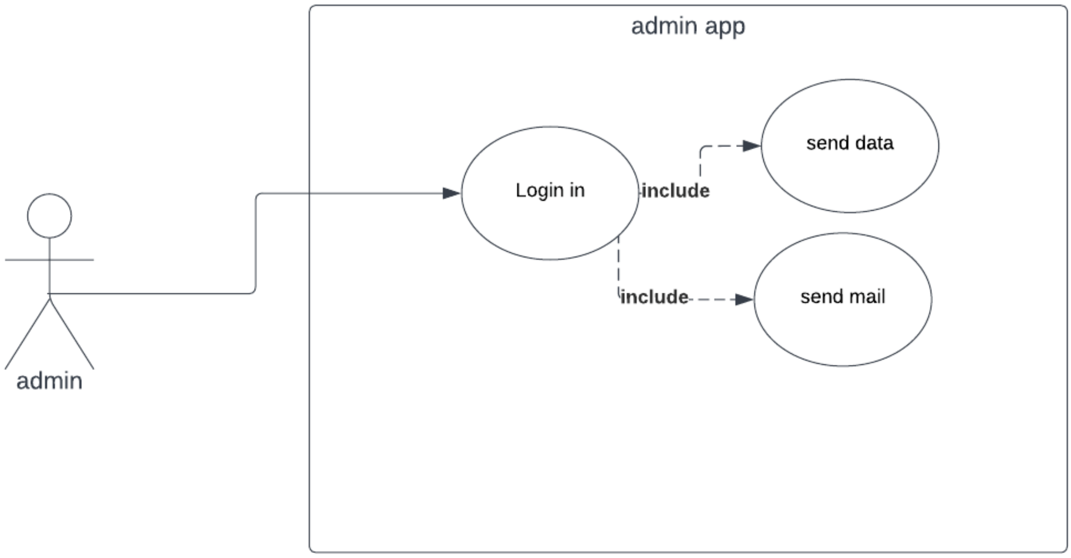
3.2 Use Case Diagrams



Figure(13): Main app use cases



Figure(14): Developer with ML system use case



Figure(15): Admin use case

Use Case ID:	UC1	
Use Case Name:	Register	
Actors:	unsigned User	
Pre-conditions:	-	
Post-conditions:	A new user will be added to the system.	
Flow of events:	**Actor Action**	**System Action**
	1- User click in on register button.	
		2-System ask user to enter his credentials (email, username, password)
	3-user enter his credentials	
		4- System check if user already exists.
	.	5- System check password validity.
		6-System add user to the system account.
		7-- System sign into the user account.
Exceptional Flow of events:	**Actor Action**	**System Action**
	At step 3- User enters an existing email.	
		4- System notify the user that the user email already exists.
Exceptional Flow of events:	At step 3- User enters an existing email.	
		4- System notify the user that password doesn’t match the required format.

Table(2): Register use case

Use Case ID:	UC2	
Use Case Name:	Sign in	
Actors:	unsigned User	
Pre-conditions:	should have an active account	
Post-conditions:	User will be signed in his account.	
Flow of events:	**Actor Action**	**System Action**
	1- User click on sign in button.	
		2-System ask user to enter his login credentials
	3-user enter his credentials	
		4- System validate user login info.
		5- System load user data from database
		6- System sign into the user account.
Exceptional Flow of events:	**Actor Action**	**System Action**
	At step 3- User enters wrong credentials (email or password).	
		4- System notify the user that username or password is wrong and should re-enter

Table(3): Sign in use case

Use Case ID:	UC3	
Use Case Name:	Log out	
Actors:	signed User	
Pre-conditions:	should have an active account and signed in	
Post-conditions:	User will log out of his account	
Flow of events:	**Actor Action**	**System Action**
	1- User click on log out button.	
		2-System log out the user from his account

Table(4): Log out use case

Use Case ID:	UC4	
Use Case Name:	Update user data	
Actors:	signed User	
Pre-conditions:	should have an active account and signed in	
Post-conditions:	User account info will be updated by the new values	
Flow of events:	**Actor Action**	**System Action**
	1- User click on update button.	
		2-System show the user options for info to change
	3-user choose change budget	
		4- System ask user to enter the value.
	5- user enter the new value	
		6- System update user's info in database
Alternate Flow of events:	**Actor Action**	**System Action**
	At step 3- user choose update ownership	
		4- System show the user the available cryptocurrencies
	5- user choose a cryptocurrency	
		6- System ask user to enter the value.
	7- user enter the new value	
		8- System update user's info in database
Exceptional Flow of events:	**Actor Action**	**System Action**
	At step 5 - user enter an invalid value	
		6- System notify user that value is invalid
Extends	Update budget, update owned cryptocurrencies	

Table(5): update user data use case

Use Case ID:	UC5	
Use Case Name:	Display cryptocurrency live information	
Actors:	signed User	
Pre-conditions:	should have an active account and signed in	
Post-conditions:	User will view a live info for the cryptocurrency as well as the prediction for its future values	
Flow of events:	**Actor Action**	**System Action**
	1- User click on home button.	
		2-System calls the live cryptocurrencies data API
		3-System filter needed data from the retrieved data put it in the right format
		4- System display the new data for the user
		5-System retrieve old data from the database for each available cryptocurrency
		6- System calls the Prediction algorithm API
		7-System retrieve the predicted price movements from the API
		8- System display the predicted price movements
Includes:	Retrieve live data, predict cryptocurrency price movement	

Table(6): Display crypto live information use case

Use Case ID:	UC6	
Use Case Name:	Send new coins data to database	
Actors:	Admin	
Pre-conditions:	should have an active account and signed in	
Post-conditions:	New coins’ data will be added to database	
Flow of events:	**Actor Action**	**System Action**
	1- User click on update database button.	
		2-System prepare the coins models
		3-System check database data if it has same date
		4- System loop over the coins and insert each of them
Alternate Flow of events:	**Actor Action**	**System Action**
		At step 3- System check database data if it has same date and find data with same date
		4- System display a warning to the user that data in database has same date and ask if he would like to overwrite it.
	5- user confirm the update.	
		6- System overwrite the old data.

Table(7): Send coins to database use case

Use Case ID:	UC7	
Use Case Name:	Overview coin data	
Actors:	signed User	
Pre-conditions:	should have an active account and signed in	
Post-conditions:	The cryptocurrency data will be visualized	
Flow of events:	**Actor Action**	**System Action**
	1- User click on overview button for a coin.	
		2-system retrieve coin data for the previous months from database.
		3-System build the graph for the coin data and show general info about the coin.
		4-system display the graph for the user.

Table(8): Visualize data use case

Use Case ID:	UC8	
Use Case Name:	view recommended investments	
Actors:	signed User	
Pre-conditions:	should have an active account and signed in	
Post-conditions:	User will log out of his account	
Flow of events:	**Actor Action**	**System Action**
	1- User click on recommendations button.	
		2-System retrieve previous cryptocurrency data from data base
		3-System calls the predictor API and send to it the data and user info
		4- System run the recommendation Algorithm.
		5- System predictor API returns the recommendations
		6- System display recommendation to the user
Includes	Recommend investments	

Table(9): View recommended investments use case

Use Case ID:	UC9	
Use Case Name:	Buy coin in live simulation	
Actors:	signed User	
Pre-conditions:	should have an active account, signed in and have enough amount of money	
Post-conditions:	A pop message saying transaction successful will appear	
Flow of events:	**Actor Action**	**System Action**
	1- User click on buy button for a coin	
	2-User will determine the Quantity he wishes to buy	
		3-System will check if he has money
		4- System will update the database for the money and the owned coins
		5-System will send a "Transaction successful" to the user
Alternate Flow of events:	**Actor Action**	**System Action**
		3-System checks if he has money
		4- System will send "Not enough money" to the user

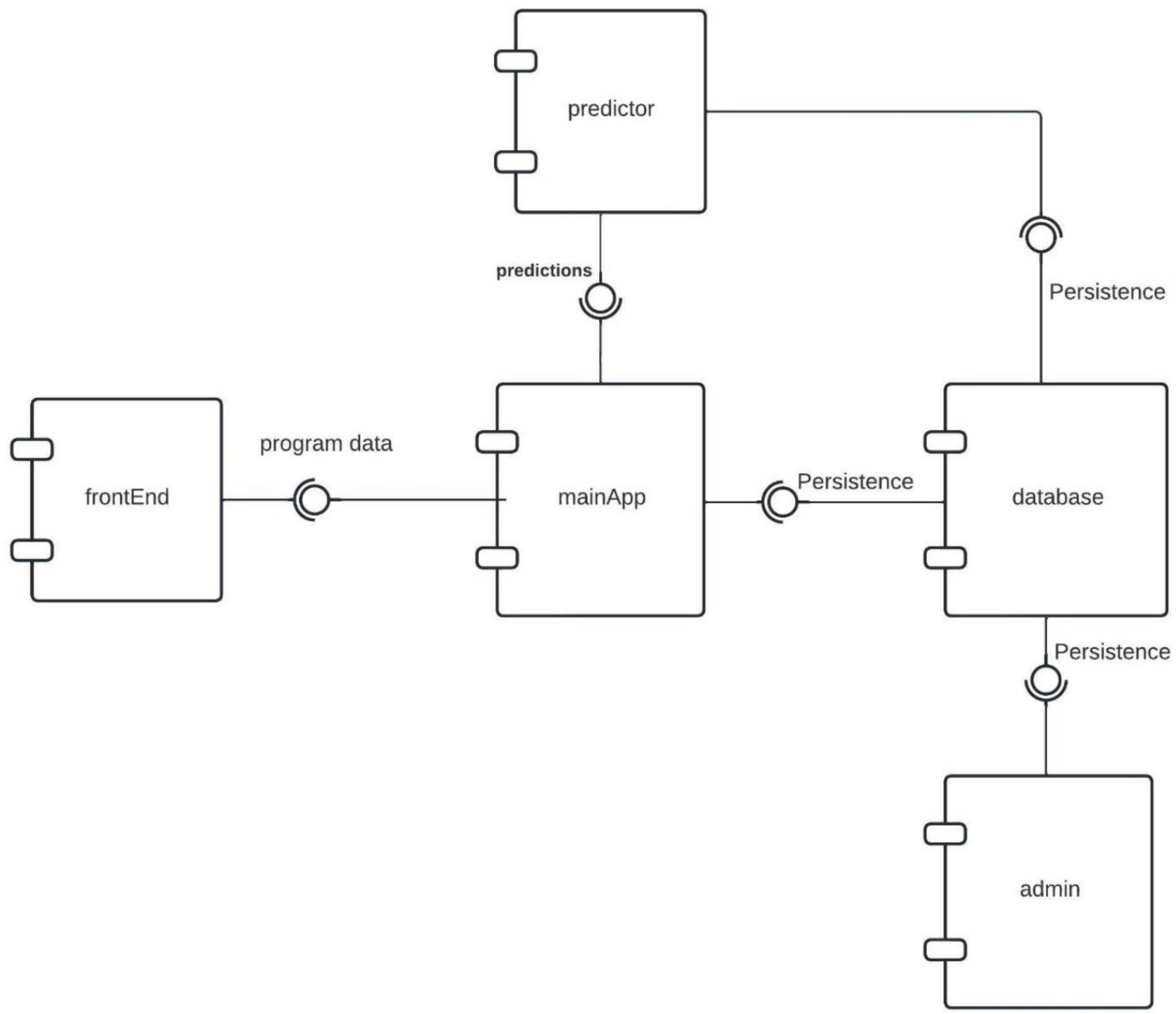
Table(10): Buy coin in live simulation use case

Use Case ID:	UC10	
Use Case Name:	sell coin in live simulation	
Actors:	signed User	
Pre-conditions:	should have an active account, signed in and have enough Quantity of crypto coin	
Post-conditions:	A pop message saying transaction successful will appear	
Flow of events:	**Actor Action**	**System Action**
	1- User click on sell button for a coin	
	2-User will determine the Quantity he wishes to sell	
		3-System will check if he the Quantity he wishes to sell
		4- System will update the database for the money and the owned coins
		5-System will send a "Transaction successful" to the user
Alternate Flow of events:	**Actor Action**	**System Action**
		3-System will check if he the Quantity he wishes to sell
		4- System will send "Not enough money" to the user

