UNIVERSITY OF GHANA

College of Basic and Applied Sciences

School of Mathematical and Physical Education

Department of Computer Science

Crypto Currency Price Prediction

by

Vanessa Atta-Fynn (10665130)

Supervised by Dr. Issac Wiafe

(September 2021)

Table of Contents

DECLARATION

I hereby declare that the content of this work was entirely produced by me under the supervision of Dr. Issac Wiafe at the Department of Computer Science, University of Ghana, Legon. Other researchers and publications whose work were referenced in this report are duly cited as appropriate.

Signed by

Student : **Vanessa Atta-Fynn** _____ **(10665130)**
Date: 1st October, 2021

Supervisor: **Dr. Issac Wiafe** _____
Date: 1st October, 2021

ACKNOWLEDGEMENTS

I would like to thank the Almighty God for giving me the strength and focus to see this project through in spite of all challenges. I would like to acknowledge my supervisor Dr. Issac Wiafe for his adequate guidance throughout this period. Finally I would like to thank my parents, co-workers and friends for supporting, for having patience and for their guidance in completing this project. Thank you all!

ABSTRACT

This project seeks to discuss and implement the processes involved in bringing the Coin Compass web application, housing a machine learning model capable of high-accuracy forecasts for Bitcoin, Ethereum, Litecoin, Stellar Lumens, Chainlink and Cardano. This project was initially intended to discuss and forecast Bitcoin Prices but was later reviewed and extended to the fore mentioned 5 other cryptocurrencies.

Chapter One

INTRODUCTION

1.1 Background and Motivation

As the world strides towards becoming a cashless society, crypto currency has gained popularity in recent years. Individuals, groups and organizations investing in crypto currency have grown in number due to high profits from trading. However, investment in crypto currency also comes with high risks because of how highly unstable or volatile the currency is. This high volatility is caused by high price changes in the crypto currency market.

During the covid-19 pandemic, many countries including Ghana migrated all physical interaction and activities to a digital level in order to reduce the spread of the virus and for protection. Many institutions improved and migrated all their activities to a digital level from banking to trading to food delivery to health care to e-learning in education. The Covid-19 pandemic encourages investing in digital currencies such as Bitcoin. The Crisis significantly influenced social media networks and crypto currency prices.

Unfortunately due to the risk involved, individuals were reluctant to invest. This study seeks to mitigate risk associated with investment in crypto currency by creating a platform to help forecast future prices, prices ranges and prices movement so as to give individuals a clearer perspective on what goes on in the market and helps individuals make decisions based on analysis aided by the system.

1.2 Problem Statement

The high volatility of crypto currency poses great risk to investor. In order to reduce risk, individuals, organizations and groups come together to discuss and attempt to predict the trend of crypto currency prices and speculate on the market.

Predictions made may not always be accurate and individuals who are not in these groups may incur unnecessary or unexpected losses.

1.3 Aim

The purpose of this project is to create a web application which houses a machine learning model to help predict the prices of six altcoins which are – Bitcoin(BTC), Ethereum(ETH), Stellar Lumens(XLM), Litecoin (LTC), Chainlink(LINK) and Cardano(ADA) on the crypto market. This application will serve as a tool in predicting the price of these coins.

1.4 Objectives

This project seeks to achieve these objectives;

1. To provide a tool in a form of a model to predict crypto currency prices.
2. To display graphically the forecasted prices for better visualization to aid in better and quicker decision making
3. To display graphically and help visualize current prices of coins
4. To compare price trends graphically
5. Create a responsive web-application that can be used on computers and mobile devices.
6. Able individuals, groups and organizations make visualize forecasted trends

1.5 Significance of Project

This project seeks to bring into existence a web application (Coin Compass) with its main purpose being to predict prices of the fore mentioned crypto currency coins so as to mitigate risk associated with investing in crypto currency. This tool will help person(s) who may not have access to groups in which discussions are held to predict and speculate coin prices. It will also be of use to individuals in such groups who need clearer and more certain forecast of trends.

1.6 Scope

This project will run as a web-based application that houses a model that predicts price of six crypto coins. It would a section to view current trend of prices and allow for comparison of trends of selected coins. The prediction will be displayed in a form of a graph showing possible price changes of the coin that has been selected for prediction.

Chapter Two

LITERATURE REVIEW

In explaining the concepts of Cryptocurrency and how it works, it would only be right to explain from why it was introduced as an option to fait currency.

"*Government-issued fiat money banknotes were used first during the 11th century in China. Fiat money started to predominate during the 20th century."* Fiat money initially took the form of paper notes and coins but now may come in various forms including credit cards and digital wallets. Fiat money is centrally controlled by governments and banks. When making a transaction with another party, the transaction would have to go through the central authority to be processed and verified before the transaction can be completed successfully. During this process there are a number of things that could cause the transaction to fail including technical issues like the systems being down at the end of the central party, hacking and identity theft at the user-end, etc.

Cryptocurrency removes the problems of modern banking by removing the central authority component form the transaction. This means in a two-party transaction where one party wants to send crypto coins to the other, they would only have to acquire an app or medium of transfer and after coins are sent, requirements for transaction to be completed will be checked and transaction will be completed in matter if minutes.

Now the question is, what is Cryptocurrency?

Dourado "*Cryptocurrency is the name given to a system that uses cryptography to allow the secure transfer and exchange of digital tokens in a distributed and decentralized manner. These tokens can be traded at market rates for fiat currencies*." *2014.*Bitcoin was the first cryptocurrency to be introduced in January 2009 by Satoshi Nakamoto. It was*" the first digital coin in the world to have used the blockchain platform. It is created within a transaction log with computers participated across a network" (Bohme et al., 2015).*
Dourado , "Until the invention of Bitcoin, it was impossible for two parties to transact electronically without employing a trusted third party intermediary. The reason was a conundrum known to computer scientists as the 'double spending problem'. "*2014*

Double-spending can occur because, unlike physical cash, a digital token consists of a digital file that can be duplicated or falsified, meaning a single digital token can be spent more than once. This poses a great danger and flow to digital cash.

Bitcoin as well as many other cryptocurrencies resolve this problem simply by using the blockchain and the universal ledger system. Here all transactions relevant to the currency are

posted to the blockchain where they are varied separately and then posted publicly and become irreversible. These processes is what keeps the network honest and secure and nearly impossible to crack.

Going down to crypotcurrency price prediction, project research revealed several research papers including *Sebastian Franz Huppmann* , "*Bitcoin Price Prediction using Sentiment Analysis of Twitter Data*" *2020* and *Abraham et al. ,"Cryptocurrency Price Prediction Using Tweet Volumes and Sentiment Analysis" 2018* discuss and predicts bitcoin prices by the use of sentiment analysis from Twitter feed. Though logic here is feasible, this project seeks to predict prices by traditional means by using historical data.

Chapter Three

SYSTEM ANALYSIS AND DESIGN

3.1 Programming Methodology

Real life problems can be huge and complex to solve. Procedural methodology is the approach used to analyze and plan development of software and controlling of processes involved in development.

The steps taken in effort to understand and develop solution to the problem include:

1. Requirement Specification
2. Problem definition
3. System design
4. Implementation
5. Testing
6. Documentation
7. Maintenance

3.2 Existing Systems

This project considered two existing crypto currency prediction applications namely Tradingbeasts and Wallerinvestor

Tradingbeast is a website that gives crypto currency price prediction over a long period of time. It provides the maximum and minimum price within a given month within a year. Its prediction is based on past performances of prices.

Walletinvetor is also a website which predicts price of coins. They gave a daily forecast for a maximum of 14-days price forecast. The weakness with this application is short period for prediction. It is more desirable if span of prediction is longer to give investors a cue on what is to come.

3.3 Proposed System

Coin Compass is a web-application taking a cue from existing systems which is aiming to mitigate risk involved in crypto currency trading and investments by making use of machine learning model and data science techniques to predict possible price movements and in crypto currency market. It provides the forecasted closing price and volume within which prices may move. The system can also give forecasts of prices for a maximum of 1 year ahead.

3.3.1 Functional Requirements

1. The application must allow users to specify time frame within with prediction should be made
2. It must allow users to predict price range
3. It must allow users to view price trends over specified time frame or over a given period of time.
4. It must be able to allow users view real-time prices of coins selected
5. It must allow users select multiple coins and display simultaneously on a graph to aid in visual comparison on price changes in selected coins
6. It allow for prediction to made for a maximum of 1 year.

3.3.2 Non-Functional Requirements

1. The application must accurate data forma reliable source to produce accurate results
2. It must have a well-structured layout
3. It should be interactive and responsive
4. It should be able to load data seamlessly from sources.

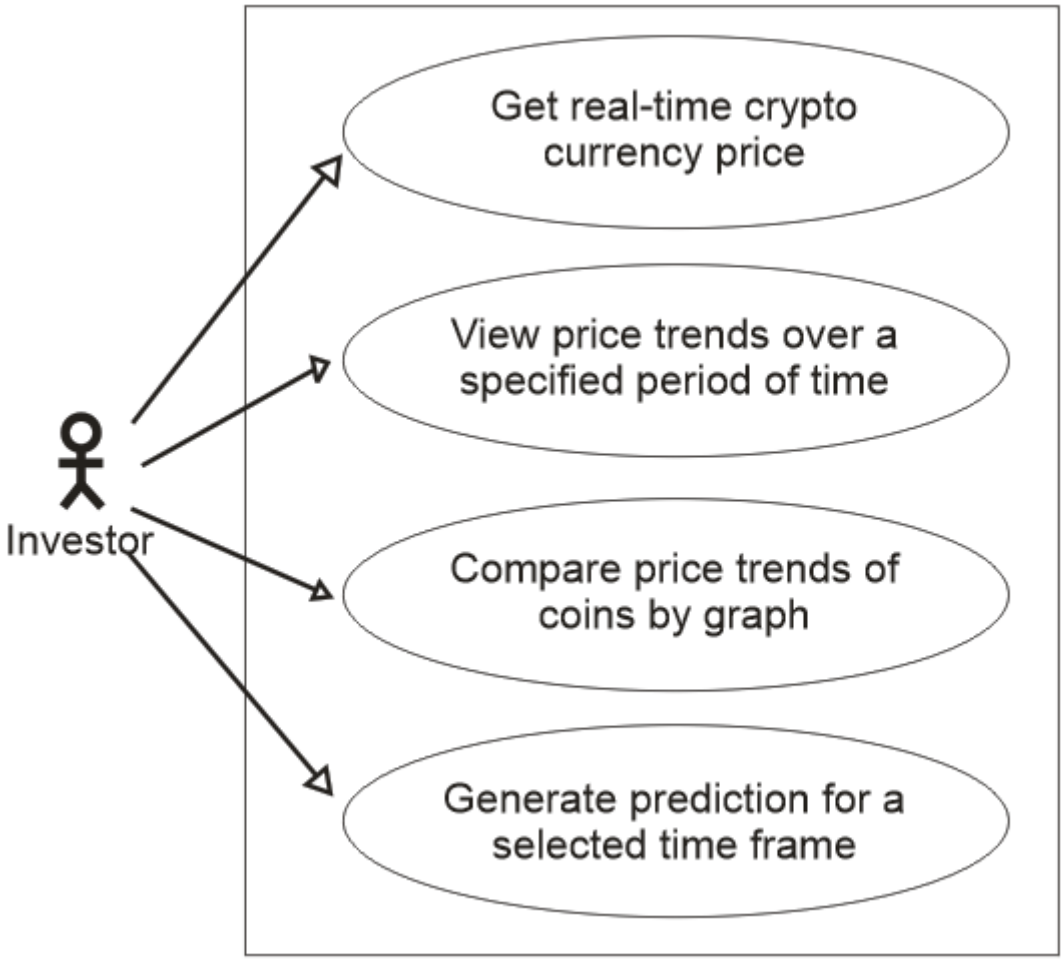
3.3.3 Project Constraints

1. Access to internet before application can be used
2. Needs to run on a web browser

3.4 System Design

This section focuses on the application of concepts of proposed system in development of product.