Table(11): Sell coin in live simulation use case

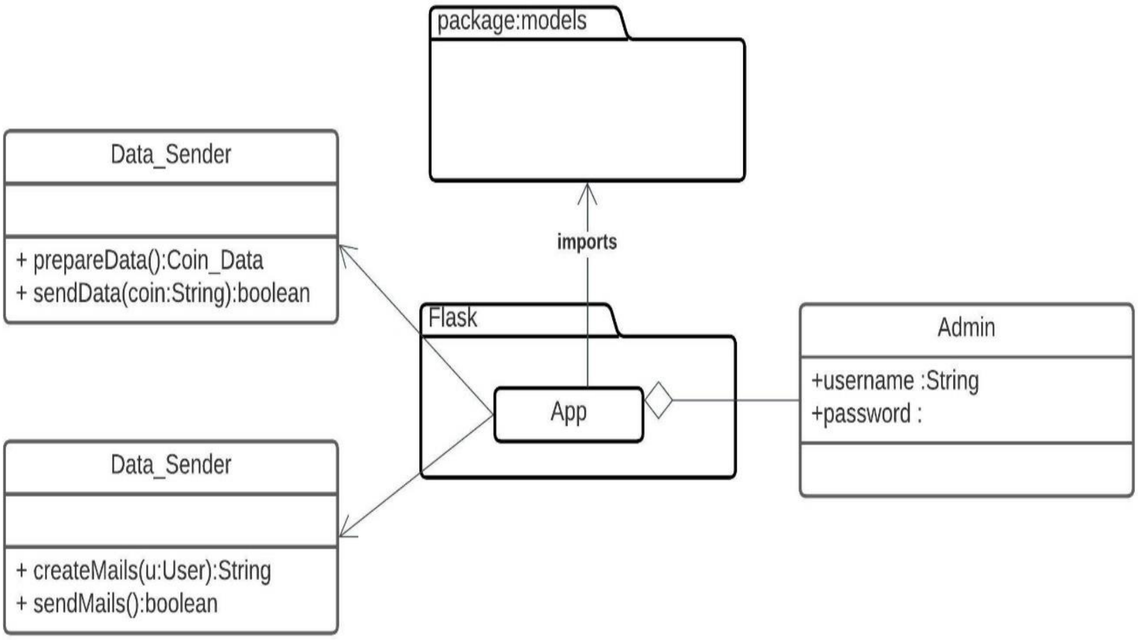
4. System Design

4.1 System component diagram

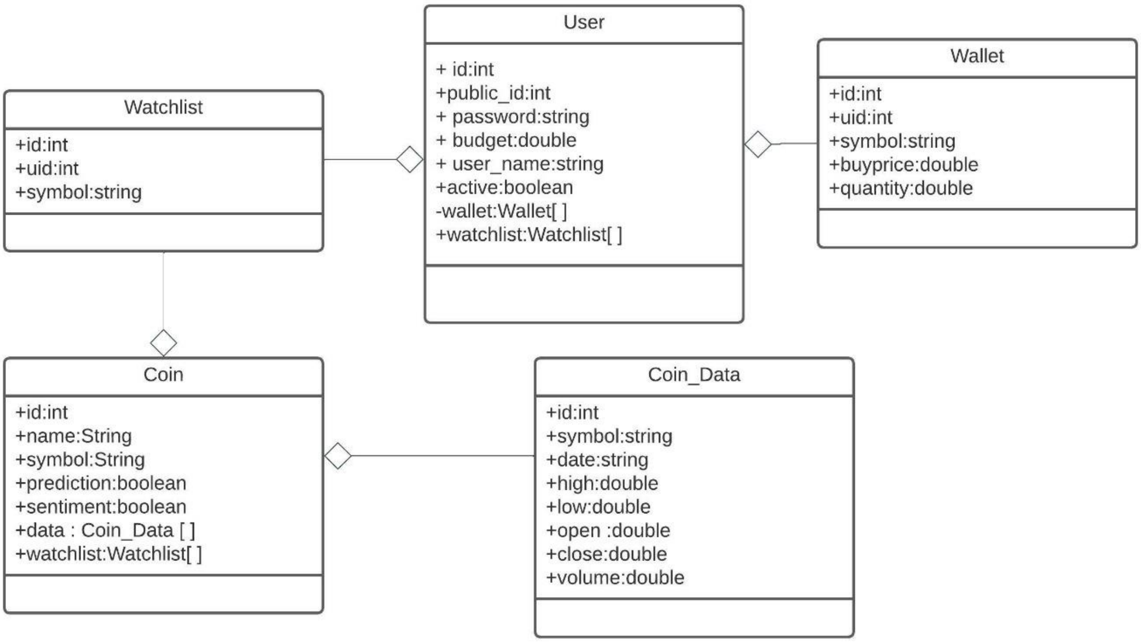


Figure(16): System component diagram

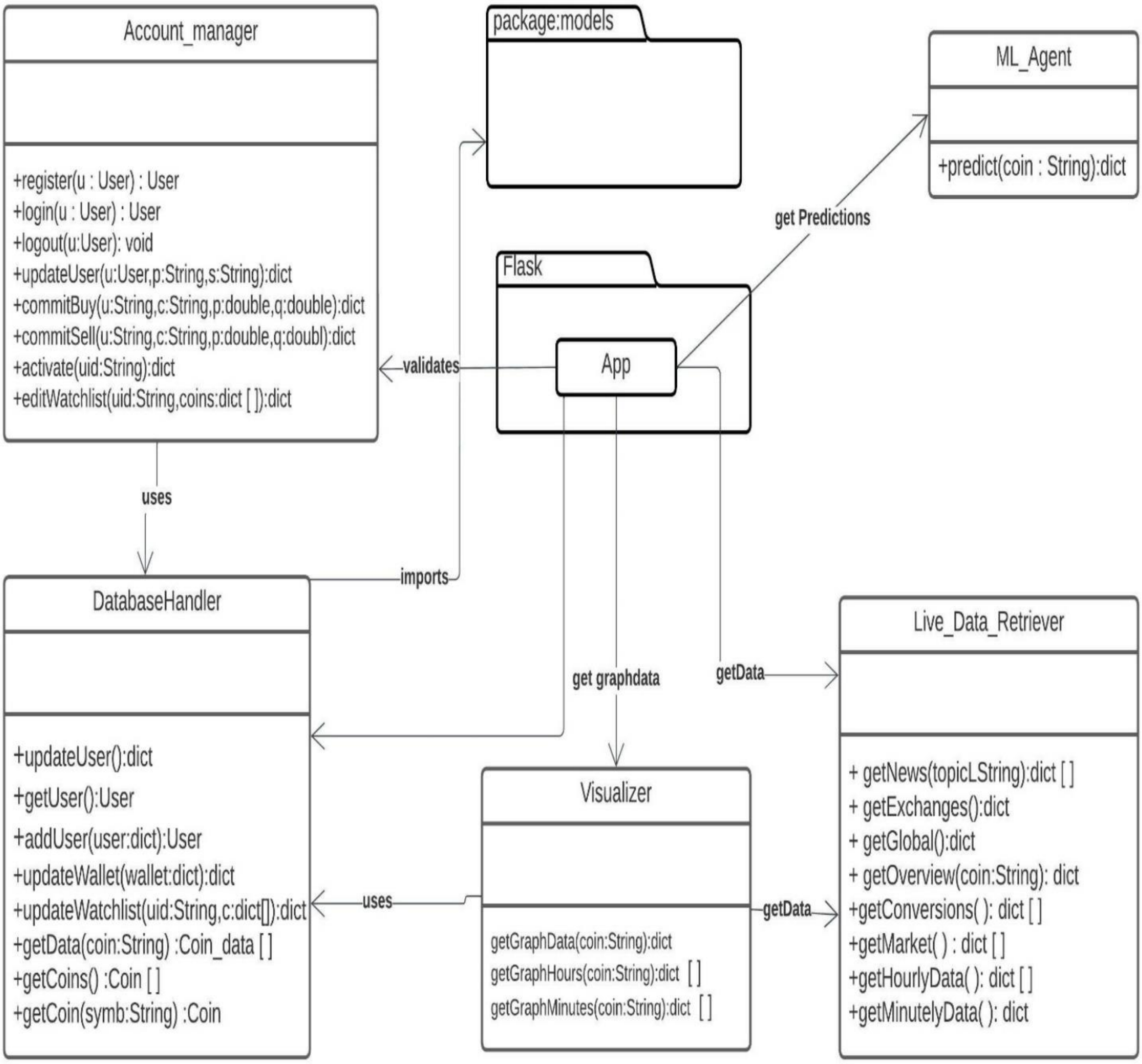
4.2 System class diagrams



Figure(17): class diagram

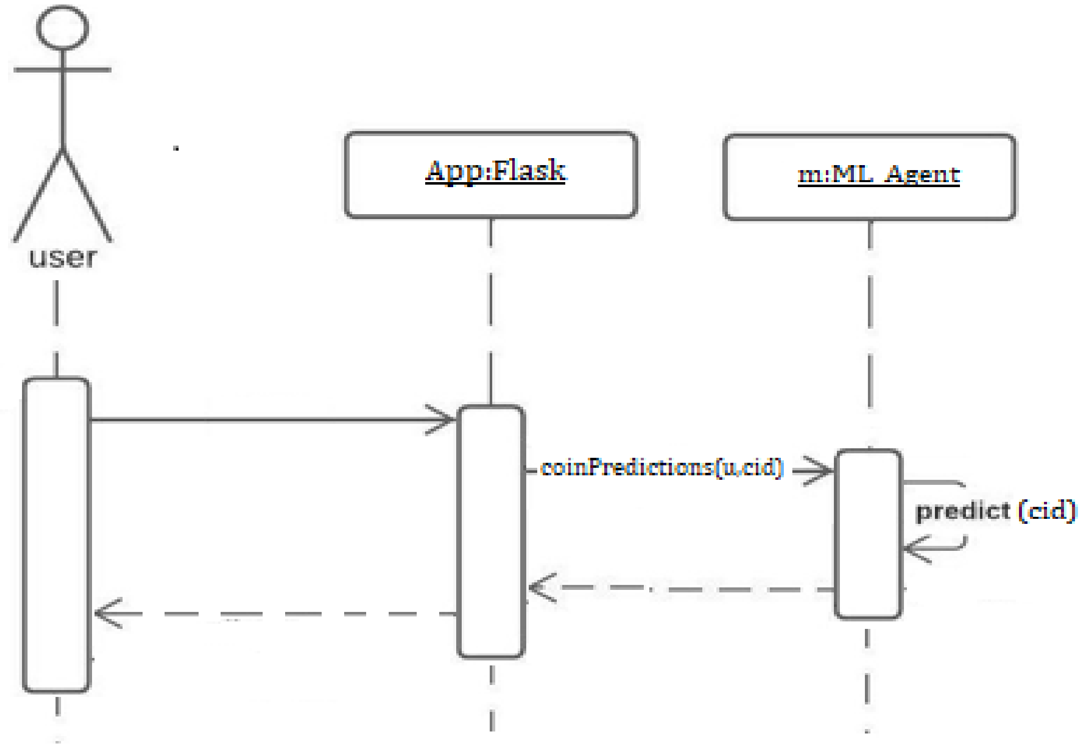


Figure(18): class diagram

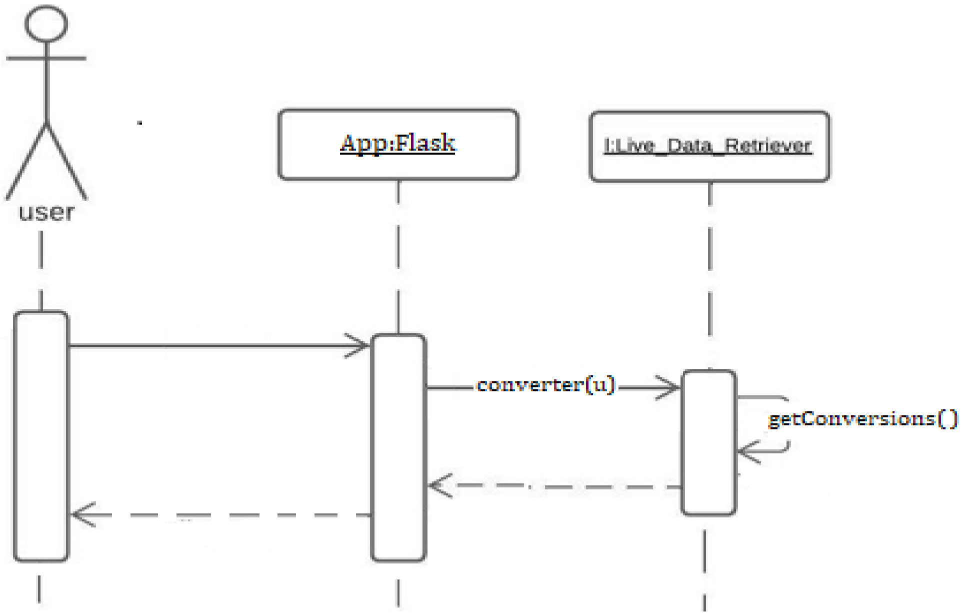

Account_manager
+register(u : User) : User
+login(u : User) : User
+logout(u:User): void
+updateUser(u:User,p:String,s:String):dict
+commitBuy(u:String,c:String,p:double,q:double):dict
+commitSell(u:String,c:String,p:double,q:doubl):dict
+activate(uid:String):dict
+editWatchlist(uid:String,coins:dict [ ]):dict
package:models
ML_Agent
+predict(coin : String):dict
get Predictions
Flask
App
validates
uses
imports
DatabaseHandler
+updateUser():dict
+getUser():User
+addUser(user:dict):User
+updateWallet(wallet:dict):dict
+updateWatchlist(uid:String,c:dict[]):dict
+getData(coin:String) :Coin_data [ ]
+getCoins() :Coin [ ]
+getCoin(symb:String) :Coin
get graphdata
getData
Live_Data_Retriever
+ getNews(topicLString):dict [ ]
+ getExchanges():dict
+ getGlobal():dict
+ getOverview(coin:String): dict
+getConversions( ): dict [ ]
+getMarket( ) : dict [ ]
+getHourlyData( ): dict [ ]
+getMinutelyData( ): dict
Visualizer
getGraphData(coin:String):dict
getGraphHours(coin:String):dict [ ]
getGraphMinutes(coin:String):dict [ ]
uses
getData