3.4.1 Use Cases



3.4.2 Wireframes

COIN COMPASS WIREFRAMES

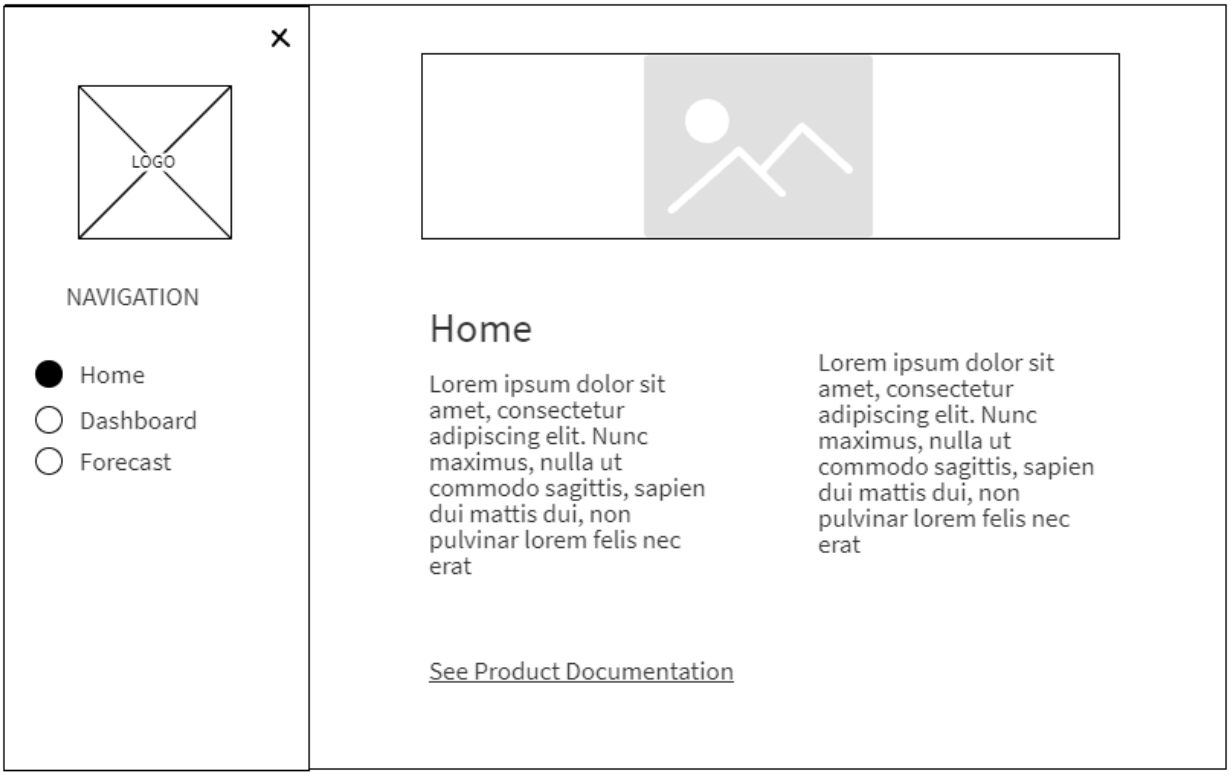


Fig 3.1 Wireframe of Coin Compass home screen

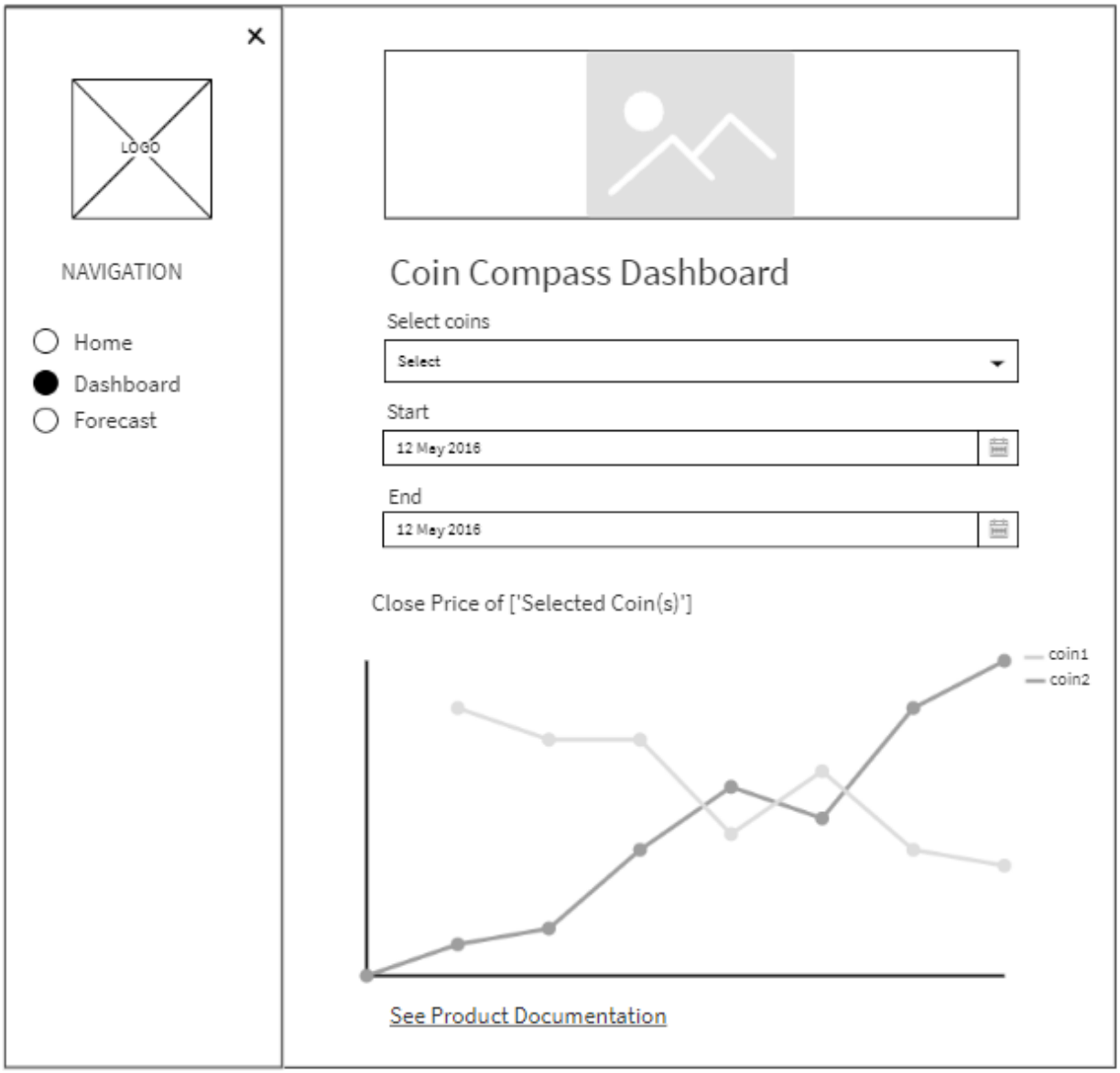


Fig 3.2 Wireframe of Coin Compass Dashboard

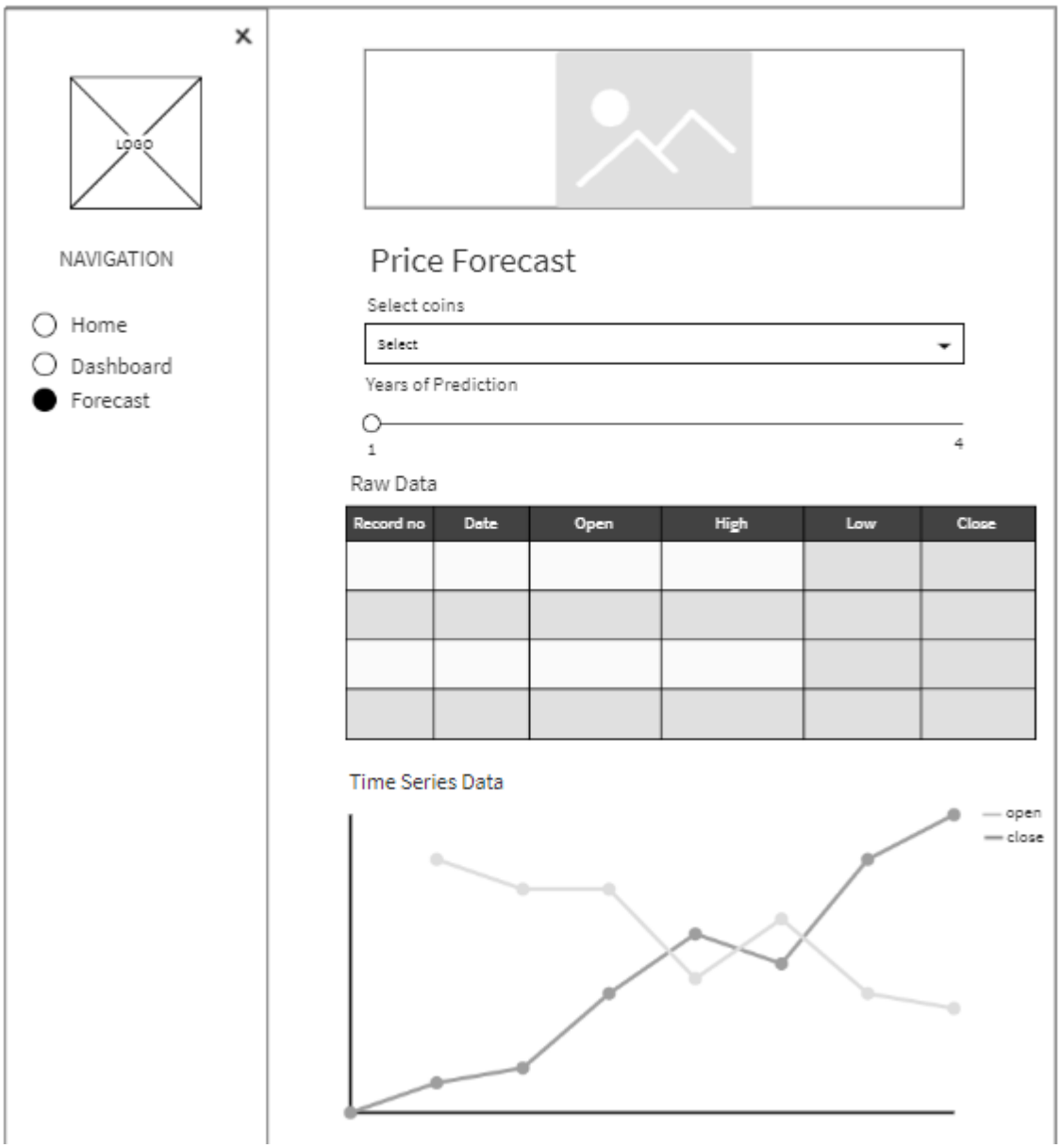


Fig 3.3.1 Wireframe of Coin Compass Forecast Screen

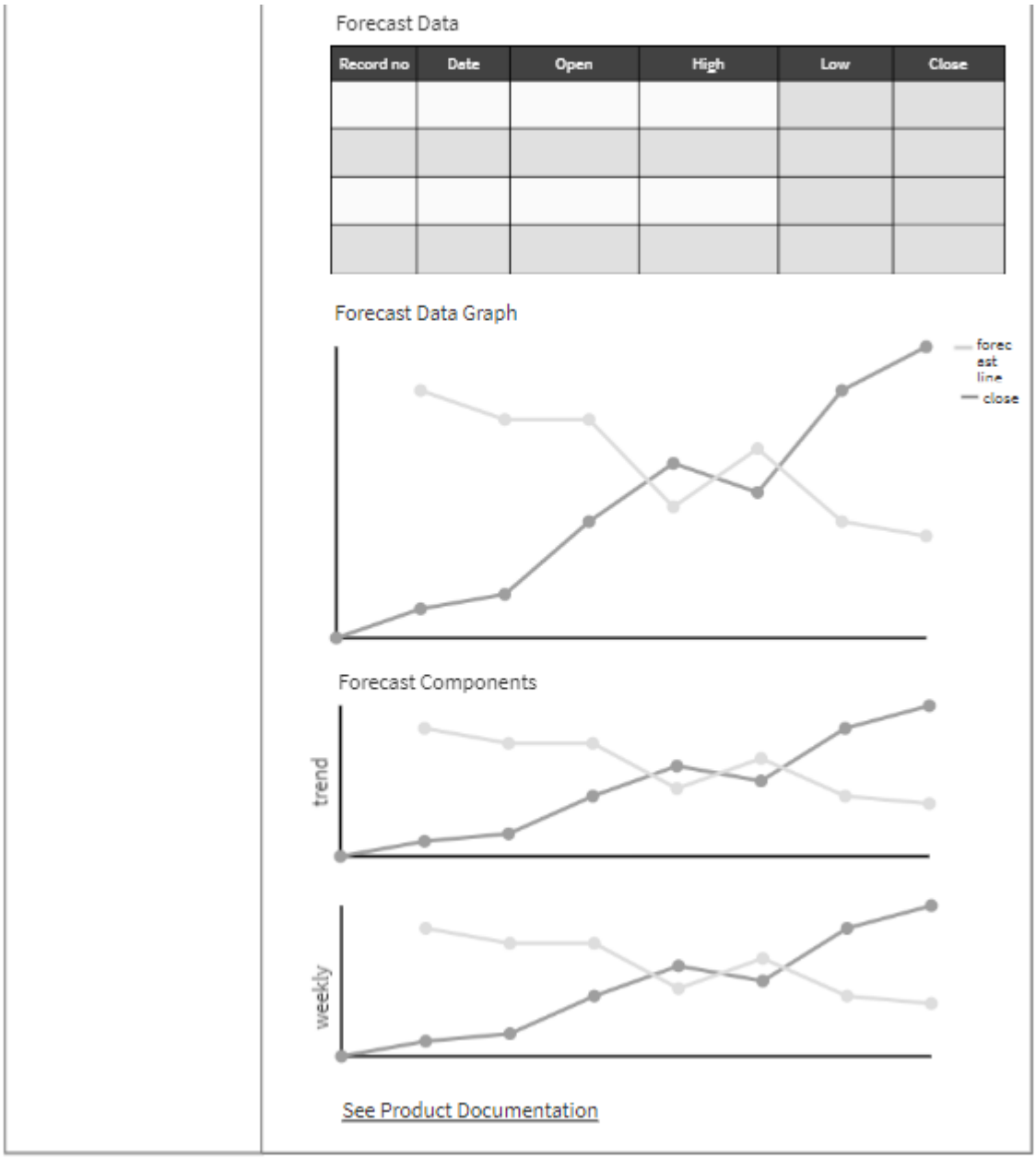


Fig 3.3.2 Wireframe of Coin Compass Forecast Screen Continued

Chapter Four

SOFTWARE IMPLEMENTATION

4.1 Implementation:

For this project, the following stages were used to implement the software as a whole

4.1.1 Language for Programming: Python 3

4.1.2 Datasets and Data Collection:

This project made use of 6 crypocurrency datasets and the dataset of prices of the US dollar.

The cryprocurrency datasets were obtained from the ***Yahoo! Finance*** Page using the ***yfinance*** package they created to offer a reliable, threaded, and pythonic way to download historical market data form Yahoo! Finance. Records in Datasets obtained are recorded in a daily format. Prices of coins at each point in the Datasets are recorded in US Dollars (USD). Data is retrieved on a daily bases and fed into the system, giving the application up-to-date data and current price of the day.

The crytpo datasets that this project considered include:

1. Bitcoin Dataset (BTC-USD)
2. Ethereum Dataset (ETH-USD)
3. Stellar Lumens Dataset (XLM-USD)
4. Litecoin Dataset (LTC-USD)
5. Chainlink Dataset (LINK-USD)
6. Cardano (ADA-USD)

The obtained crypto datasets have a total of 7 attributes of which are:

1. Date – Recorded Date in daily format
2. Open – starting price of coin at the beginning of the day
3. High – Highest price at which the coin was traded for that day
4. Low – Lowest price at which the coin was traded for that day
5. Close – Last price recorded or price of coin at the end of a full day
6. Adj Close – Adjusted Closing price
7. Volume – volume indicates how many coins are traded on a specific exchange

Date	Open	High	Low	Close	Adj Close	Volume
2021-09-29	41064.984375	42545.257813	40829.667969	41564.363281	41564.363281	3.060236e+10
2021-09-30	41551.269531	44092.601563	41444.582031	43790.894531	43790.894531	3.114168e+10
2021-10-01	43816.742188	48436.011719	43320.023438	48116.941406	48116.941406	4.285064e+10
2021-10-02	48137.468750	48282.062500	47465.496094	47711.488281	47711.488281	3.061435e+10
2021-10-03	47792.492188	47902.402344	47196.386719	47860.683594	47860.683594	3.137089e+10

Fig 4.1 BTC Dataset Obtained from Yahoo! Finance

The USD dataset was obtained from Investing.com stock market page – https://www.investing.com/currencies/us-dollar-index-historical-data. It dates back form Jan 1st 2017 to Oct 2nd 2021 giving almost about 4-years worth of data recorded on a day-to-day bases. The dataset contained 7 attributes of which included:

1. Date – Date in a daily format
2. Price – Price of USD
3. High – Highest price reached that day
4. Low – Lowest price reached that day
5. Open – Starting price of asset (USD)
6. Vol. – volume indicated the quantity of USD traded within a specific exchange
7. Change% - Exchange rate

Date	Price	Open	High	Low	Vol.	Change %
2021-10-01	94.047	94.320	94.405	94.000	22.85K	-0.20%
2021-09-30	94.240	94.345	94.520	94.120	33.91K	-0.12%
2021-09-29	94.353	93.730	94.440	93.685	31.45K	0.61%
2021-09-28	93.780	93.405	93.820	93.360	36.70K	0.43%
2021-09-27	93.381	93.305	93.495	93.195	21.08K	0.05%

4.1.3 Libraries Imported

Import streamlit as st
Import yfinance as yf
Import pandas as pd
Import codecs
Import streamlit.components.v1 as stc
From datetime import date
From plotly import graph_objs as go
From prophet import Prophet
From prophet.plot import plot_plotly
From PIL import Image

4.1.4 Data Preprocessing

At this stage, data is prepared for the next phases where relationships will be discovered and prepared data will be fed into ML model for training, testing and forecasting.

During the research phase of this project, a video by Wall Street Journal (WSJ) brought to light a relationship between Bitcoin and Cryptocurrency prices in extension as against the US Dollar prices. It was highlighted that Bitcoin prices "hedge against" the US Dollar.
The next phase seeks to discover and validate this relationship. In preparing data for this process, features from the BTC and USD Dataset were selected.

From the Bitcoin dataset, the attributes – Date, Close and Volume selected.

```
1 btc_sub = btc.drop(btc.columns[[0,1,2,4]], axis=1)
2 btc_sub.tail()
```

Date	Close	Volume
2021-09-29	41564.363281	3.060236e+10
2021-09-30	43790.894531	3.114168e+10
2021-10-01	48116.941406	4.285064e+10
2021-10-02	47711.488281	3.061435e+10
2021-10-03	47860.683594	3.137089e+10

Fig 4.2 Subset of attributes from Bitcoin dataset

From the USD dataset, the attributes used were – Date and Price.

```
#displaying usd dataframe
usd_sub = usd.drop(usd.columns[[1,2,3,4,5]], axis=1)
usd_sub.head()
```

Date	Price
2020-12-31	89.894
2020-12-30	89.649
2020-12-29	89.918
2020-12-28	90.275
2020-12-24	90.250

Fig 4.3 Subset of attributes from the USD dataset

These attributes were merged together based on their date into a new ***Dataframe*** called ***join.***

```
join = btc_sub
for x in join.index.values:
    for x2 in usd_sub.index.values:
        if x == x2:
            itemindex = np.where(usd_sub.index==x2)[0][0]
            val = usd_sub.at[x2, "Price"]
            join.at[x, 'Price'] = val
join.head()
```

Date	Close	Volume	Price
2017-10-03	4317.479980	1.288020e+09	93.414
2017-10-04	4229.359863	1.116770e+09	93.284
2017-10-05	4328.410156	1.161770e+09	93.803
2017-10-06	4370.810059	1.069940e+09	93.641
2017-10-07	4426.890137	9.069280e+08	NaN

Fig 4.4 Merge of Bitcoin subset attributes and USD subset attributes

4.1.5 Data Exploration

Here, the ***plot( )*** method was used to graph out the components of the join dataframe.

```
join = join.dropna()
join.plot(subplots=True, figsize=(12,8))
```

```
array([<AxesSubplot:xlabel='Date'>, <AxesSubplot:xlabel='Date'>,
       <AxesSubplot:xlabel='Date'>], dtype=object)
```

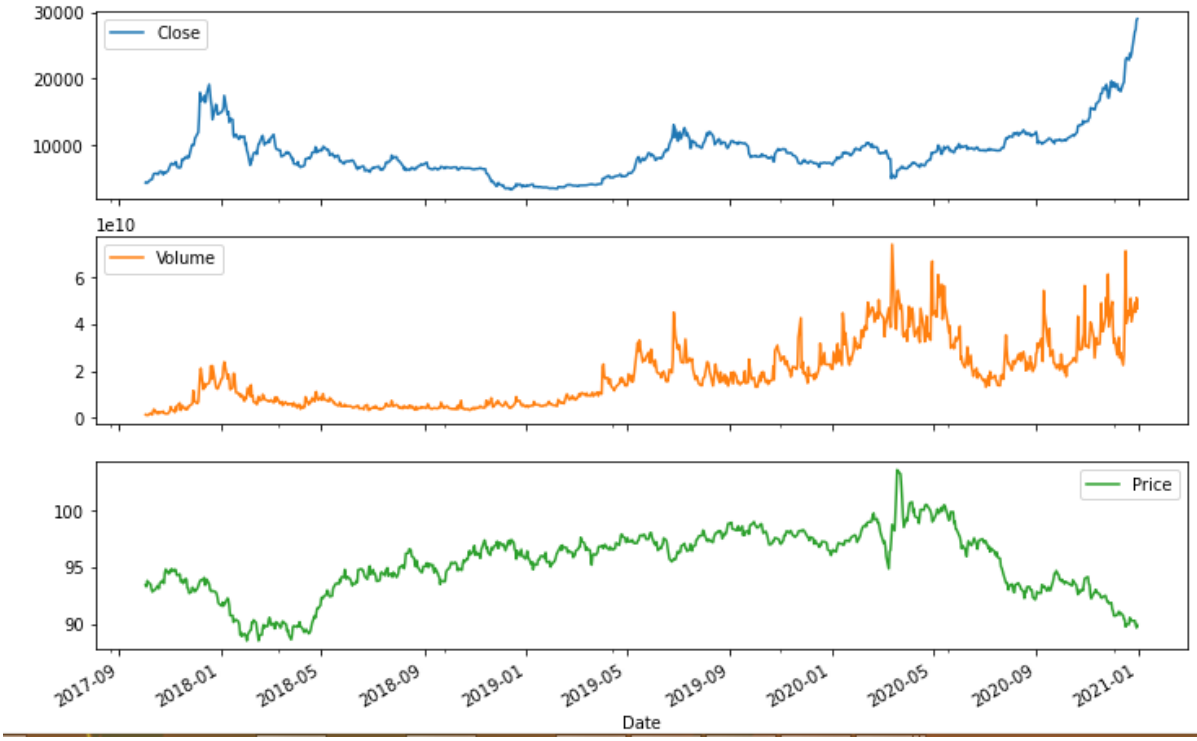


Fig 4.5 Graph of join attributes – Close, Volume and Price

From the graphs illustrated, a pattern can be observed by looking at the Close and Price graphs. From the time period 2012-09 to 2018-05, the graph of the closing price of bitcoin rises and peaks while that of the US Dollar price declines during that very time frame. After 2018-05 hits the floor and remains low till 2020-05. The trend for the US dollar during that point is the inverse during this time frame. It increases and remains steadily high during that time period. After 2020-05, the Closing Price of Bitcoin rises to its highest points here and in the same vein USD prices plummet drastically in that time period.