Figure(19):class diagram

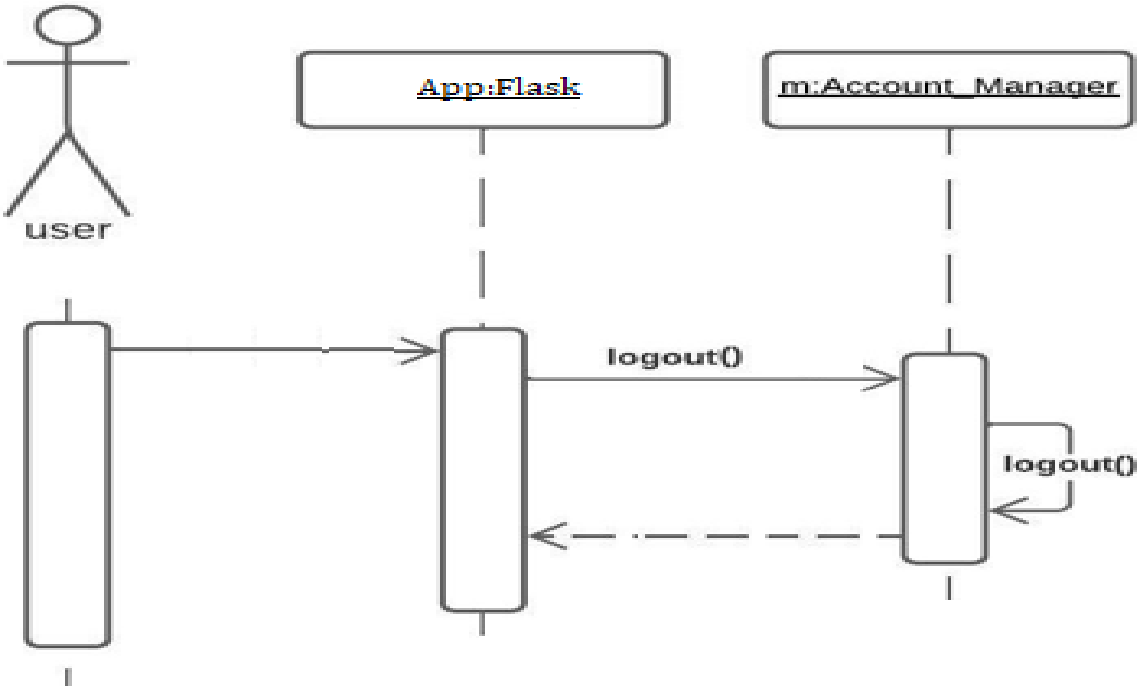
4.3 Sequence diagrams



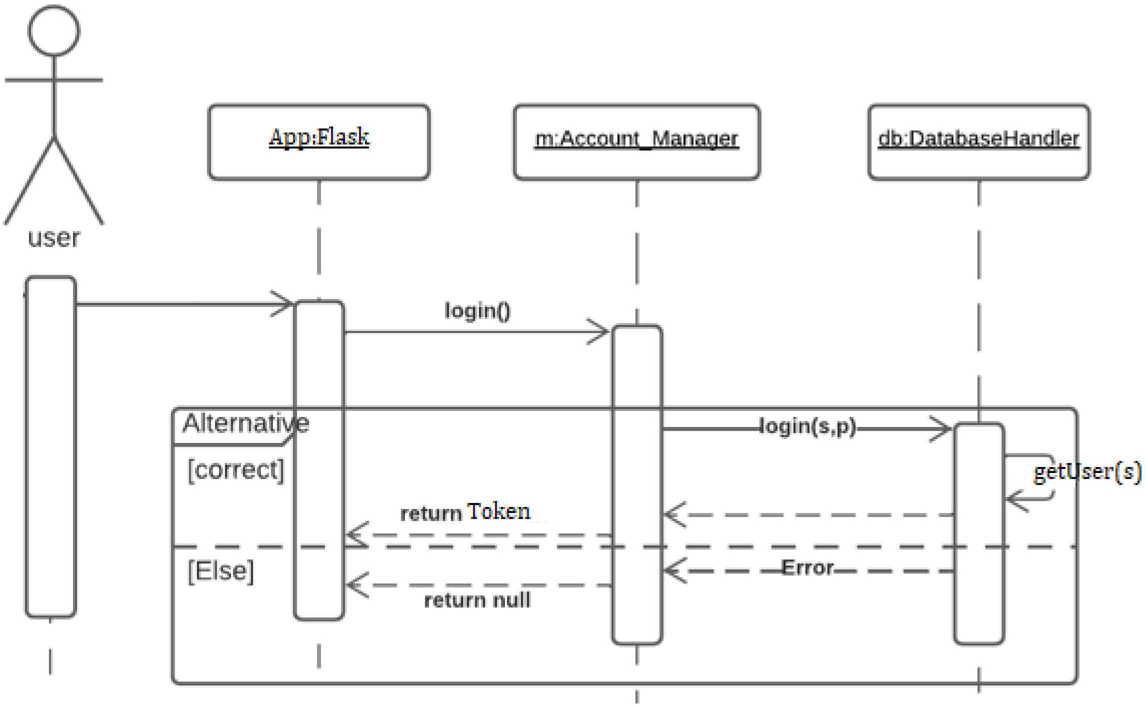
Figure(20)



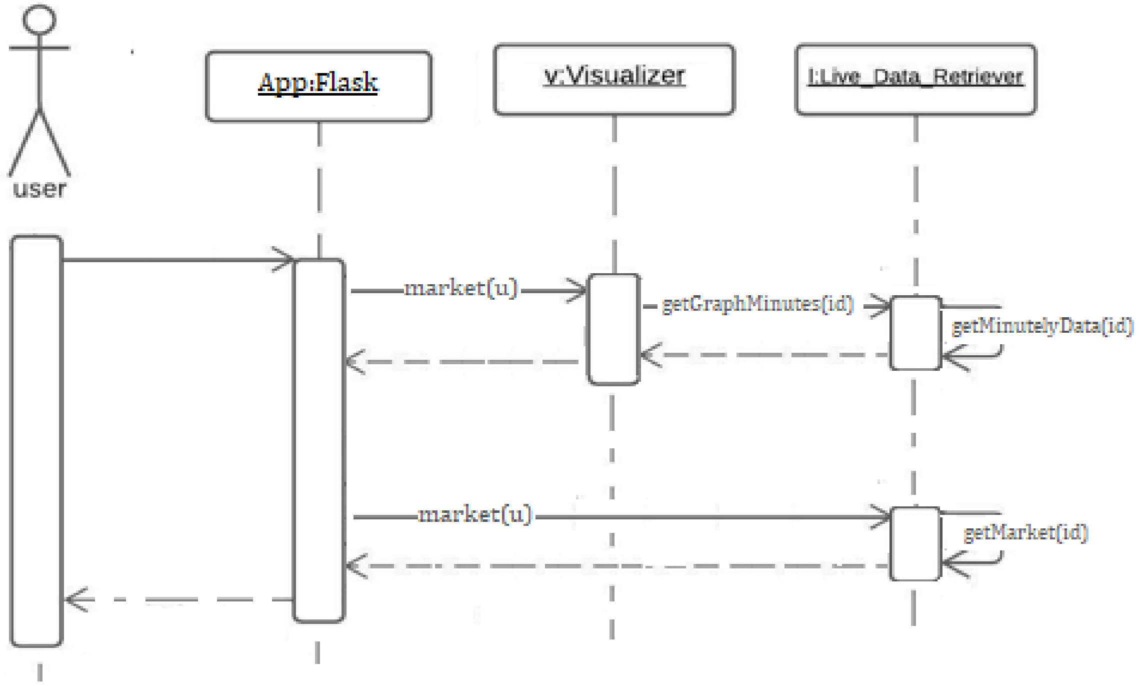
Figure(21)



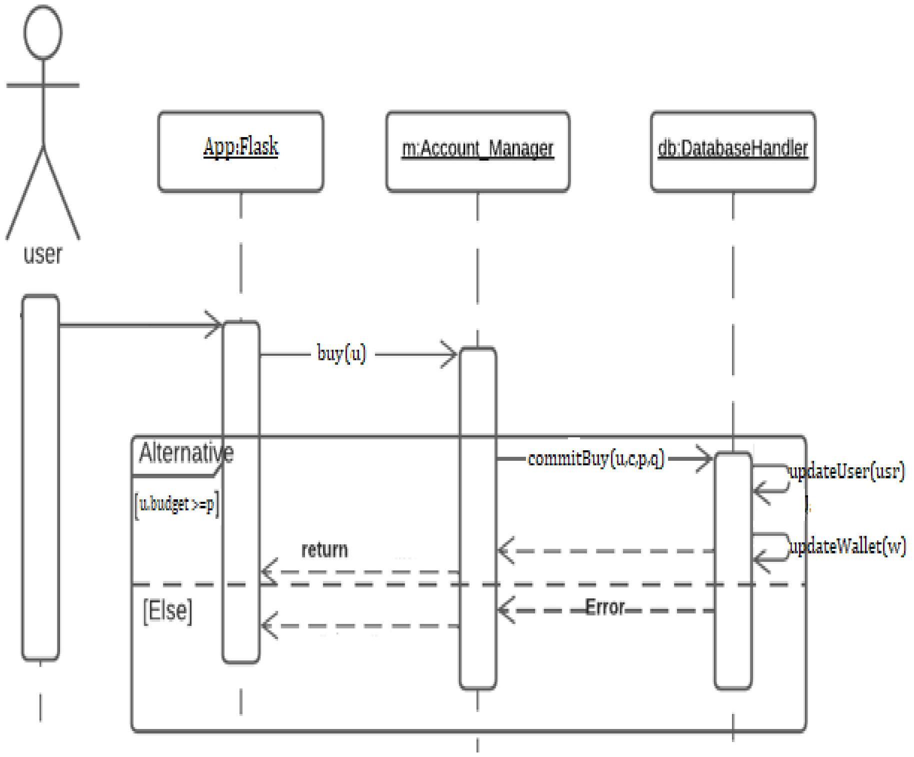
Figure(22)



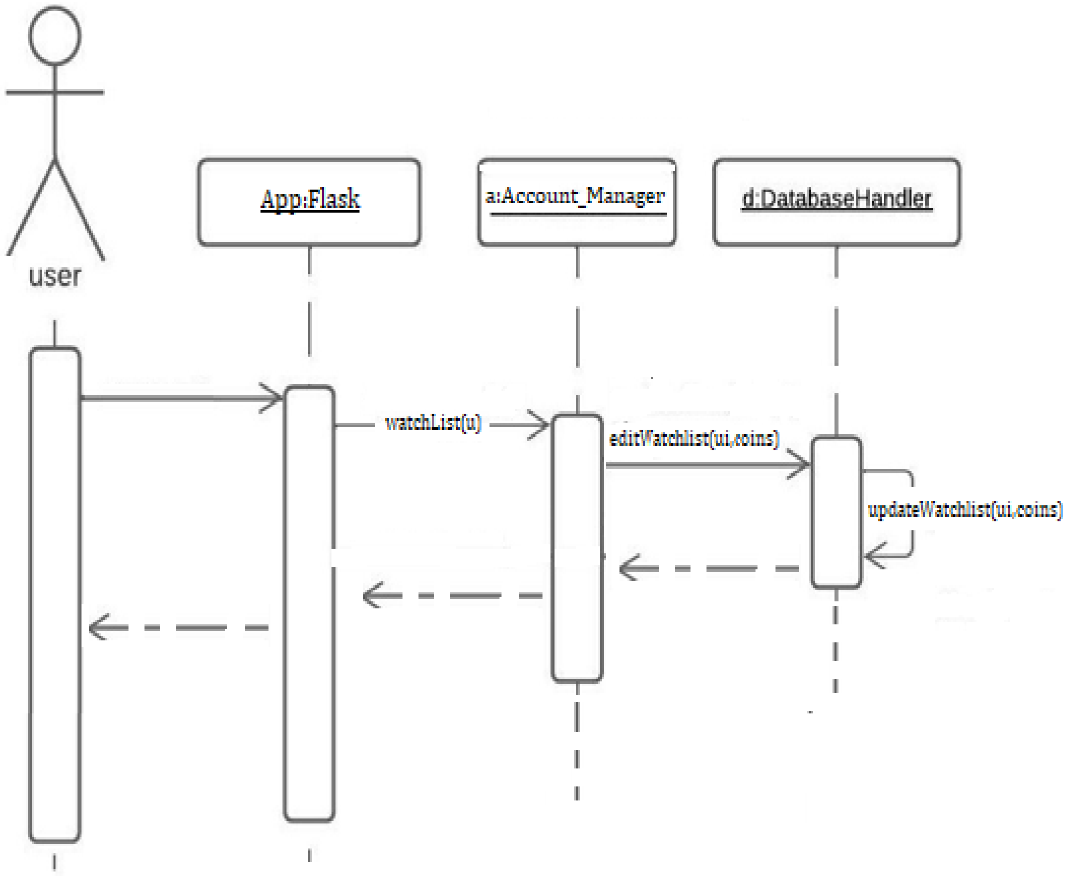
Figure(23)


user
App:Flask
v:Visualizer
l:Live_Data_Retriever
market(u)
getGraphMinutes(id)
getMinutelyData(id)
market(u)
getMarket(id)

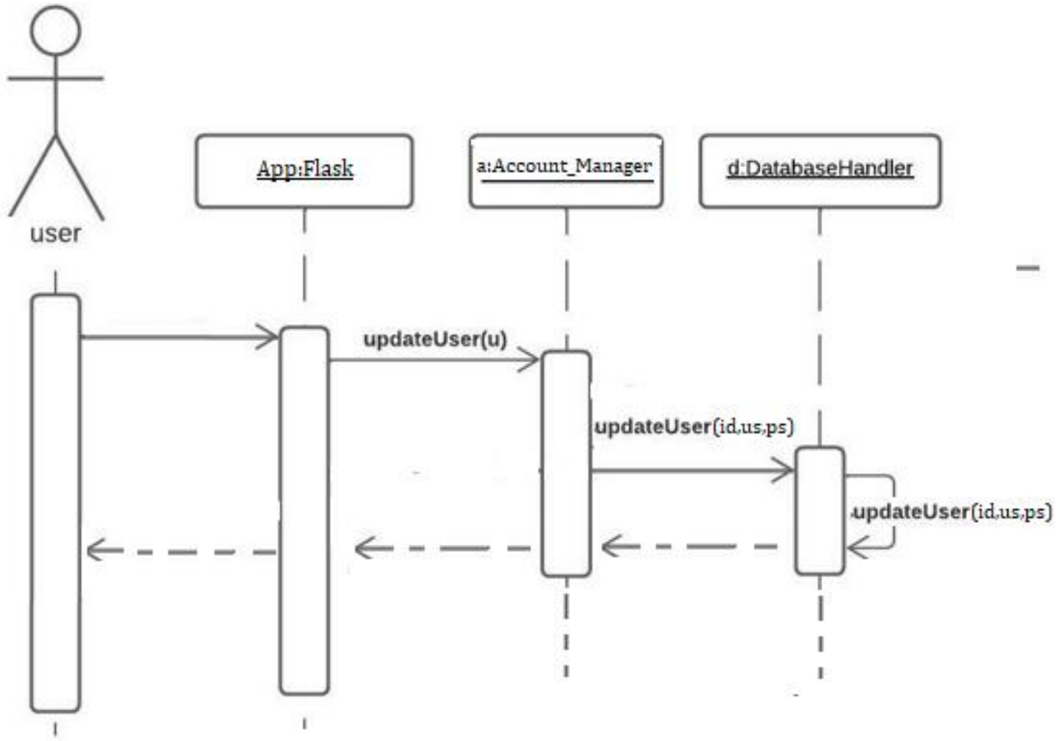
Figure(24)



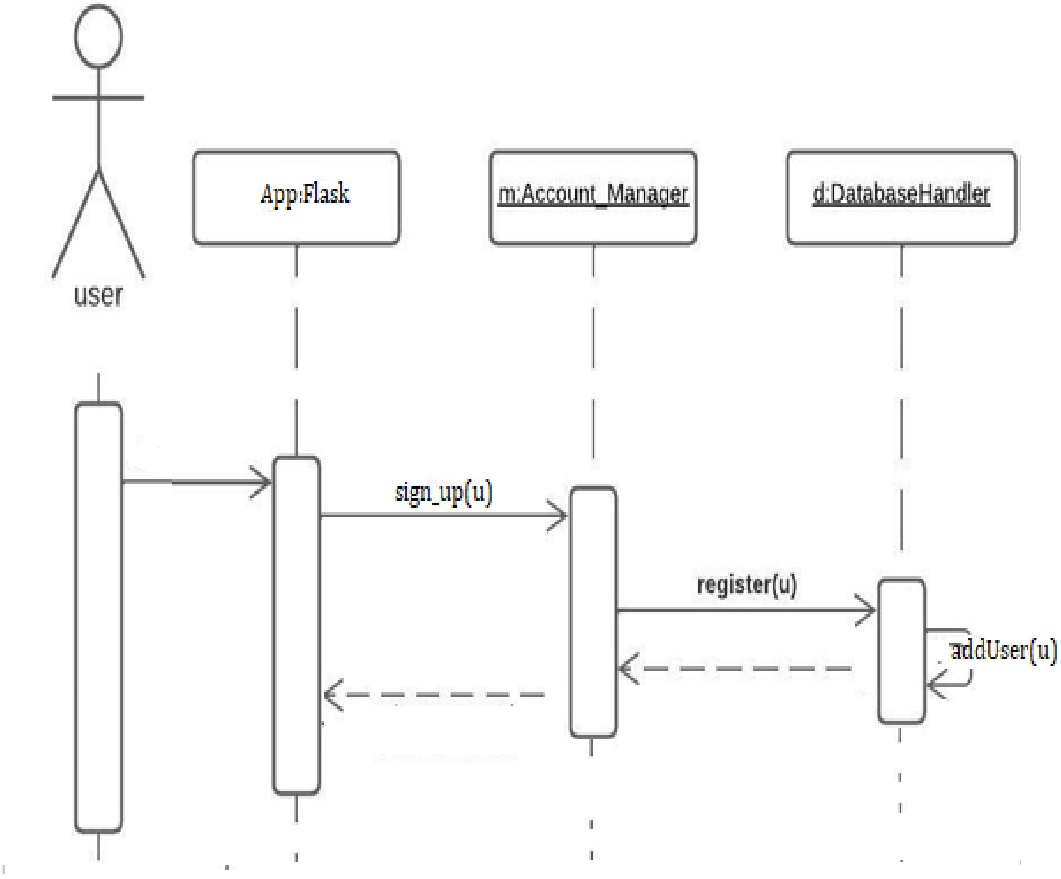
Figure(25)



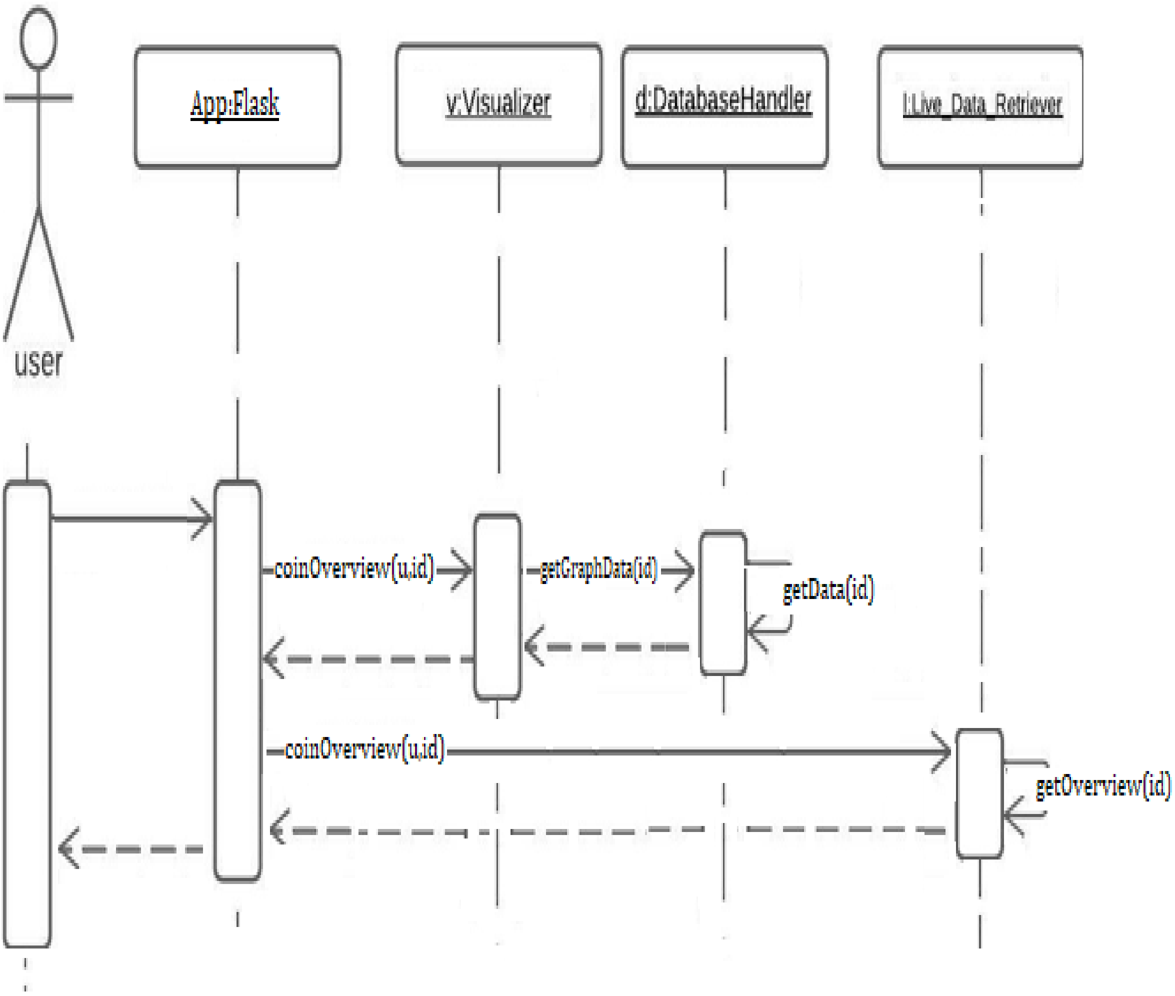
Figure(26)



Figure(27)

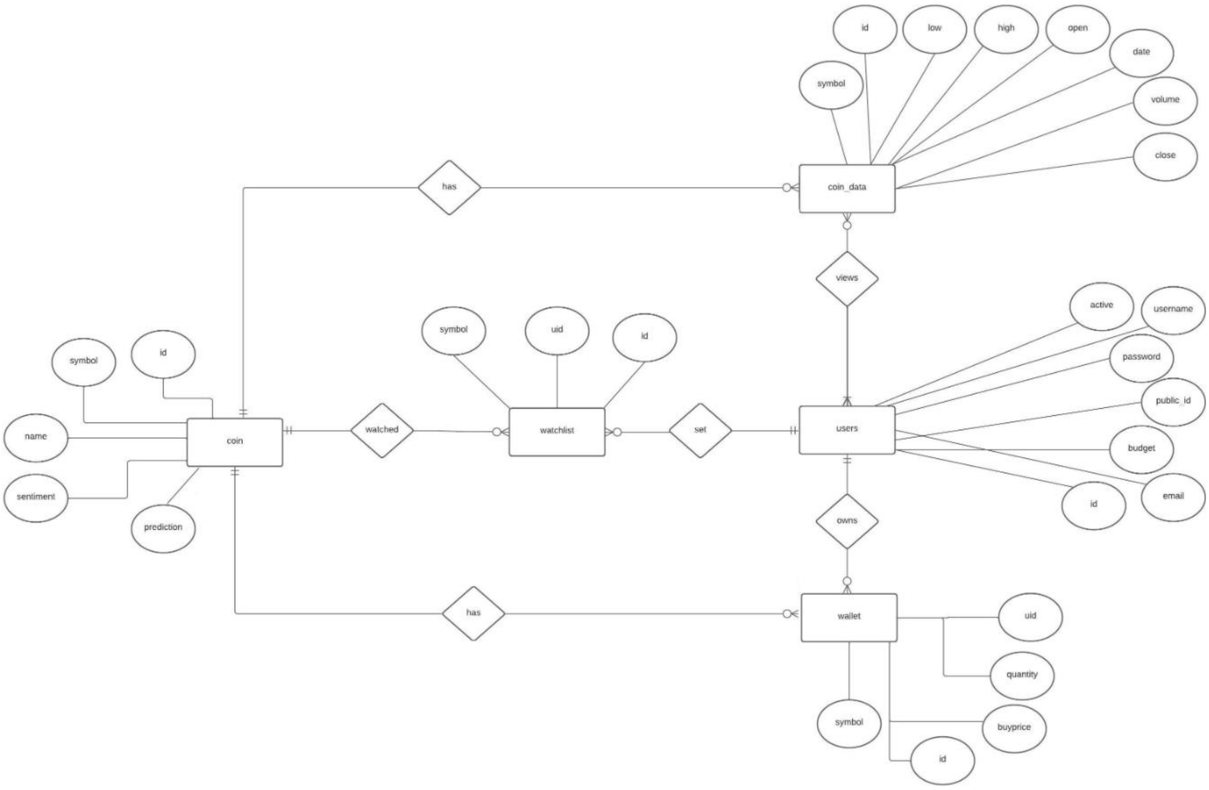


Figure(28)


user
App:Flask
v:Visualizer
d:DatabaseHandler
l:Live_Data_Retriever
coinOverview(u,id)
getGraphData(id)
getData(id)
coinOverview(u,id)
getOverview(id)

Figure(29)