The Close and Price attributes are observed to have an inverse relationship and a negative correlation. This means whenever Bitcoin prices goes up the US dollar goes down and vise vera. A correlation map was illustrated to verify the observation.

```
# Correlation
join.corr()
```

	Close	Volume	Price
Close	1.000000	0.498985	-0.391387
Volume	0.498985	1.000000	0.311511
Price	-0.391387	0.311511	1.000000

```
# Heatmap
sns.heatmap(join.corr(), annot= True)
```

```
<AxesSubplot:>
```

Fig 4.6 Heatmap showing negative correlation between Close and Price attributes

4.1.6 Feature Selection

Here features were selected based on the data that is to be fed into the ML Model for training, testing and forecasting. In order to forecast accurately the closing price of any cryptocurreny, the *date* and *close* attributes were selected and any null value removed. To forecast the volume of any cryptocurrency, the *date* and *volume* attributes were also selected. The ML model being used for this forecast is ***facebook prophet***. This model accepts only two fixed attributes for prediction that is – ***ds for dates and y for prices.*** Hence, we rename our *date* and *close* columns as *ds* and *y* and stored in a new *dataframe* called ***coin_close*** to be fed into the model. We also rename *date* and *volume* columns as ds and y and store in a new *dataframe* called ***coin_vol.***

```
#Feature Selection

coin_close = data.drop(data.columns[[1,2,3,5,6]], axis=1)
coin_vol = data.drop(data.columns[[1,2,3,4,5]], axis=1)
coin_close = coin_close.rename(columns={"Date": "ds", "Close": "y"})
coin_vol = coin_vol.rename(columns={"Date":"ds", "Volume":"y"})
coin_close.head()
```

Fig 4.7 Feeature Selection Code

4.1.7 Forecasting Closing Price and Volume

"Forecasting is a common data science task that helps organizations with capacity planning, goal setting, and anomaly detection. Producing high quality forecasts is not an easy problem for either machines or for most analysts." (Taylor et al. 2017)
Prophet was open created and open sources by Facebook as a forecasting tool for time series data available in Python and R. Prophet has the ability to visualize significant features in time series data like outliers, seasonality, trends. Prophet is also robust enough to handle any missing values.

As previously stated, Prophet is the model being used for this project prediction.
First for the prediction of the closing price, data in columns of *coin_close* is fitted into out model, duration of ***period*** of prediction will be determined by user of the application and forecast is made for the users selected coin.

```
# Forecasting

m = Prophet(daily_seasonality=True)
m.fit(coin_close)
future = m.make_future_dataframe(periods=period)
forecast = m.predict(future)
st.subheader('Forecast Data')
st.write(forecast.tail())
```

Fig 4.8 Forecasting codes

After forecast is made, plot_plotly() helps us to graph out the actual data with a predication line running through to show the nature of predictions made at each point in the past and chosen future.

```
#Graphs of Forecasted Data
    st.write('Forecast Data Graph')
    fig1 = plot_plotly(m, forecast)
    st.plotly_chart(fig1)

    st.write('Forecast Components')
    fig2 = m.plot_components(forecast)
    st.write(fig2)
```

Fig 4.9 Code to graph out predictions and components

Fig 4.10 Sample of graph after prediction. This is a 60-day BTC close price forecast

The plot_components() method also graphs out the integral components considered in prediction.

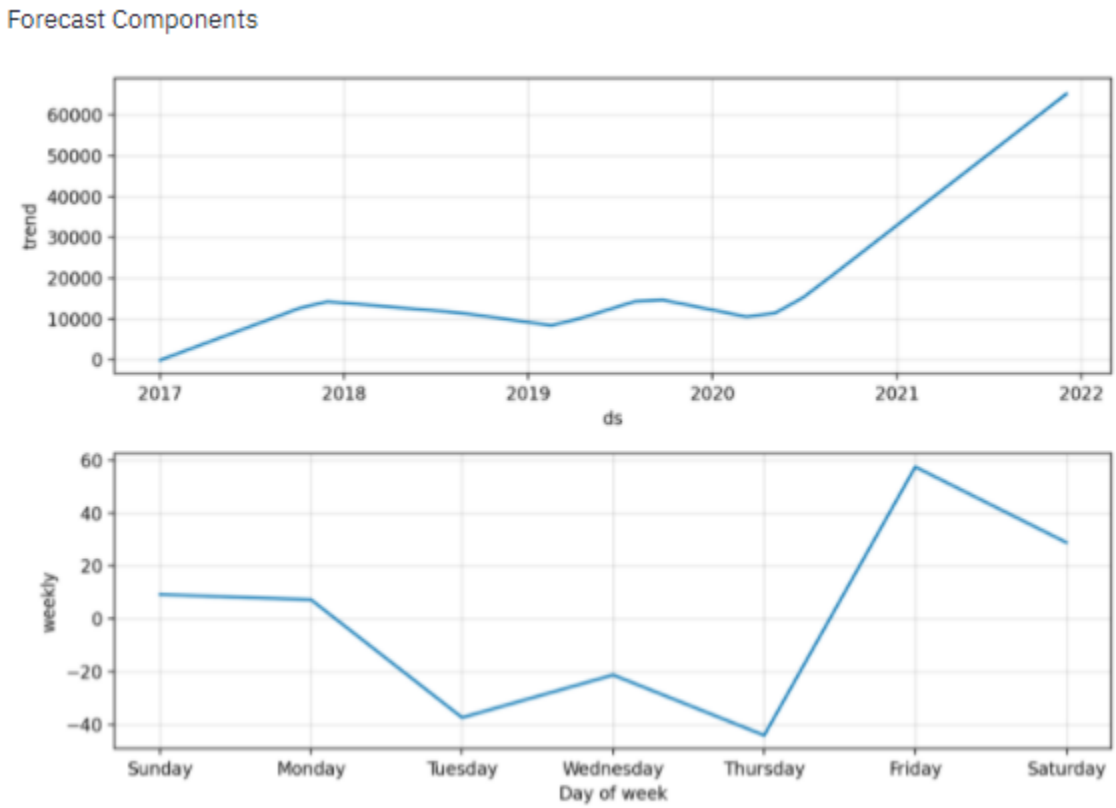


Fig 4.11.1 Graph of Forecast components

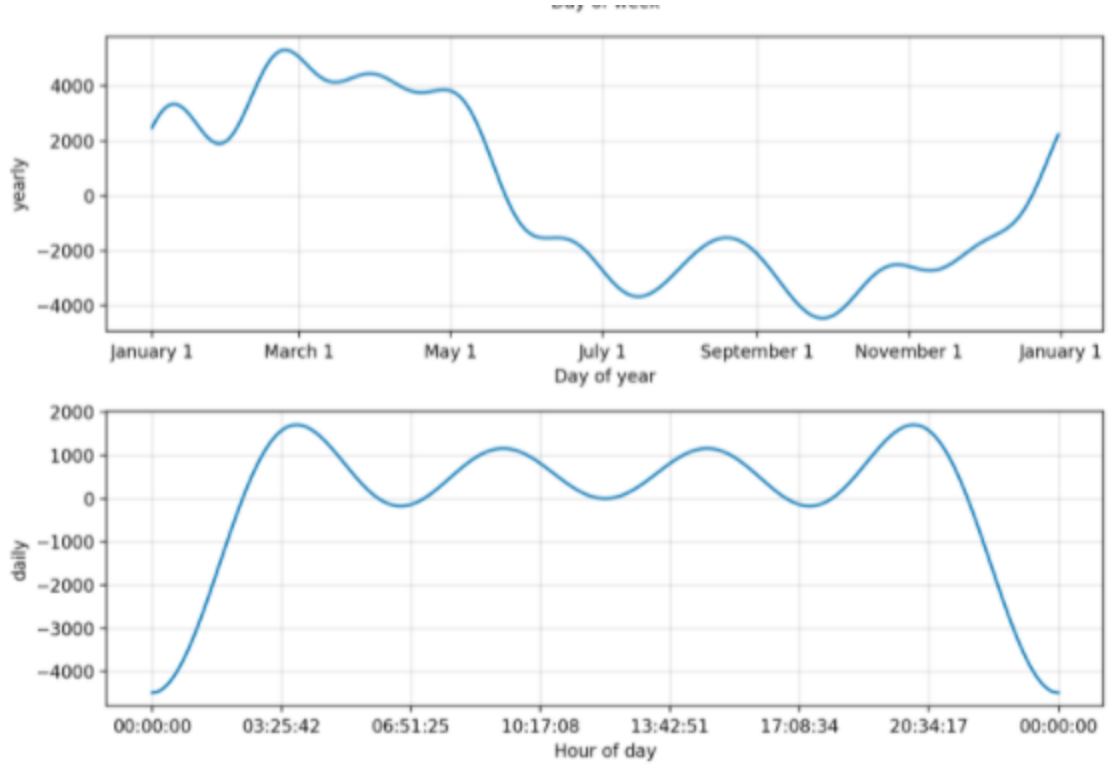
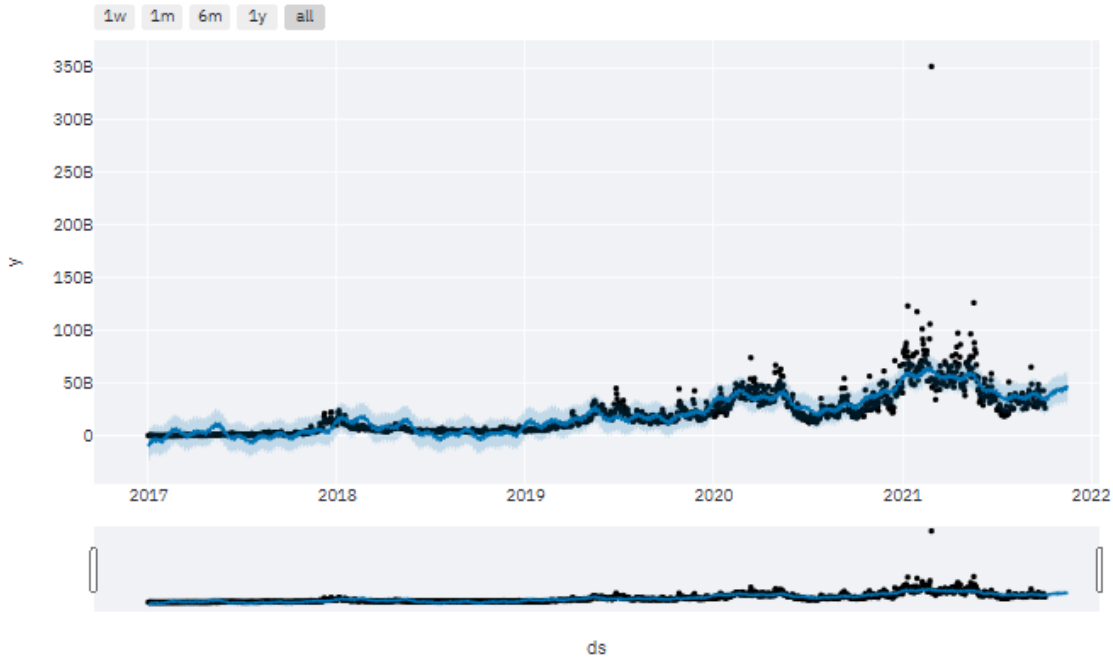


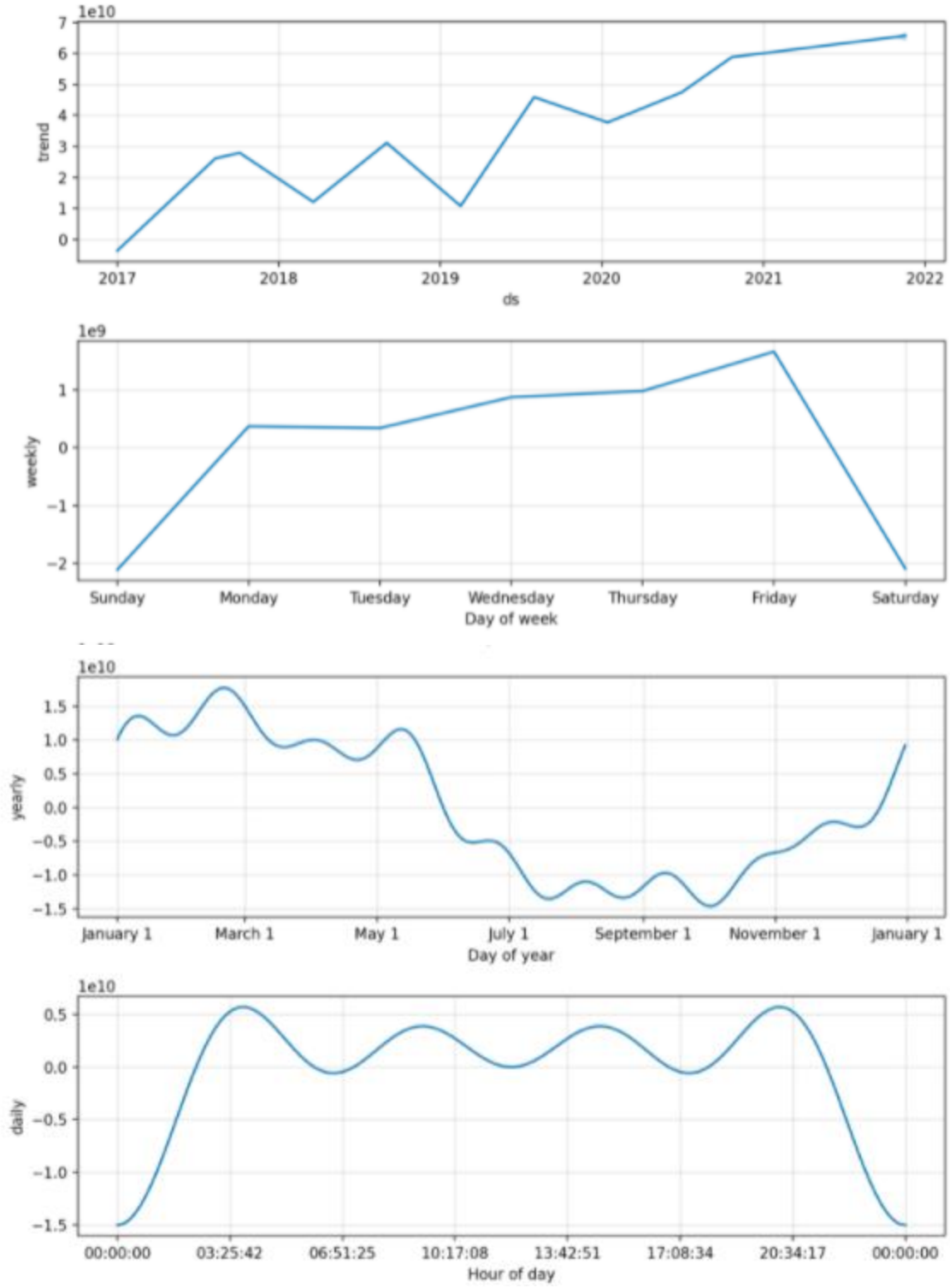
Fig 4.11.2 Graph of Forecast Component Continued

A similar process was followed in predicting the volume of the coin selected to obtain the following graphs

Forecast Volume Graph



Volume Forecast Components



Earlier, a discovery was made that compared USD to Bitcoin and Cryptocurrencies by entension. This project found it necessary to also predict the price of USD since the price movement of USD is somewhat related to that of the prices of Crypto coins.
To predict USD accurately, we would be using the same model that is Prophet but change our dataset to that of the USD dataset we obtained earlier. This dataset is not auto-updating like that of the coins however so frequent updates will be supplied manually to keep the system running until an auto-update method for this dataset is implemented.

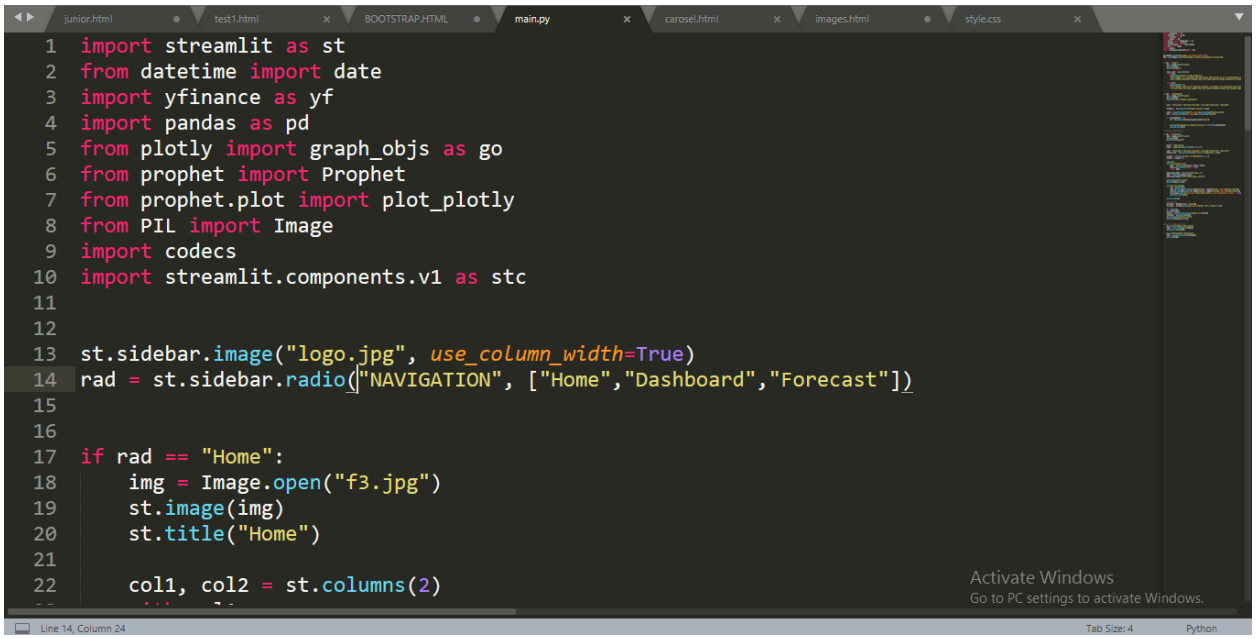
```
#Load Dataset
usd = pd.read_csv("C:/Users/user1/Downloads/LVL 400/Project/Re-Try/data/USD.csv")
#Feature Selection
usd_price = usd.drop(usd.columns[[1,2,3,4,5]], axis=1)
#usd_price = usd_price.rename(columns={"Date": "ds", "Close": "y"})
usd_price.columns = ["ds","y"]
usd_price.head()
```

```
# Forecasting USD
m = Prophet(daily_seasonality=True)
m.fit(usd_price)
future2 = m.make_future_dataframe(periods=period)
forecast2 = m.predict(future2)
st.header('Forecast USD Prices')
st.write(forecast2.tail())


#Graphs of Forecasted USD
st.header('Forecast USD Graph')
fig5 = plot_plotly(m, forecast2)
st.plotly_chart(fig5)

st.subheader('USD Forecast Components')
fig6 = m.plot_components(forecast2)
st.write(fig6)
```

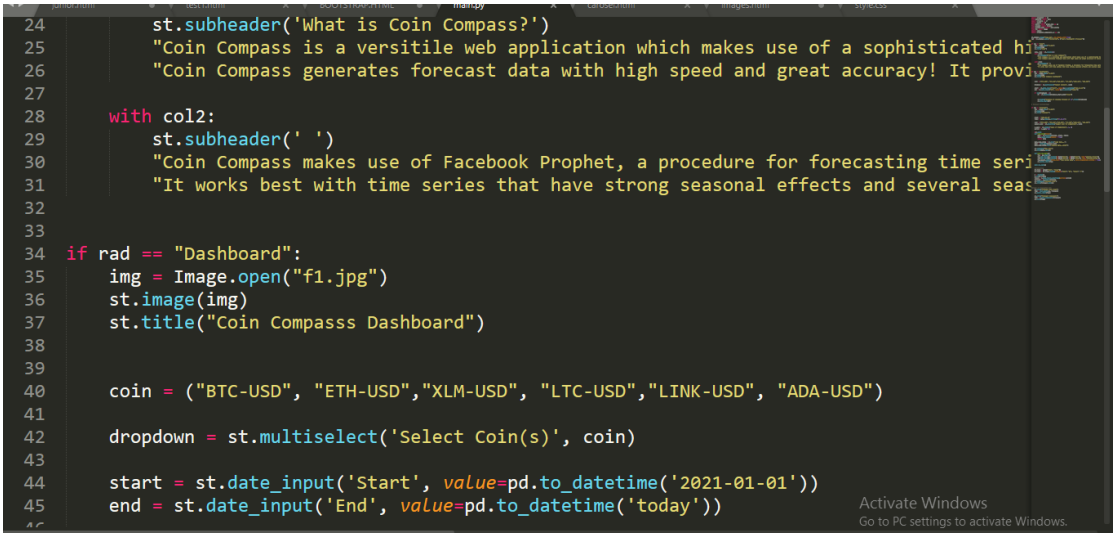
4.1.8 Creation of Web Application

The Coin Compass web application was created and powered by ***Streamlit,*** an open-source Python library that makes it easy to create and share beautiful, custom web apps for machine learning and data science.

4.1.9 Some Screenshots of Codes in Streamlit



```
import streamlit as st
from datetime import date
import yfinance as yf
import pandas as pd
from plotly import graph_objs as go
from prophet import Prophet
from prophet.plot import plot_plotly
from PIL import Image
import codecs
import streamlit.components.v1 as stc


st.sidebar.image("logo.jpg", use_column_width=True)
rad = st.sidebar.radio("NAVIGATION", ["Home","Dashboard","Forecast"])


if rad == "Home":
    img = Image.open("f3.jpg")
    st.image(img)
    st.title("Home")

    col1, col2 = st.columns(2)
```

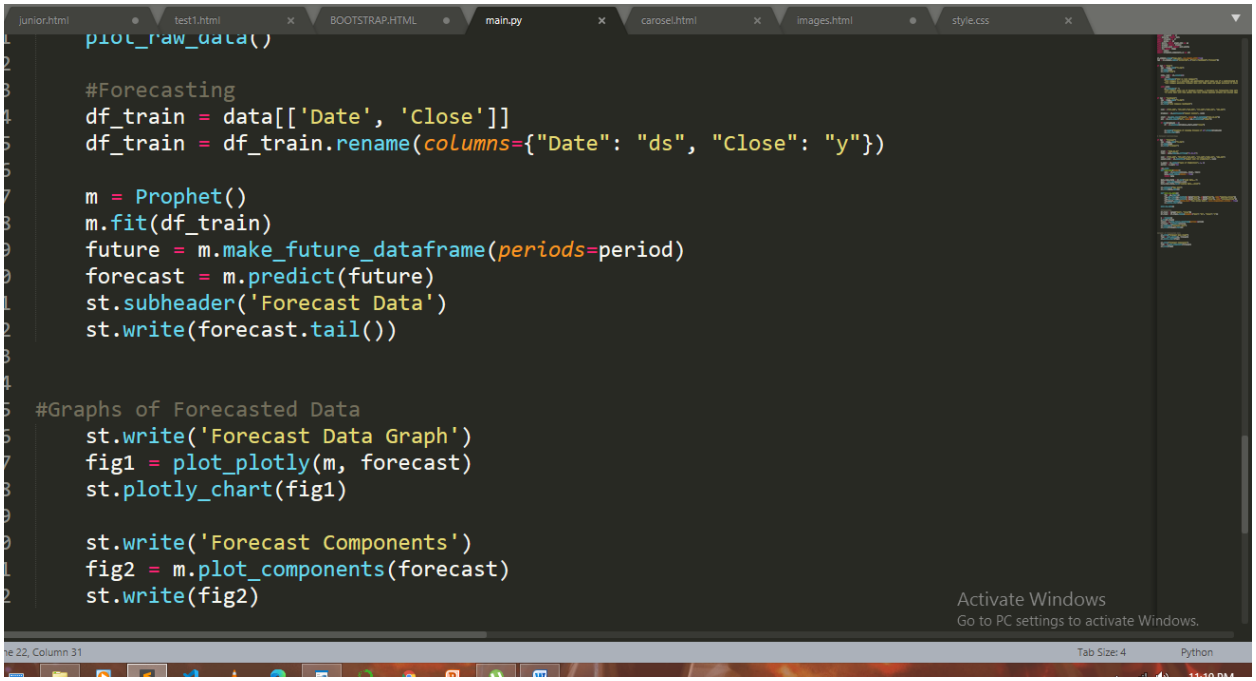


```
        st.subheader('What is Coin Compass?')
        "Coin Compass is a versitile web application which makes use of a sophisticated hi
        "Coin Compass generates forecast data with high speed and great accuracy! It provi

    with col2:
        st.subheader(' ')
        "Coin Compass makes use of Facebook Prophet, a procedure for forecasting time seri
        "It works best with time series that have strong seasonal effects and several seas


if rad == "Dashboard":
    img = Image.open("f1.jpg")
    st.image(img)
    st.title("Coin Compasss Dashboard")


    coin = ("BTC-USD", "ETH-USD","XLM-USD", "LTC-USD","LINK-USD", "ADA-USD")

    dropdown = st.multiselect('Select Coin(s)', coin)

    start = st.date_input('Start', value=pd.to_datetime('2021-01-01'))
    end = st.date_input('End', value=pd.to_datetime('today'))
```