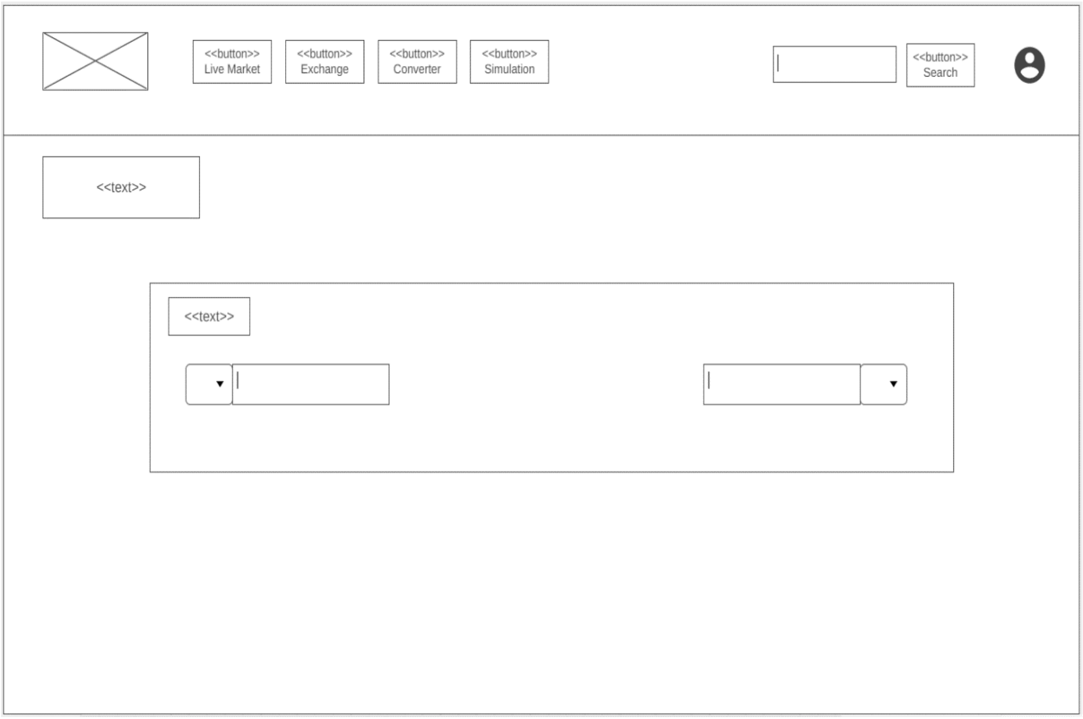
4.4 Project ERD



Figure(30): ERD diagram

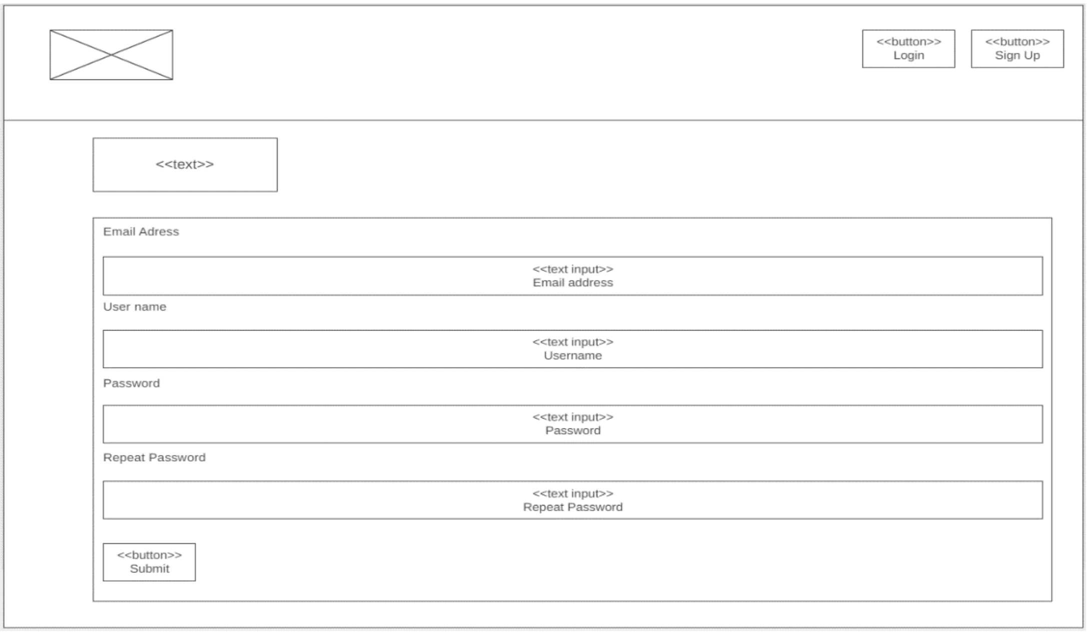
4.5 System GUI Design

Converter



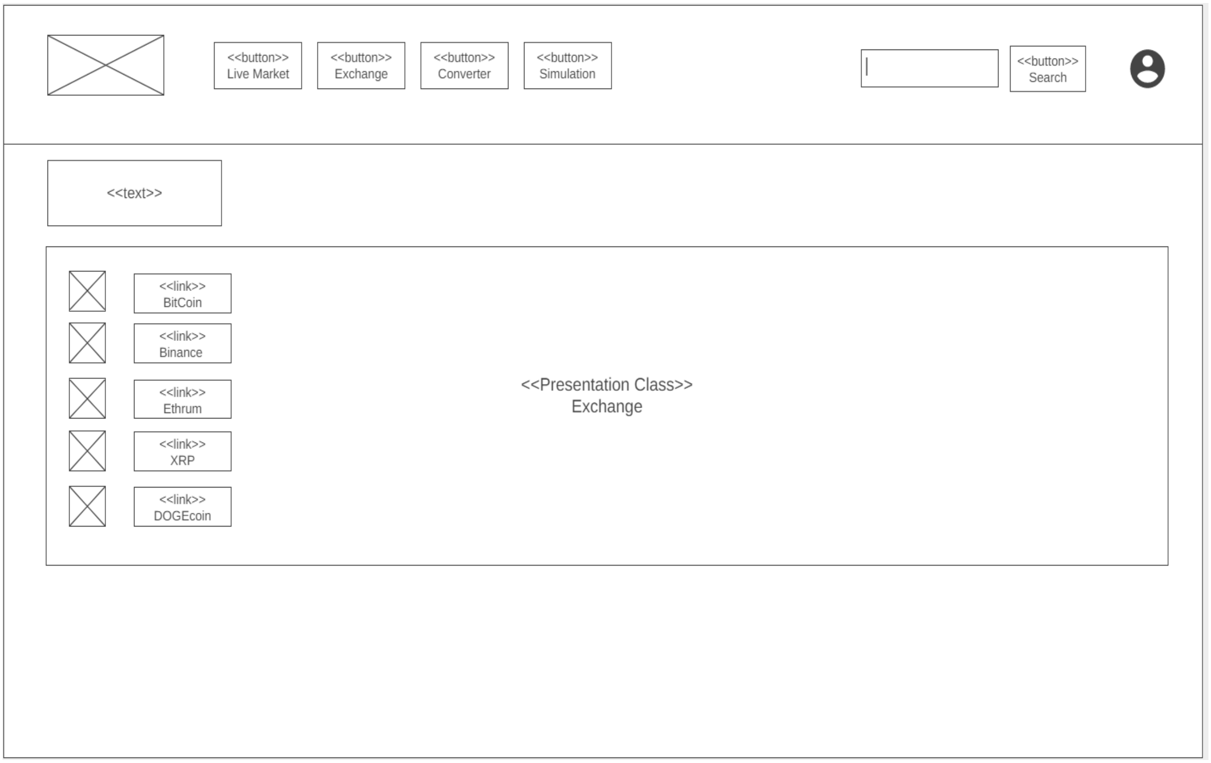
Figure(31): The UI design of converter page

SignUp



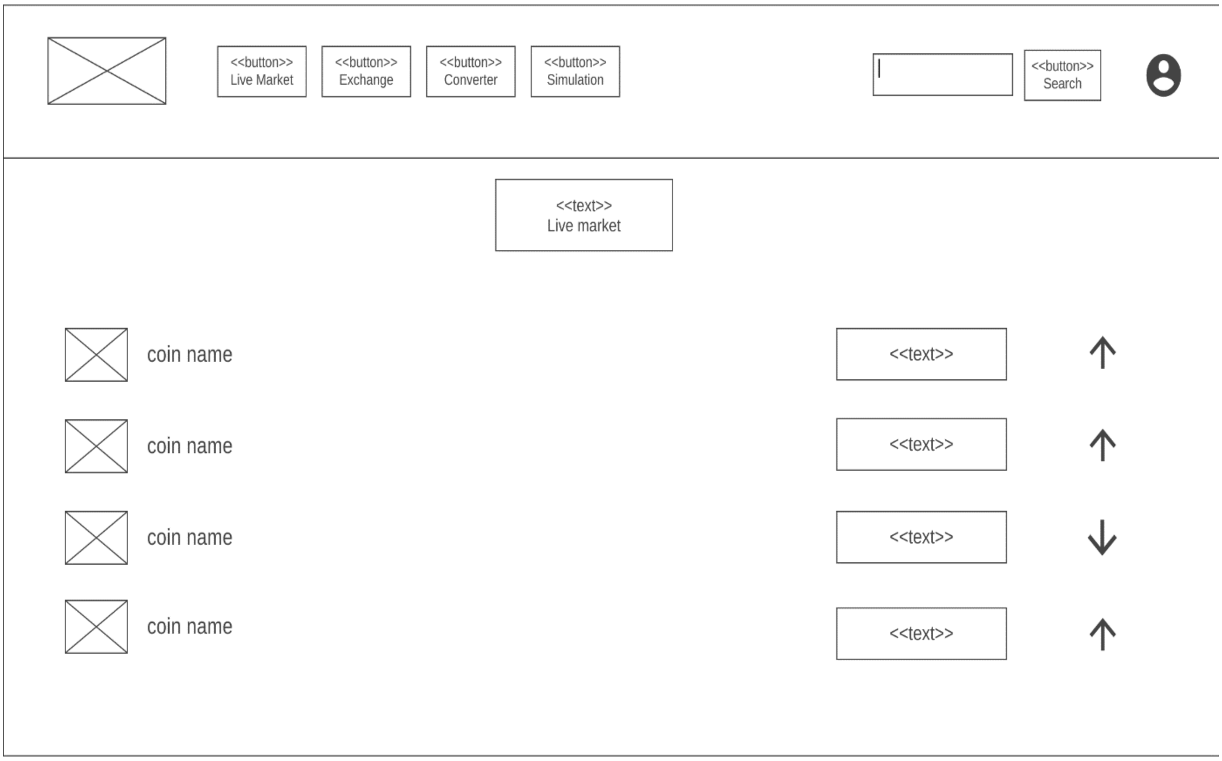
Figure(32): The UI design of signup page

Exchange



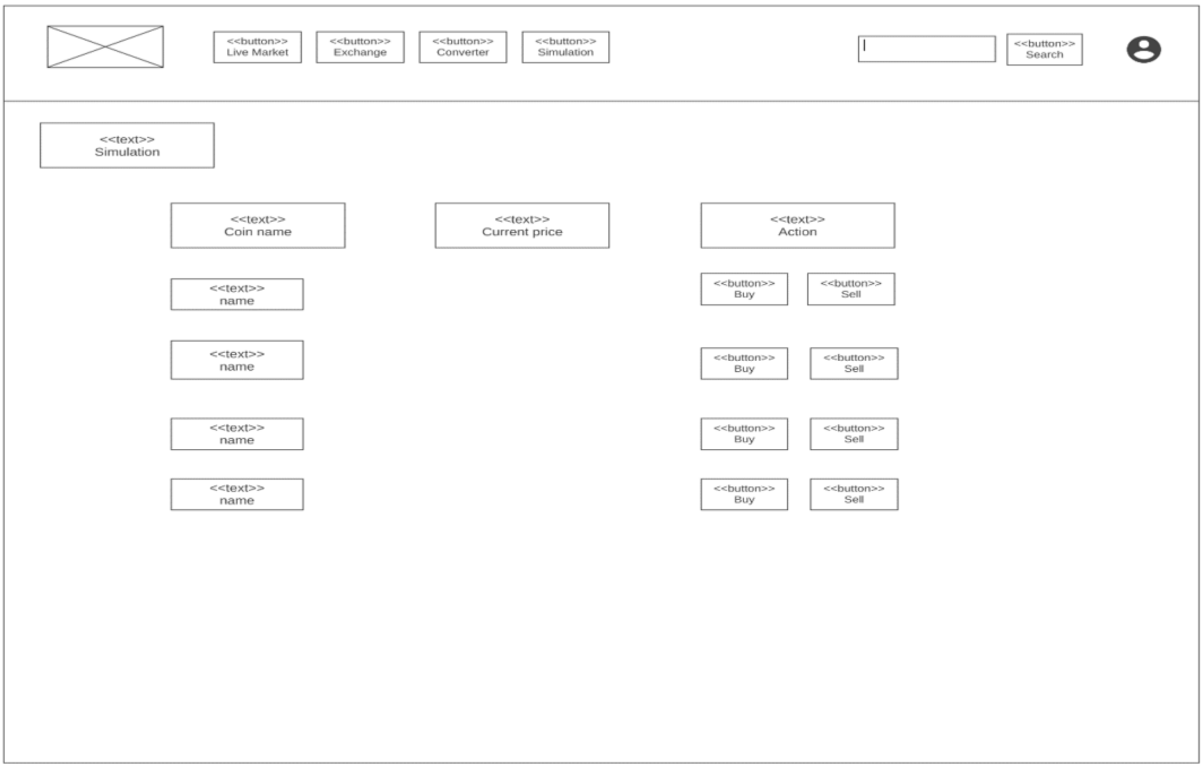
Figure(33): The UI design of exchange page

Live market



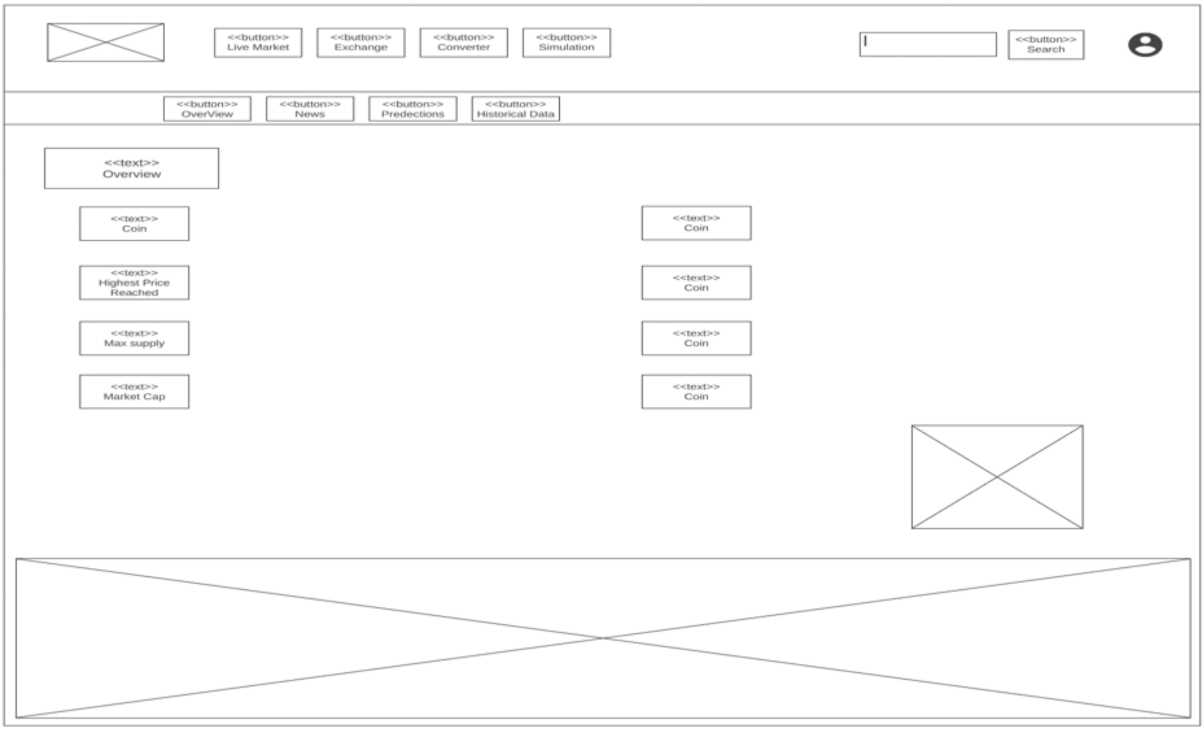
Figure(34): The UI design of live market page