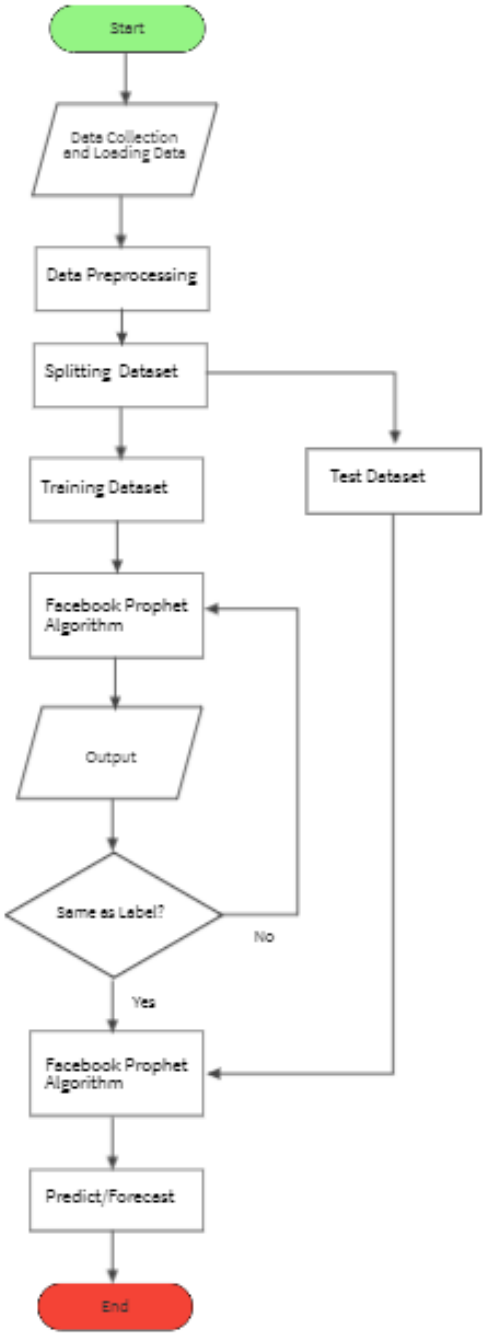
```
47      if len(dropdown) > 0:
48          df = yf.download(dropdown,start,end)['Close']
49
50
51          st.header("Graph(s) Of Closing Price(s) of {}".format(dropdown))
52          st.line_chart(df)
53
54  # Forecast Section/Page
55
56  if rad == "Forecast":
57      img = Image.open("f2.jpg")
58      st.image(img)
59      st.title("Forecast")
60
61
62      START = "2020-01-01"
63      TODAY = date.today().strftime("%Y-%m-%d")
64
65      coin = ("BTC-USD", "ETH-USD","XLM-USD", "LTC-USD","LINK-USD", "ADA-USD")
66      select_coin = st.selectbox("Select coin for prediction", coin)
67
68      n_years = st.slider("Years of Prediction:", 1, 4)
```



```
82      st.write(data.tail())
83
84      def plot_raw_data():
85          fig = go.Figure()
86          fig.add_trace(go.Scatter(x=data['Date'], y=data['Open'], name='opening_prices'))
87          fig.add_trace(go.Scatter(x=data['Date'], y=data['Close'], name='closing_prices'))
88          fig.layout.update(title_text="Time Series Data", xaxis_rangeslider_visible = True)
89          st.plotly_chart(fig)
90
91      plot_raw_data()
92
93      #Forecasting
94      df_train = data[['Date', 'Close']]
95      df_train = df_train.rename(columns={"Date": "ds", "Close": "y"})
96
97      m = Prophet()
98      m.fit(df_train)
99      future = m.make_future_dataframe(periods=period)
100     forecast = m.predict(future)
101     st.subheader('Forecast Data')
102     st.write(forecast.tail())
103
```



4.2 Flowchart



4.3 Some Software/ Tools Used

The Software and tools used for the completion of this project are:

1. Jupyter Notekook IDE from Anaconda
2. Command Prompt from Anaconda
3. Sublime Text
4. MockFlow
5. CorelDraw X8

Chapter Five

SOFTWARE TESTING AND MAINTENANCE

5.1 Testing

Testing refers to crosschecking the product against the expected requirements of the system to remove bugs and errors and make sure the system is doing what it was meant to do.

5.2. Unit and Integration Testing

At this point, each component of the web applications was tested separately to ensure it works correctly by itself(Unit Testing). After that the components were assemble together with continuous testing to ensure that it works correctly (Integration Testing). Errors emerging at these stages were easily handled

5.3 System Testing

This stage followed after integration testing and focused on the functional and non-functional aspects of the product. Here, performance, operator and user's smooth interaction with system nd software documentation were considered and focused on

5.4 Functional Testing

At this stage, the system was cross checked to ensure that it met all its functional requirements such as the system being able to allow users choose the time frame for prediction and that allow for multiple coins to be selected for comparison.

5.5 Performance Testing

Here, Coin Compass was run on different web browsers to check for irregularities, the speed of the platform was checked , the performance of the machine learning model was checked and the responsiveness of the web application was also checked.

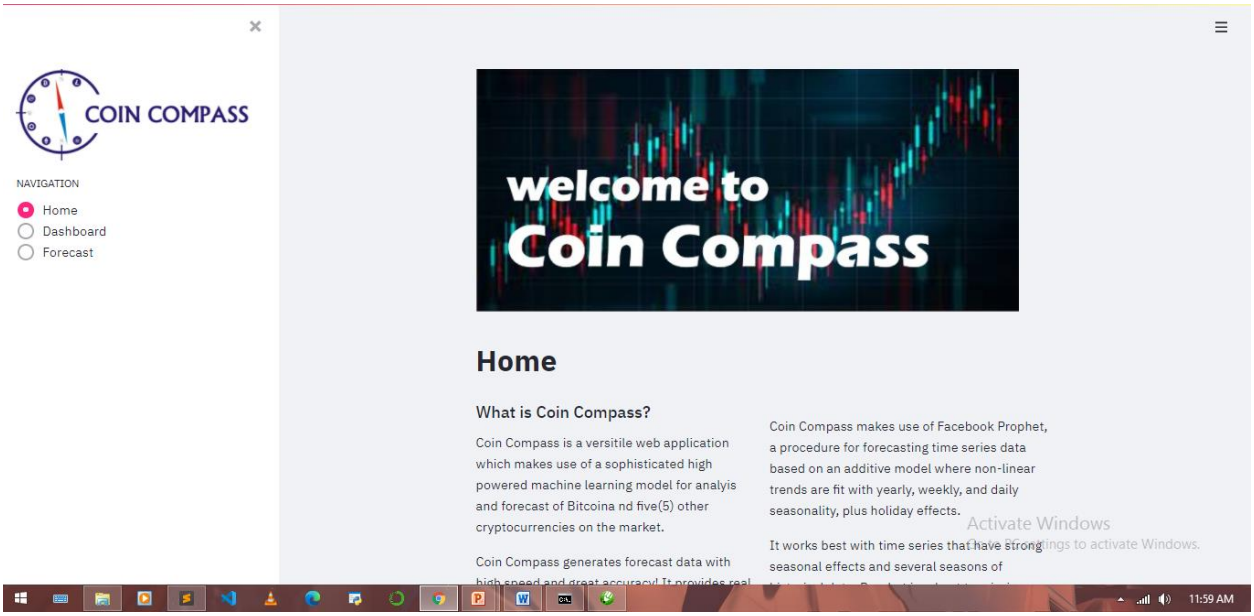
5.6 Maintenance

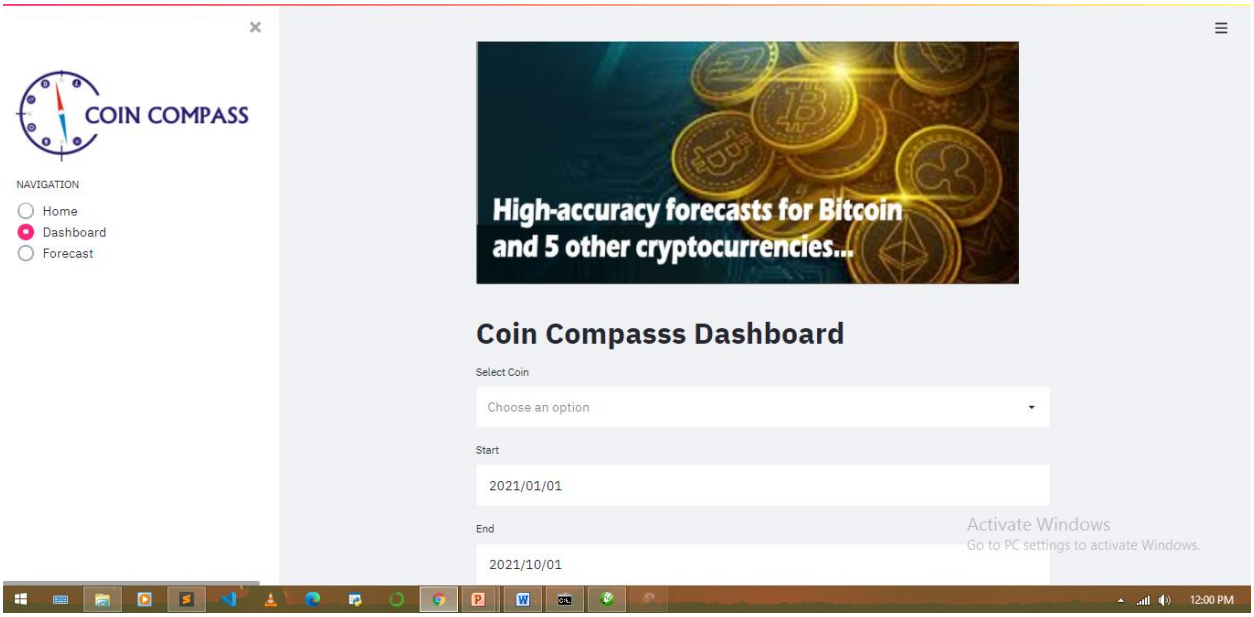
Comments, indentations and good documentation was used during product development so as to make maintenance of system easier. Also, all languages and used for development are quite popular and very recent (up to date). These measures were considered so as to make it easier to maintain the system in the future.

Chapter Six

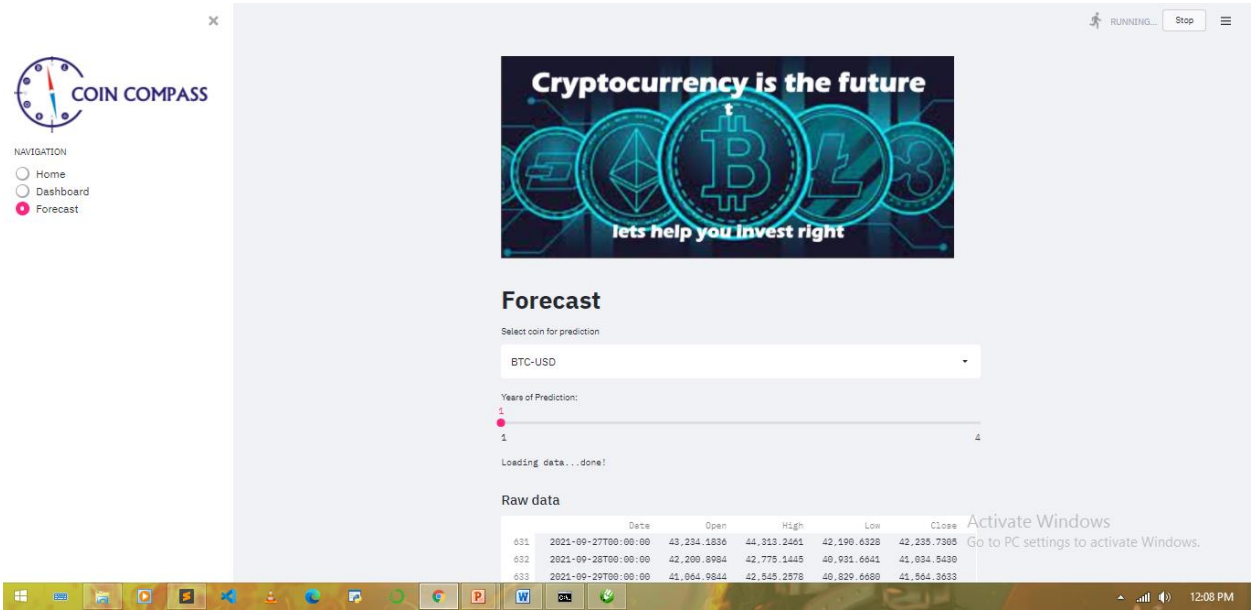
FINAL PRODUCT AND CONCLUSION

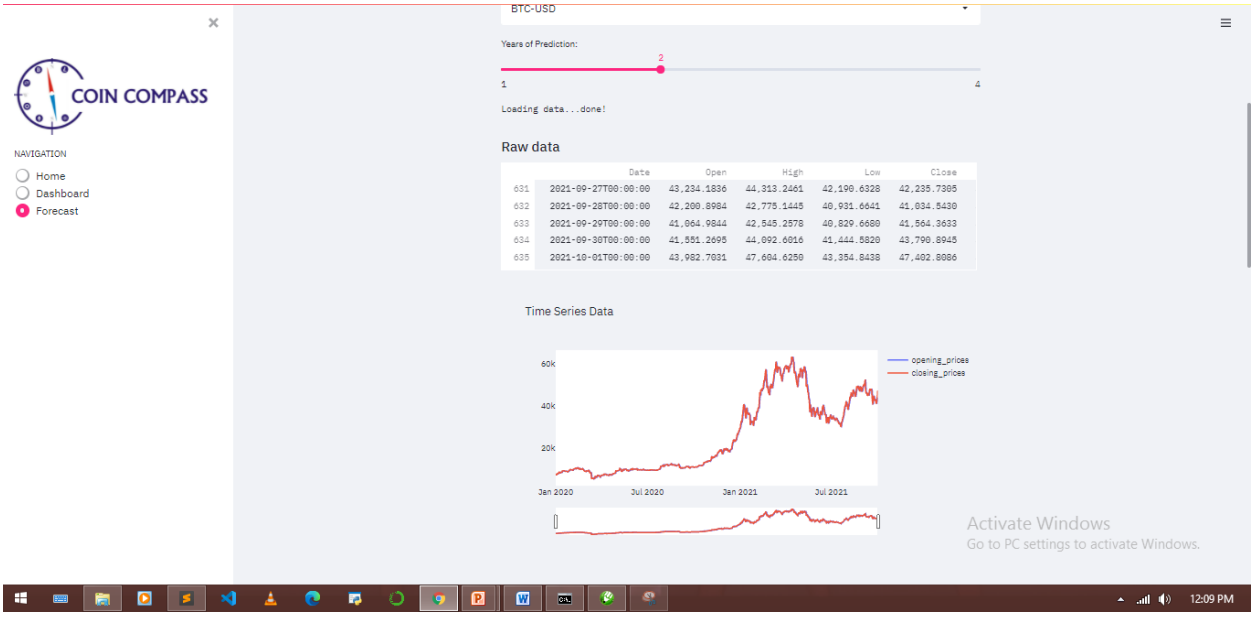
6.1 Final Application Screenshots

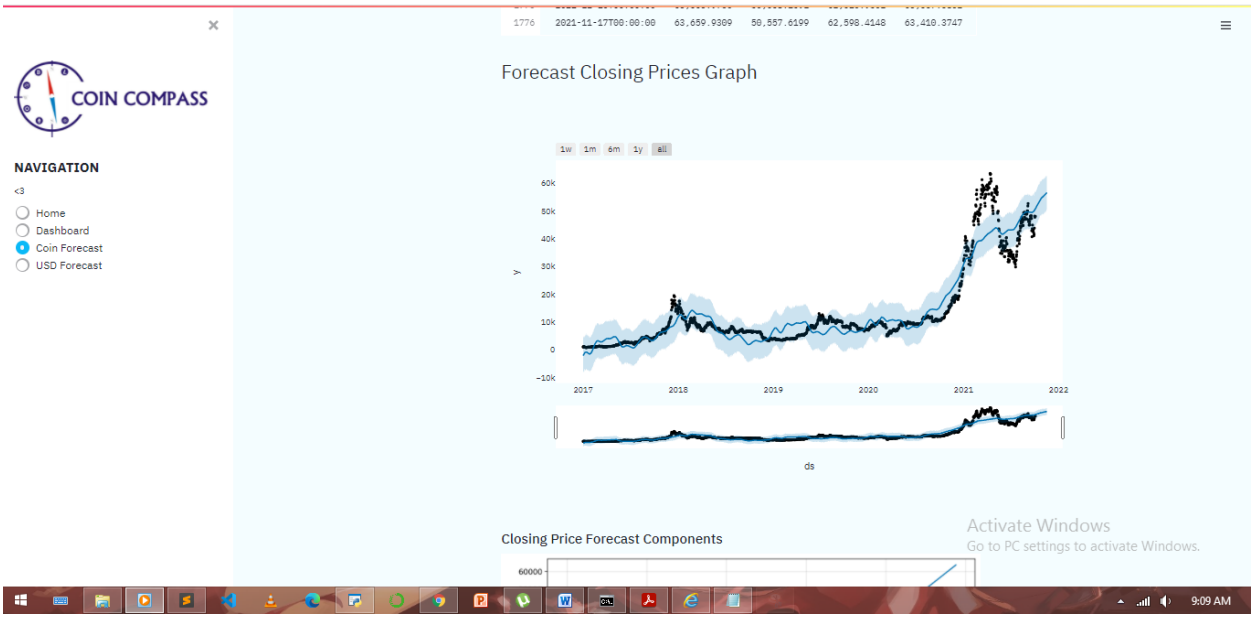


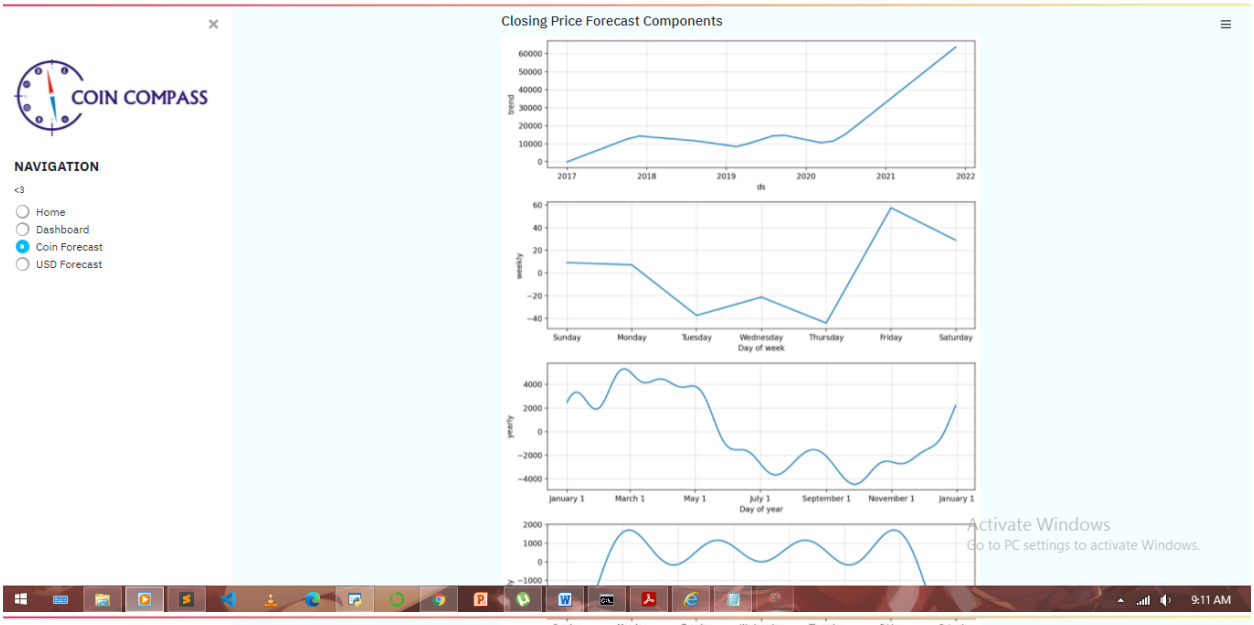


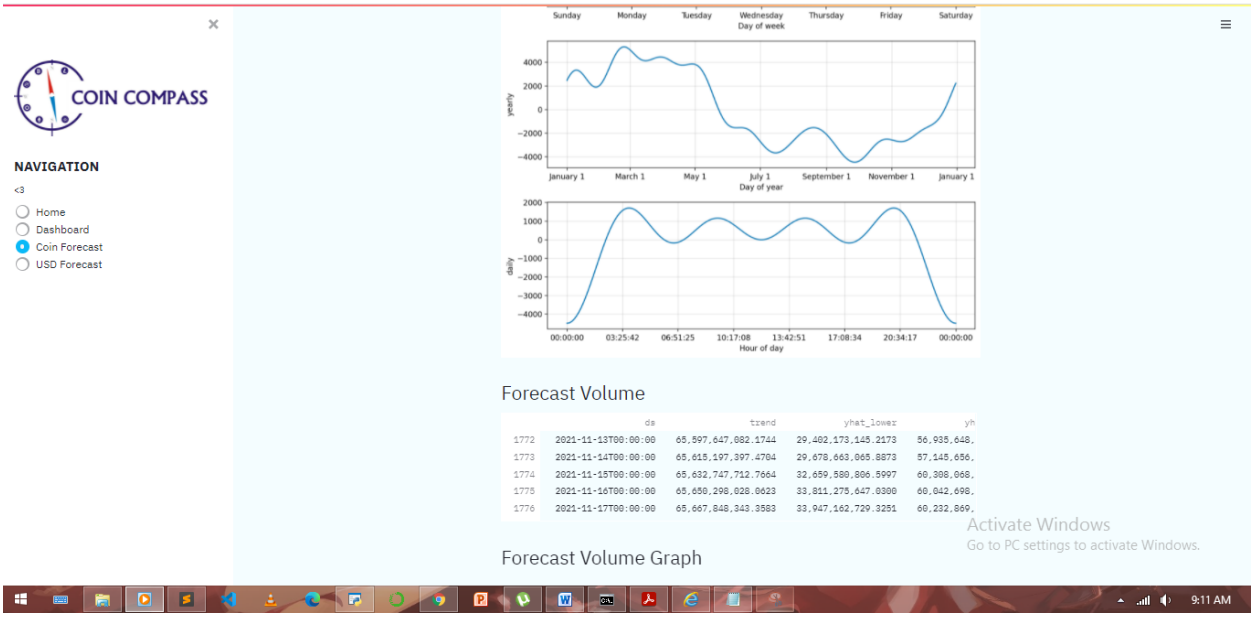

COIN COMPASS
NAVIGATION
Home
Dashboard
Forecast
Coin Compasss Dashboard
Select Coin(s)
BTC-USD
XLM-USD
ETH-USD
Start
2021/01/01
End
2021/10/01
Graph(s) Of Closing Price(s) of ['BTC-USD', 'XLM-USD', 'ETH-USD']
Activate Windows
Go to PC settings to activate Windows.
12:07 PM


COIN COMPASS
NAVIGATION
Home
Dashboard
Forecast
RUNNING...
Stop
Cryptocurrency is the future
lets help you invest right
Forecast
Select coin for prediction
BTC-USD
Years of Prediction:
Loading data...done!
Raw data
Activate Windows
Go to PC settings to activate Windows.
12:08 PM