Simulation



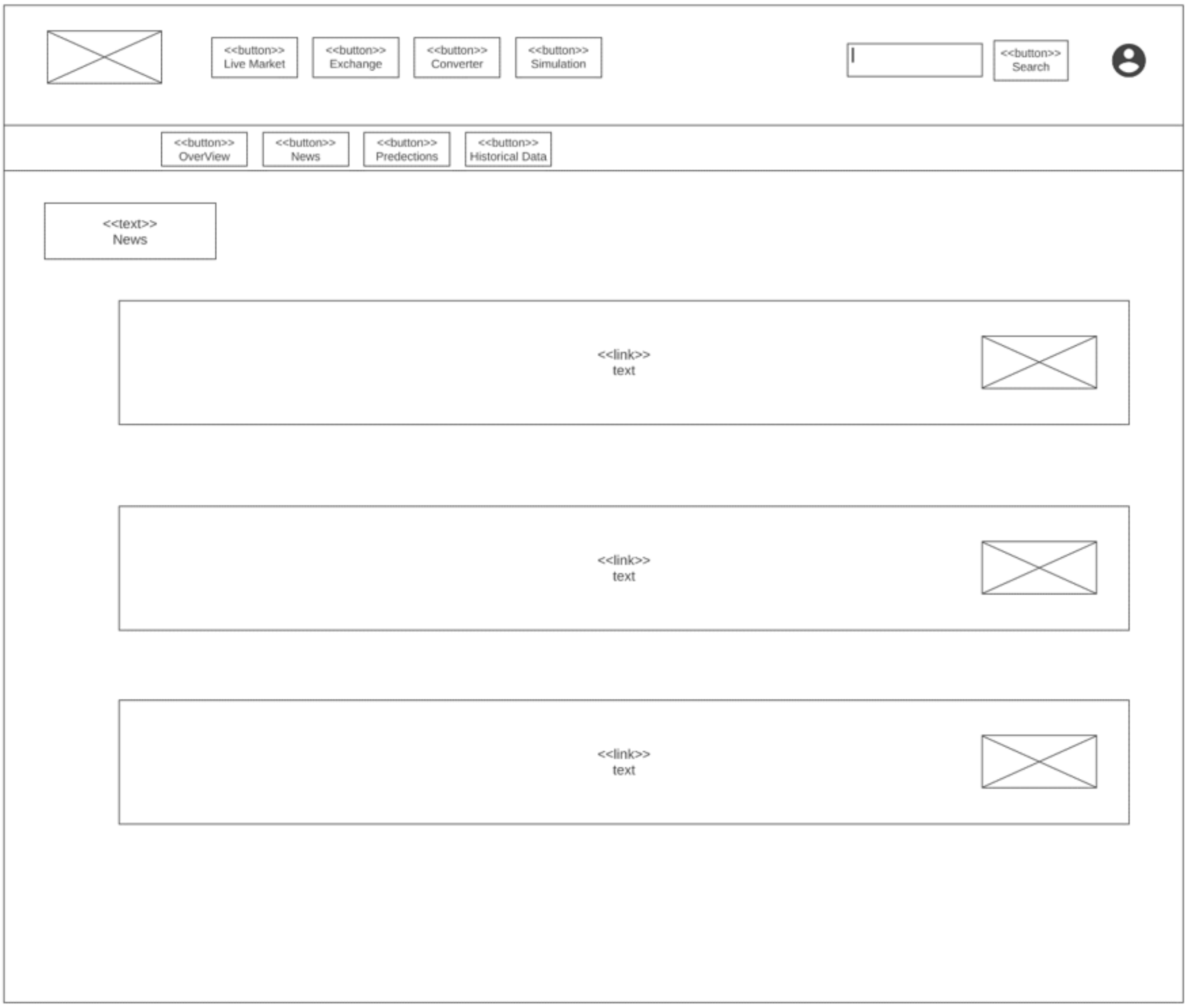
Figure(35): The UI design of simulation page

Overview



Figure(36): The UI design of overview page

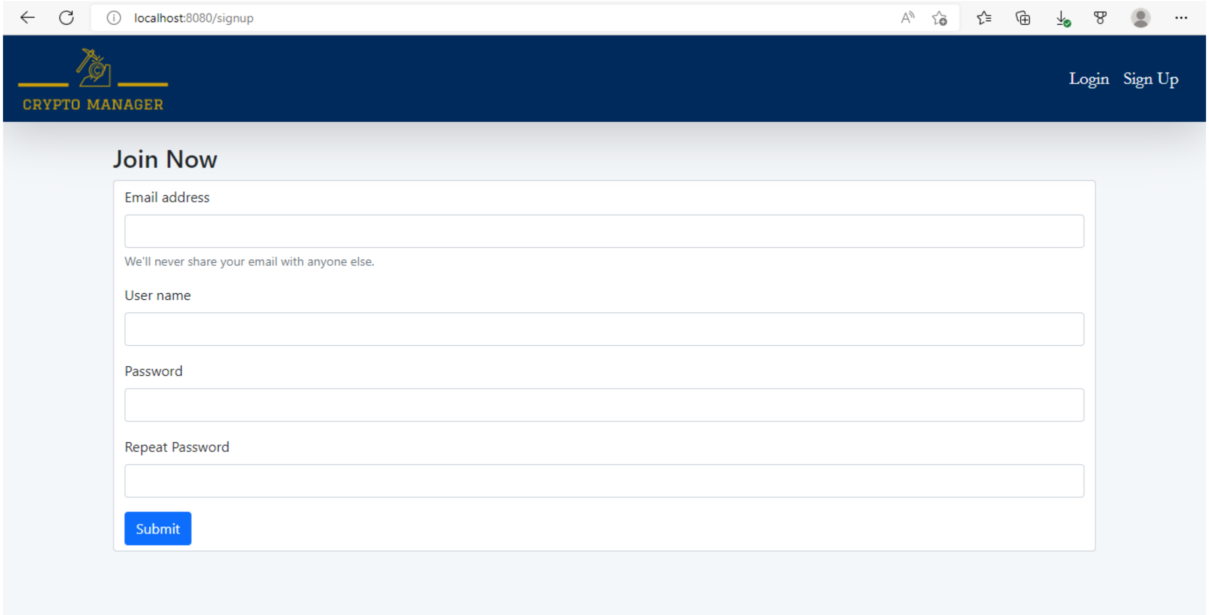
News



Figure(37): The UI design of news page

5.Implementation and Testing

5.1 implementation



localhost:8080/signup

Join Now

Email address

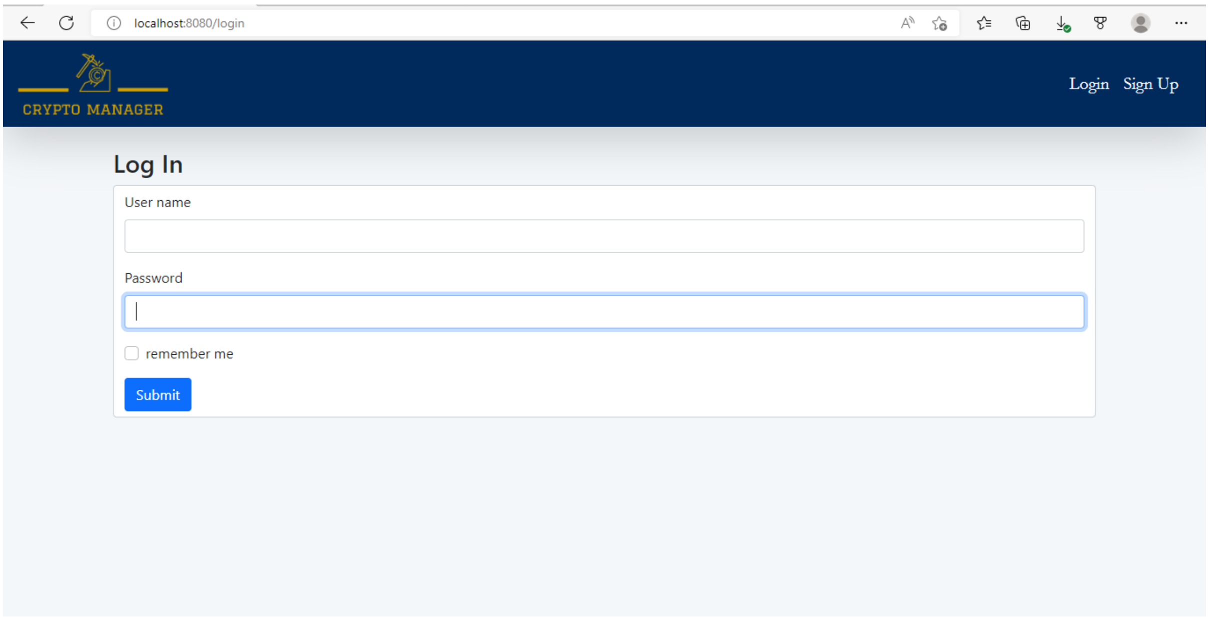
We'll never share your email with anyone else.

User name

Password

Repeat Password

Figure(38): The sign up page



localhost:8080/login

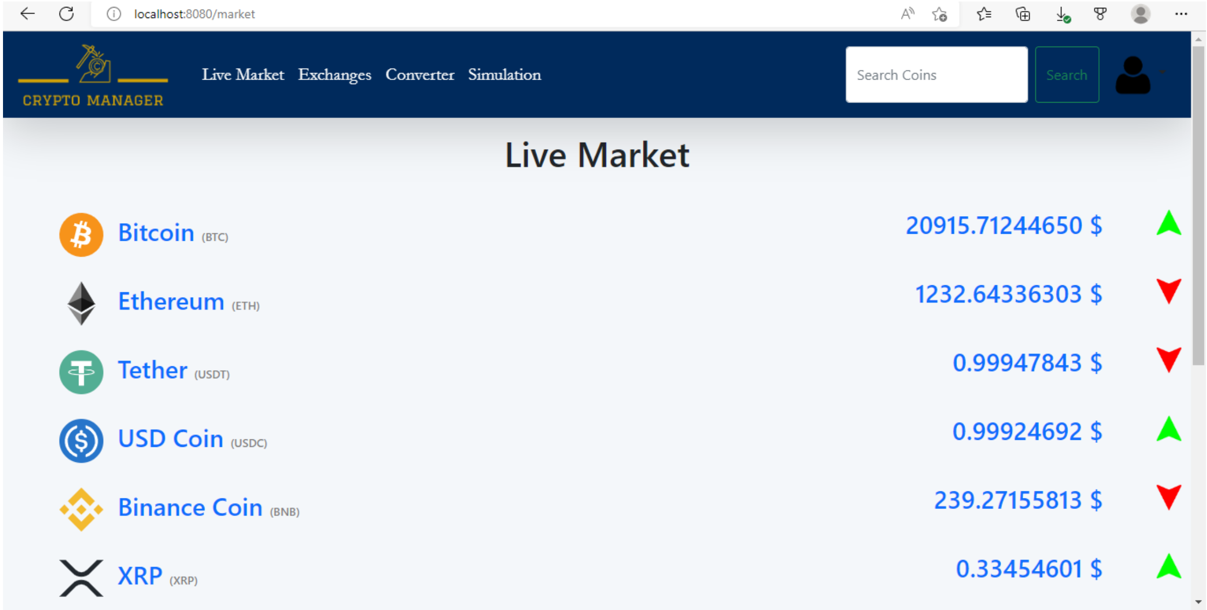
Log In

User name

Password

□ remember me

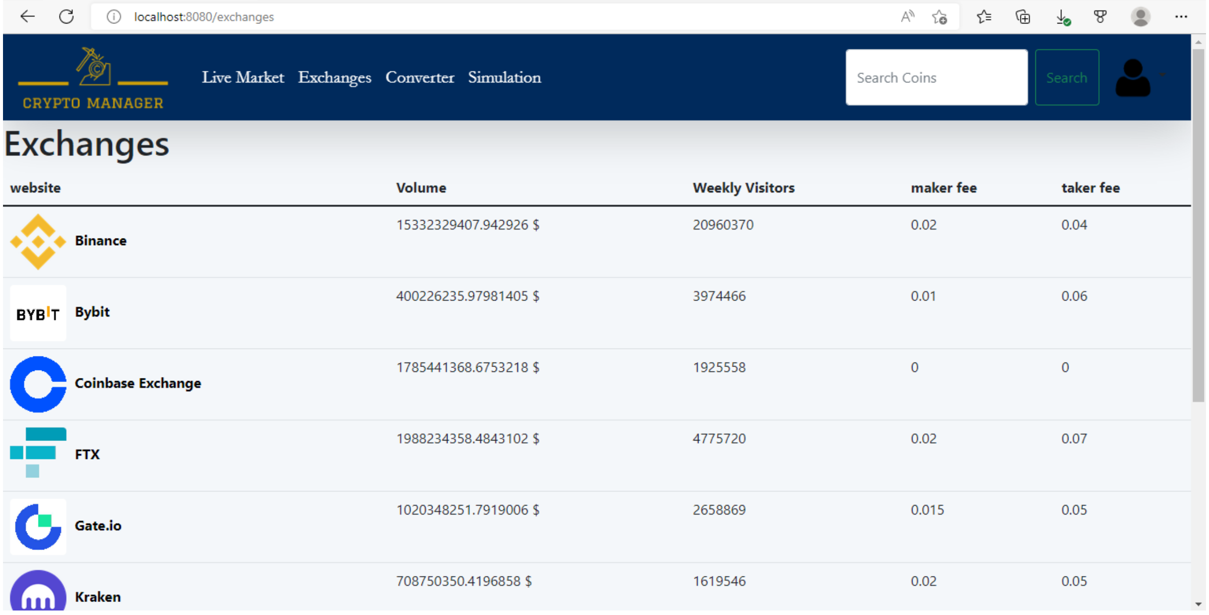
Figure(39): The login page



Live Market

Bitcoin (BTC)	20915.71244650 $	▲
Ethereum (ETH)	1232.64336303 $	▼
Tether (USDT)	0.99947843 $	▼
USD Coin (USDC)	0.99924692 $	▲
Binance Coin (BNB)	239.27155813 $	▼
XRP (XRP)	0.33454601 $	▲

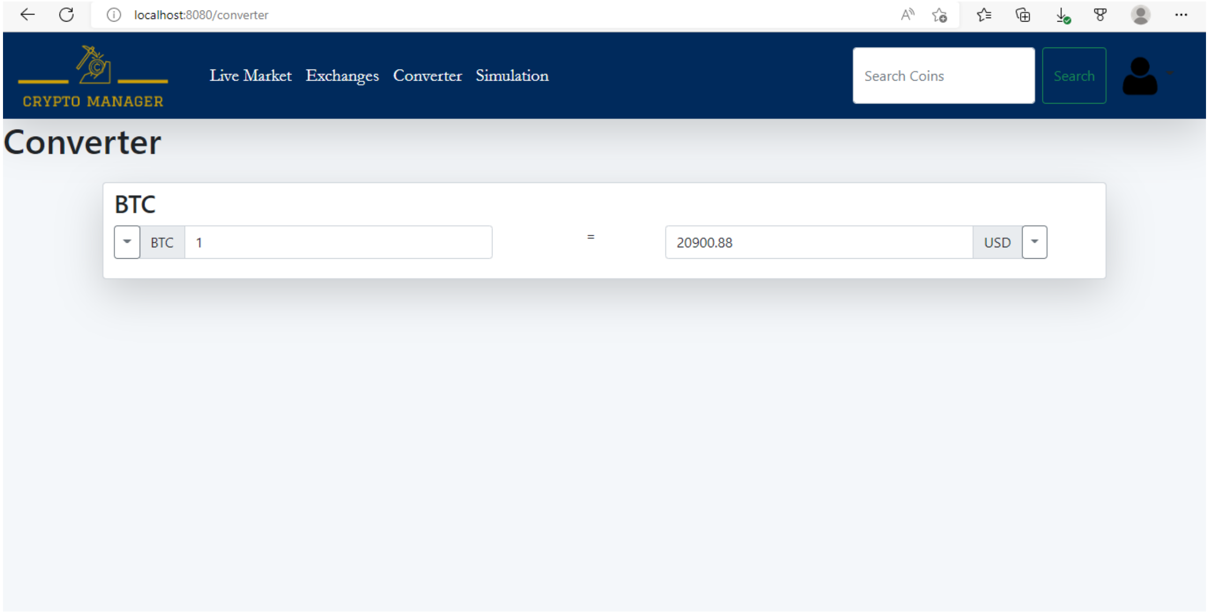
Figure(40): The live market page



Exchanges

website	Volume	Weekly Visitors	maker fee	taker fee
Binance	15332329407.942926 $	20960370	0.02	0.04
Bybit	400226235.97981405 $	3974466	0.01	0.06
Coinbase Exchange	1785441368.6753218 $	1925558	0	0
FTX	1988234358.4843102 $	4775720	0.02	0.07
Gate.io	1020348251.7919006 $	2658869	0.015	0.05
Kraken	708750350.4196858 $	1619546	0.02	0.05

Figure(41): The exchanges page

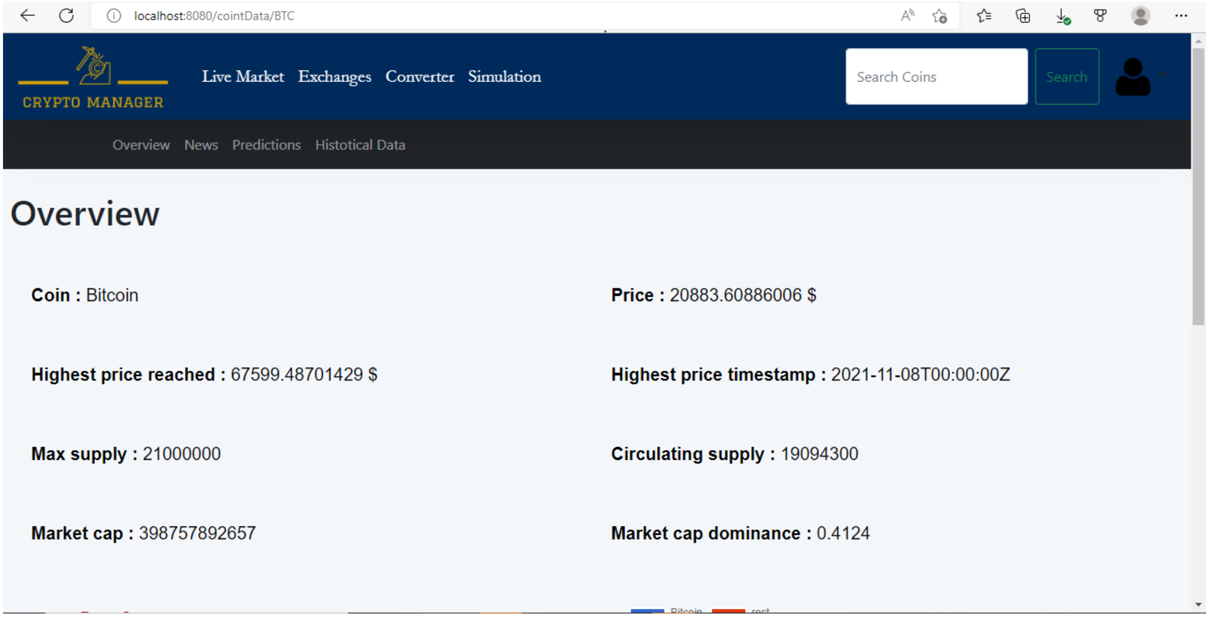


Converter

BTC

BTC 1 = 20900.88 USD

Figure(42): The coin converter page



Overview

Coin : Bitcoin

Price : 20883.60886006 $

Highest price reached : 67599.48701429 $

Highest price timestamp : 2021-11-08T00:00:00Z

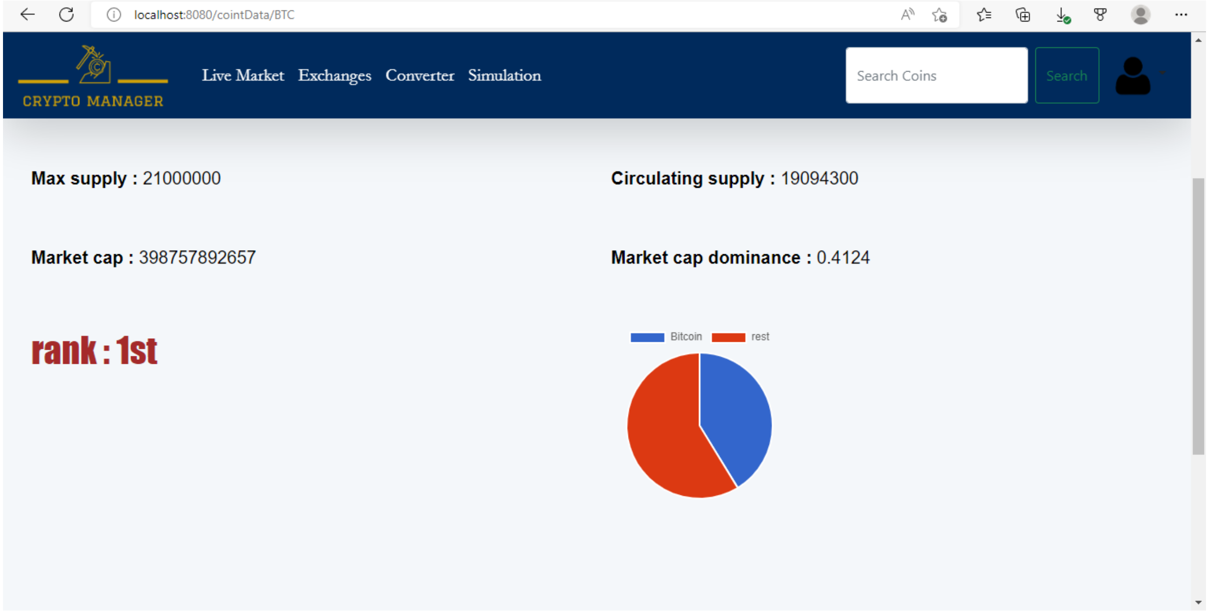
Max supply : 21000000

Circulating supply : 19094300

Market cap : 398757892657

Market cap dominance : 0.4124

Figure(43): The coin overview page



Max supply : 21000000

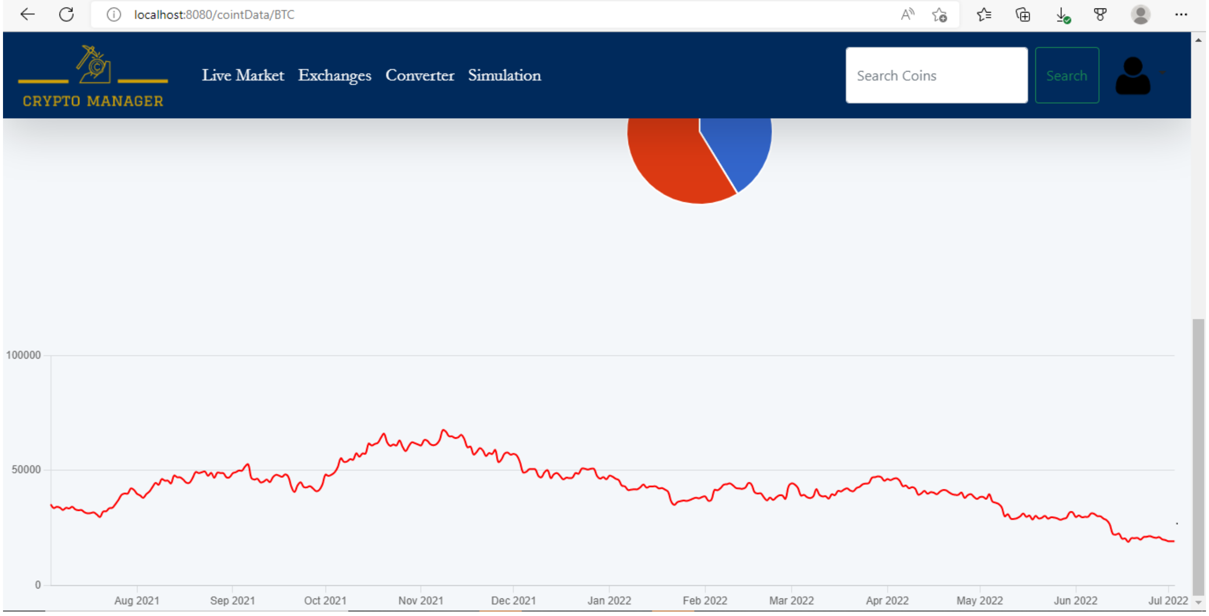
Circulating supply : 19094300

Market cap : 398757892657

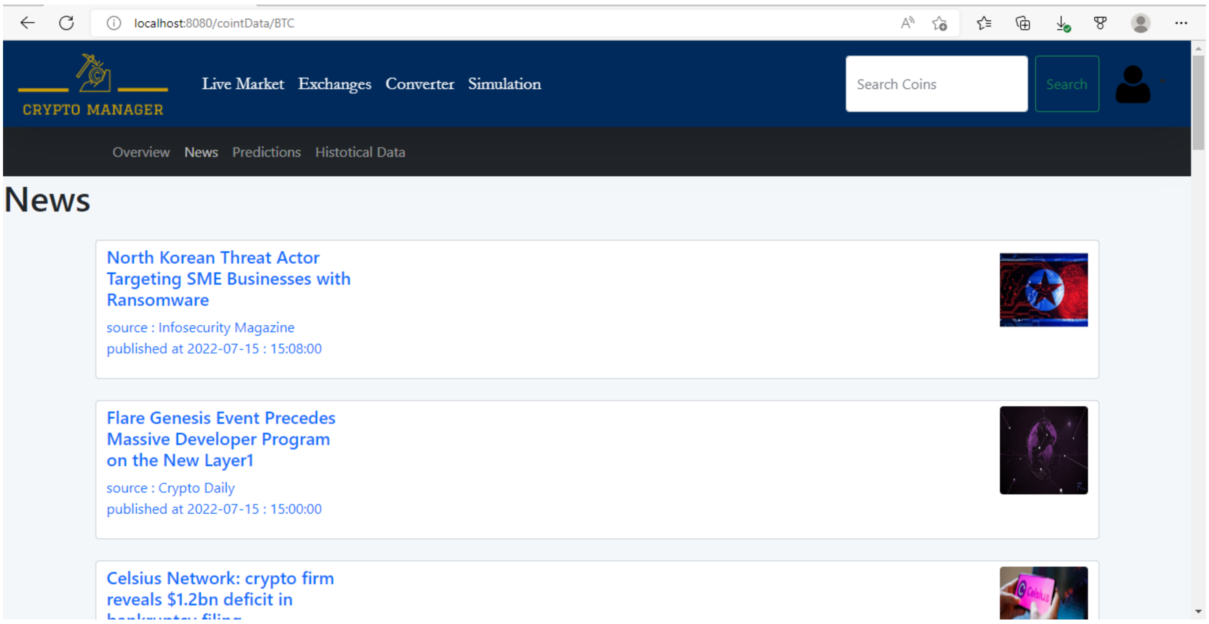
Market cap dominance : 0.4124

rank : 1st

Figure(44): The coin overview page(con)



Figure(45): The coin overview page(con)