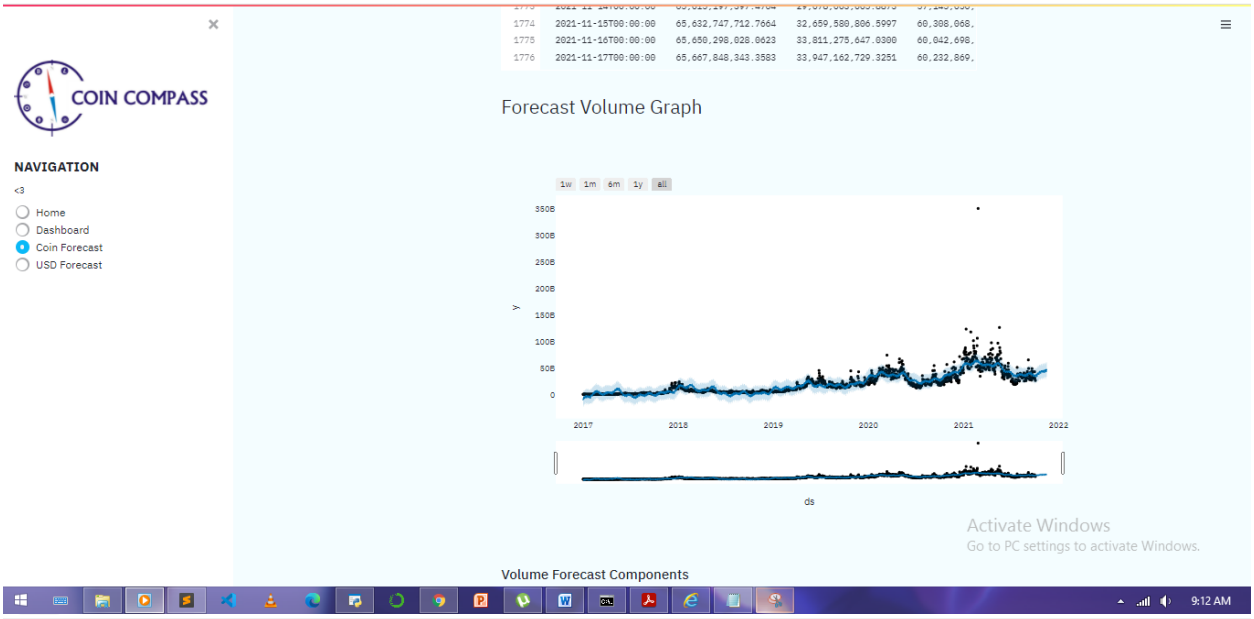

COIN COMPASS
NAVIGATION
Home
Dashboard
Forecast
BTC-USD
Years of Prediction:
2
1
4
Loading data...done!
Raw data
Date Open High Low Close
631 2021-09-27T00:00:00 43,234.1836 44,313.2461 42,190.6328 42,235.7305
632 2021-09-28T00:00:00 42,200.8984 42,775.1445 40,931.6641 41,034.5430
633 2021-09-29T00:00:00 41,064.9844 42,545.2578 40,829.6680 41,564.3633
634 2021-09-30T00:00:00 41,551.2695 44,092.6016 41,444.5820 43,790.8945
635 2021-10-01T00:00:00 43,982.7031 47,604.6250 43,354.8438 47,402.8086
Time Series Data
60k
40k
20k
Jan 2020
Jul 2020
Jan 2021
Jul 2021
opening_prices
closing_prices
Activate Windows
Go to PC settings to activate Windows.
12:09 PM

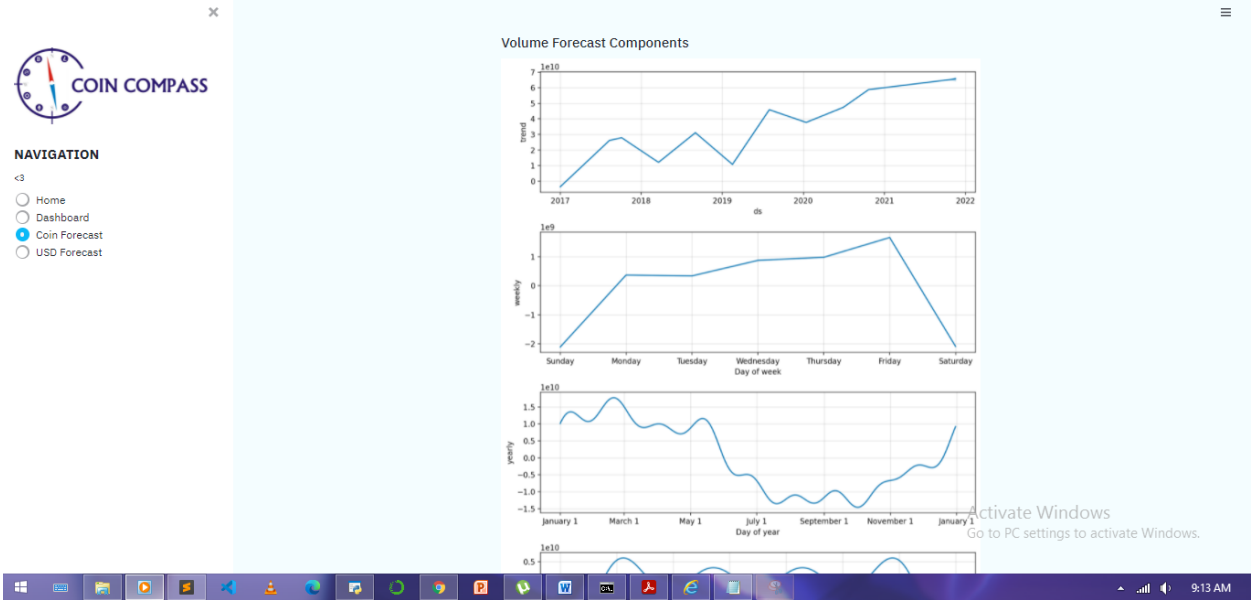

1776 2021-11-17T00:00:00 63,659.9309 58,557.6199 62,598.4148 63,410.3747
COIN COMPASS
NAVIGATION
<3
Home
Dashboard
Coin Forecast
USD Forecast
Forecast Closing Prices Graph
1w 1m 6m 1y all
60k
50k
40k
30k
20k
10k
0
-10k
y
2017
2018
2019
2020
2021
2022
ds
Closing Price Forecast Components
60000
Activate Windows
Go to PC settings to activate Windows.
9:09 AM

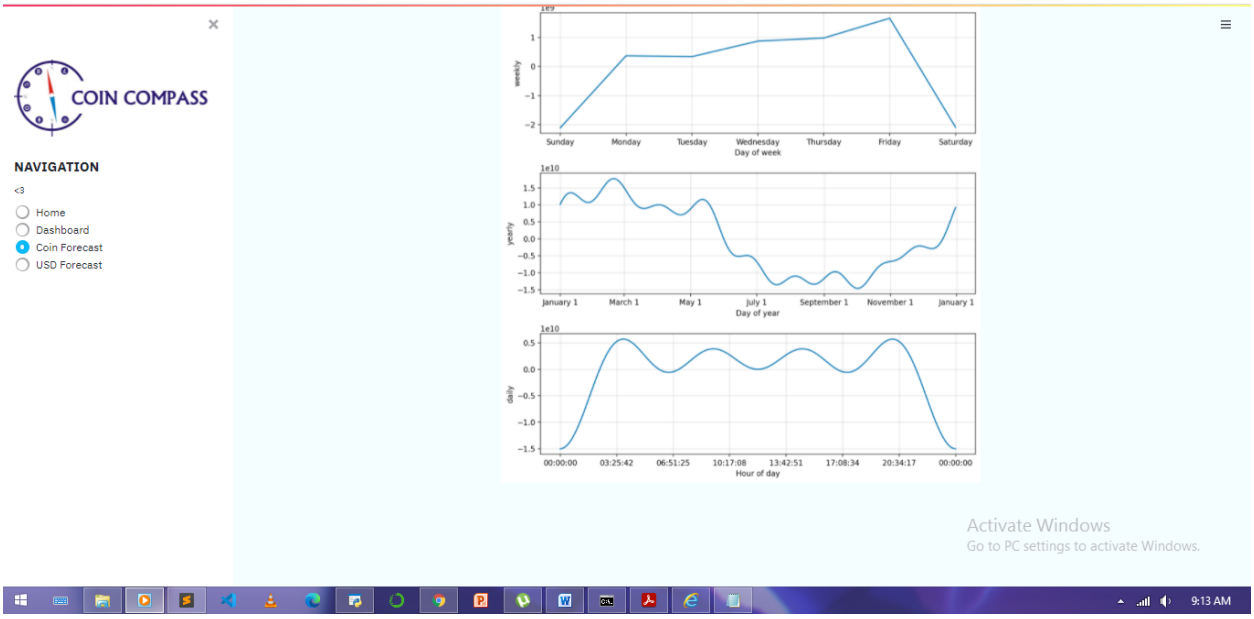




	ds	trend	yhat_lower	yh
1772	2021-11-13T00:00:00	65,597,647,082.1744	29,402,173,145.2173	56,935,648,
1773	2021-11-14T00:00:00	65,615,197,397.4704	29,678,663,065.8873	57,145,656,
1774	2021-11-15T00:00:00	65,632,747,712.7664	32,659,580,806.5997	60,308,068,
1775	2021-11-16T00:00:00	65,650,298,028.0623	33,811,275,647.0300	60,042,698,
1776	2021-11-17T00:00:00	65,667,848,343.3583	33,947,162,729.3251	60,232,869,


COIN COMPASS
NAVIGATION
<3
Home
Dashboard
Coin Forecast
USD Forecast
1774 2021-11-15T00:00:00 65,632,747,712.7664 32,659,580,806.5997 60,308,068.
1775 2021-11-16T00:00:00 65,650,298,028.0623 33,811,275,647.0300 60,042,698.
1776 2021-11-17T00:00:00 65,667,848,343.3583 33,947,162,729.3251 60,232,869.
Forecast Volume Graph
1w 1m 6m 1y all
350B
300B
250B
200B
150B
100B
50B
0
y
2017
2018
2019
2020
2021
2022
ds
Activate Windows
Go to PC settings to activate Windows.
Volume Forecast Components
9:12 AM


COIN COMPASS
NAVIGATION
<3
Home
Dashboard
Coin Forecast
USD Forecast
Volume Forecast Components
1e10
trend
2017
2018
2019
2020
2021
2022
ds
1e9
weekly
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Day of week
1e10
yearly
January 1
March 1
May 1
July 1
September 1
November 1
January 1
Day of year
Activate Windows
Go to PC settings to activate Windows.
9:13 AM



6.2 Conclusion

At the end of this project, the crypto currency price prediction application (Coin Compass) was created to meet all its expected requirements. This application can now serve as a tool to make predictions of the possible trend of prices and aid individuals, groups and organizations to make better investment decisions when it comes to crypto currency.

REFERENCES

Taylor SJ, Letham B. 2017. Forecasting at scale. *PeerJ Preprints* 5:e3190v2 https://doi.org/10.7287/peerj.preprints.3190v2

(24) Bitcoin and Cryptocurrency: Challenges, Opportunities and Future Works. Available from: https://www.researchgate.net/publication/343675556_Bitcoin_and_Cryptocurrency_Challenges_Opportunities_and_Future_Works [accessed Sep 20 2021]

Peter Bernholz(2003). Monetary Regimes and Inflation: History, Economic and Political Relationships. Edward Elgar Publishing.p.53.ISBN 978-1-84376-155-6 https://en.wikipediaorg/wiki/Fiat money#cite ref-Bernholz 5-0

Abraham, Jethin; Higdon, Daniel; Nelson, John; and Ibarra, Juan (2018) "Cryptocurrency Price Prediction Using Tweet Volumes and Sentiment Analysis," SMU Data Science Review: Vol. 1 : No. 3 , Article 1. Available at: https://scholar.smu.edu/datasciencereview/vol1/iss3/1

(1) Cryptocurrency. Available from: https://www.researchgate.net/publication/298792075_Cryptocurrency [accessed Sep 20 2021].

https://towardsdatascience.com/cryptocurrency-price-prediction-using-deep-learning-70cfca50dd3a

https://crossbrowsertesting.com/continuous-delivery/web-testing?utm_medium=ppcg&utm_source=aw&utm_term=&utm_content=546049

https://www.browserstack.com/guide/functional-testing

https://facebook.github.io/prophet/

https://docs.streamlit.io/en/stable/

https://www.tutorialspoint.com/programming_methodologies/index.htm#:~:text=Programming%20Methodology%20is%20the%20approach,programming%2C%20also%20called%20modular%20programming.

https://theccpress.com/top-10-cryptocurrency-price-prediction-platforms-to-follow-now/

https://walletinvestor.com/

https://tradingbeasts.com/price-prediction/dogecoin

https://www.sciencedirect.com/science/article/pii/S240584402101642X

APPENDIX

Follow the link to the github repository with the notebooks and data required for Coin Compass and its model:

https://github.com/VanessaAttaFynn/Final_Year_Project