News

North Korean Threat Actor Targeting SME Businesses with Ransomware

source : Infosecurity Magazine

published at 2022-07-15 : 15:08:00

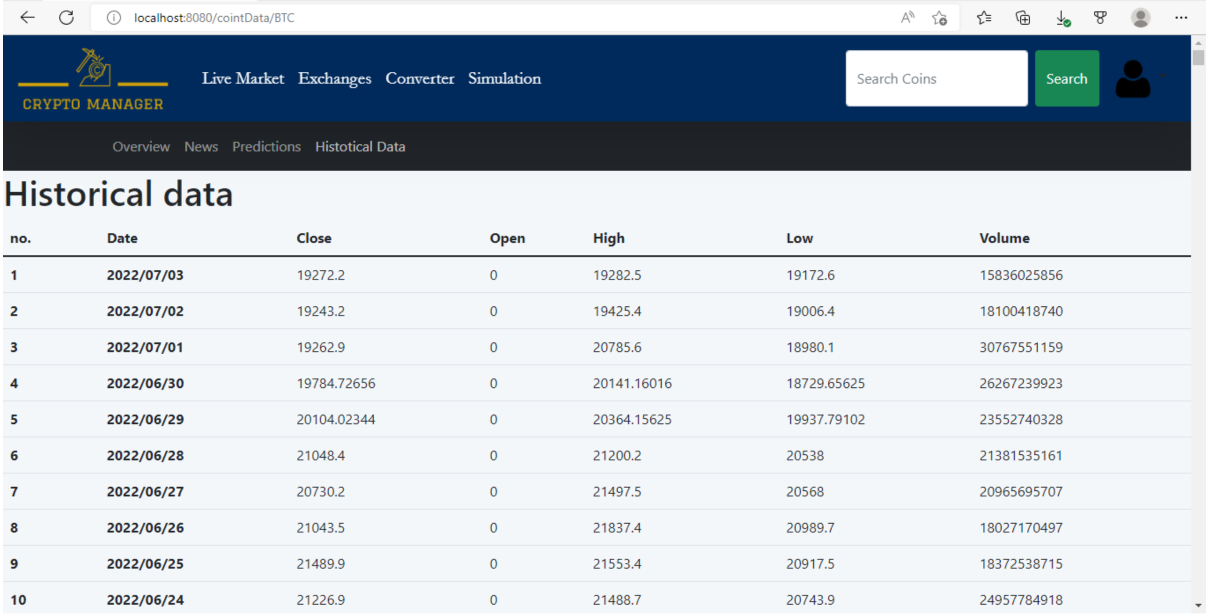
Flare Genesis Event Precedes Massive Developer Program on the New Layer1

source : Crypto Daily

published at 2022-07-15 : 15:00:00

Celsius Network: crypto firm reveals $1.2bn deficit in

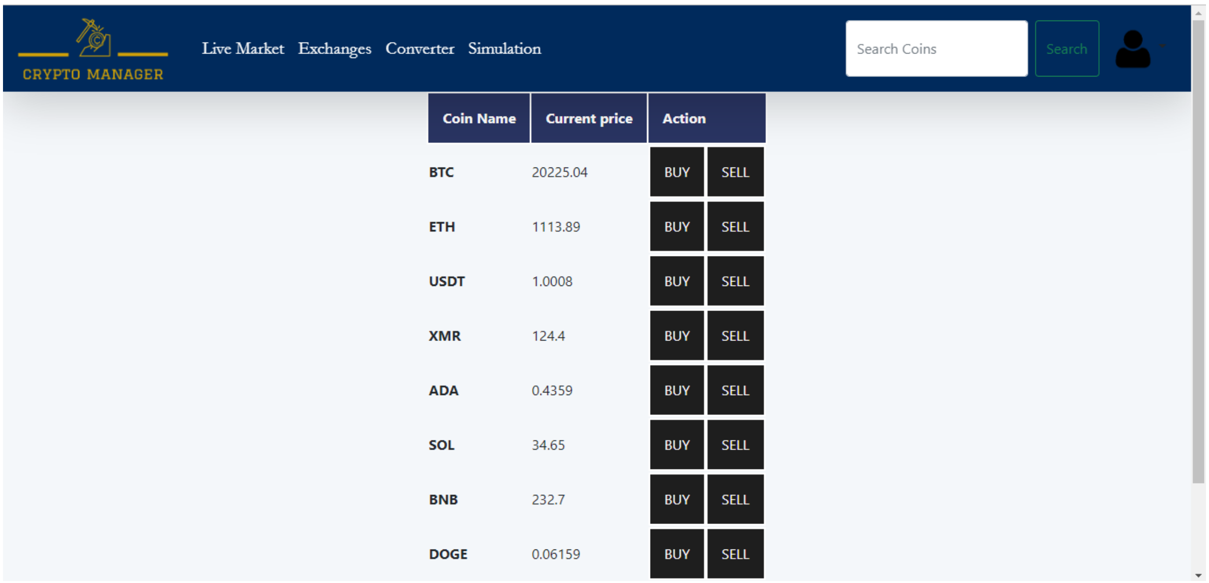
Figure(46): The news page



Historical data

no.	Date	Close	Open	High	Low	Volume
1	2022/07/03	19272.2	0	19282.5	19172.6	15836025856
2	2022/07/02	19243.2	0	19425.4	19006.4	18100418740
3	2022/07/01	19262.9	0	20785.6	18980.1	30767551159
4	2022/06/30	19784.72656	0	20141.16016	18729.65625	26267239923
5	2022/06/29	20104.02344	0	20364.15625	19937.79102	23552740328
6	2022/06/28	21048.4	0	21200.2	20538	21381535161
7	2022/06/27	20730.2	0	21497.5	20568	20965695707
8	2022/06/26	21043.5	0	21837.4	20989.7	18027170497
9	2022/06/25	21489.9	0	21553.4	20917.5	18372538715
10	2022/06/24	21226.9	0	21488.7	20743.9	24957784918

Figure(47) The coin historical data page



Coin Name	Current price	Action
BTC	20225.04	BUY SELL
ETH	1113.89	BUY SELL
USDT	1.0008	BUY SELL
XMR	124.4	BUY SELL
ADA	0.4359	BUY SELL
SOL	34.65	BUY SELL
BNB	232.7	BUY SELL
DOGE	0.06159	BUY SELL

Figure(48): The simulation page

5.2 Testing

System Testing

Project Name:			Crypto Manager					
Module Name:			**Signup**					
Test Case_ID	**Test Case Description**	**Test steps**	**Pre-Conditions**	**Test Data**	**Post-Condition**	**Expected Output**	**Actual Output**	**State**
TC_Signup_001	Valid email Valid username Valid password1 Valid password2	User will click on the signup button	-	Email: andrew12@gmail.com Username: Andrew Password1:12345678 Password2:12345678	A user account will be created	User created	User created	Passed
TC_Signup _002	Valid email Valid username Valid password1 Valid password2	User will click on the signup button	Email already exists	Email: andrew12@gmail.com Username: Andrew Password1:12345678 Password2:12345678	Error message will appear to the user	Email already exists	Email already exists	Passed
TC_Signup _003	Valid email Valid username Valid password1 Valid password2	User will click on the signup button	Username already exists	Email: omar189@gmail.com Username: Omar Password1: omar1234 Password2: omar1234	Error message will appear to the user	Username already exists	Username already exists	Passed
TC_Signup _004	Invalid email Valid username Valid password1 Valid password2	User will click on the signup button	-	Email: ahmed@gmail.com Username: Ahmed Password1:12345678 Password2:12345678	Error message will appear to the user	Email must be greater than 7 characters	Email must be greater than 7 characters	Passed
TC_Signup _005	Valid email Invalid username Valid password1 Valid password2	User will click on the signup button	-	Email: andrew12@gmail.com Username: Ali Password1:12345678 Password2:12345678	Error message will appear to the user	Username must be greater than 3 characters	Username must be greater than 3 characters	Passed
TC_Signup_006	Valid email Valid username	User will click on the	-	Email: mohamed@gmail.com Username: Mohamed Password1:12345678	Error message will	Password don't match	Password don't match	Passed

	Valid password1 Invalid password2	signup button		Password2:12345678	appear to the user			
TC_Signup_007	Valid email Valid username Invalid password1 Valid password2	User will click on the signup button	-	Email: mohamed@gmail.com Username: Mohamed Password1:123456 Password2:123456	Error message will appear to the user	Password must be at least 7 characters	Password must be at least 7 characters	passed

Table(12): signup test cases

Project Name:	**Crypto Manager**							
Module Name:	**Login**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_Login_001	Valid username Valid password	User will click on the login button	User must have a username and password	Username: Andrew Password:12345678	User can navigate through the website	Logged in successfully	Logged in successfully	Passed
TC_Login_002	Valid username Valid password	User will click on the login button	User must have a username and password	Username: Ahmed Password: ahmed123	Error message will appear to the user	Incorrect password	Incorrect password	Passed
TC_Login_003	Valid username Valid password	User will click on the login button	Username already exists	Username: Omar Password: omar1234	Error message will appear to the user	Username does not exist	Username does not exist	Passed

Table(13): login test cases

Project Name:	**Crypto Manager**							
Module Name:	**Logout**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_Logout_001	Valid username Valid password	User will click on the logout button	User must be logged in		User will be redirected to the login page			Passed

Table(14): logout test cases

Project Name:			**Crypto Manager**					
Module Name:			**buyCoin**					
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_buyCoin_001	Invalid coinQuantity	User will click on the buy button	User must be logged in	coinQuantity<=0		Invalid input	Invalid input	Passed
TC_buyCoin_002	Valid coinQuantity	User will click on the buy button	User must be logged in	0<coinQuantity<=maximum_quantity		Transaction done Successfully	Transaction done Successfully	Passed
TC_buyCoin_003	Invalid coinQuantity	User will click on the buy button	User must be logged in	coinQuantity>maximum_quantity		Not enough Money	Not enough Money	Passed

Table(15): buy test cases

Project Name:			**Crypto Manager**					
Module Name:			**sellCoin**					
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_sellCoin_001	Invalid coinQuantity	User will click on the sell button	User must be logged in	coinQuantity <=0		Invalid input	Invalid input	Passed
TC_sellCoin_002	Valid coinQuantity	User will click on the sell button	User must be logged in	0<coinQuantity<= Wallet_quantity		Transaction done Successfully	Transaction done Successfully	Passed
TC_sellCoin_003	Invalid coinQuantity	User will click on the sell button	User must be logged in	coinQuantity >Wallet_quantity		Not enough Coin	Not enough Money	Passed

Table(16): sell test cases

Project Name:	**Crypto Manager**							
Module Name:	**market**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_market_001		User will click on the market button	User must be logged in		User will observe live crypto data			Passed

Table(17): market test case

Project Name:	**Crypto Manager**							
Module Name:	**coinNews**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_coinNews_001		User will click on the news button in the market page	User must be logged in and in the live market page		User will be able to see news about the cryptocurrencies			Passed

Table(18): news test case

Project Name:	**Crypto Manager**							
Module Name:	**coinData**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_coinData_001		User will click on the Historical data button	User must be logged in and in the live market page		User will observe the historical crypto data (high, low, etc.)			Passed

Table(19): coindata test case

Project Name:	**Crypto Manager**							
Module Name:	**coinPredection**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_coinPredection _001		User will click on the Predictions button	User must be logged in and in the live market page		User will be able to see the predicted values for different crypto coins			Passed

Table(20): coinPrediction test case

Project Name:	**Crypto Manager**							
Module Name:	**coinOverview**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_coinOverview_001		User will click on the overview button so that he can navigate through it	User must be logged in and in the market page		User will be able to see information about the crypto (price, highest price reached, Market cap, max supply, graph about the coin, etc.)			Passed

Table(21): coinoverview test case

Project Name:	**Crypto Manager**							
Module Name:	**profile**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_profile_001		User will click on the Profile button	User must be logged in		User will be able to see his profile (budget, Quantity, etc.)			Passed

Table(22): profile test case

Project Name:	**Crypto Manager**							
Module Name:	**Converter**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Condition**	**Expected Output**	**Actual Output**	**State**
TC_Converter_001	Valid input	User enter a quantity of crypto currency	User must be logged in	Quantity=-1 coin Name=BTC	User will observe a change in currency	USD: 19649.88	USD: 19649.88	Passed
TC_Converter_002	Valid input	User enter a quantity of crypto currency	User must be logged in	Quantity=0 coin Name=ETH	User will not observe a change in currency	USD: 0	USD: 0	Passed
TC_Converter_003	Valid input	User enter a quantity of crypto currency	User must be logged in	Quantity=1 coin Name=BNB	User will observe a change in currency	USD: 224.82	USD: 224.82	Passed

TC_Converter_004	Valid input	User enter a quantity of crypto currency	User must be logged in	Quantity=BTC coin name=BTC	Error pop up message	Nan	Nan	Passed

Table(23): converter test cases

Project Name:	**Crypto Manager**							
Module Name:	**Exchange**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_exchange_001		User will click on the exchange button	User must be logged in		User will be able to see the (volume, weekly visitors, maker fees, taker fees) for each coin			Passed

Table(24): exchange test case

Project Name:	**Crypto Manager**							
Module Name:	**newsletter**							
Test Case_ID	**Test Case Description**	**Test Steps**	**Pre-Conditions**	**Test Data**	**Post-Conditions**	**Expected Output**	**Actual Output**	**State**
TC_newsLetter_001		The user will click the checkbox	User must be logged in		An email will be sent to the user			Passed

Table(25): news letter test case

References

1. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems Book by Geron Aurelien
2. Deep Learning-Based Approaches for Sentiment Analysis Book by Dr. Basant Agarwa
3. Cryptocurrency Prediction with LSTM | by Soner Yıldırım | Towards Data Science
4. 2021. DEEP LEARNING-BASED APPROACHES FOR SENTIMENT ANALYSIS. [S.l.]: SPRINGER VERLAG, SINGAPOR.
5. (PDF) Comparative Performance of Machine Learning Algorithms for Cryptocurrency Forecasting (researchgate.net)
6. Burniske, C. and Tatar, J., n.d. Cryptoassets.
7. Géron, A., n.d. Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow.
8. Shah, V.H., 2007. Machine learning techniques for stock prediction. Foundations of Machine Learning| Spring, 1(1), pp.6-12.