NATIONAL UNIVERSITY OF SINGAPORE
IS5006 – INTELLIGENT SYSTEMS DEPLOYMENT
(Semester 2 – AY2020/2021)

Group 3

How To Guide

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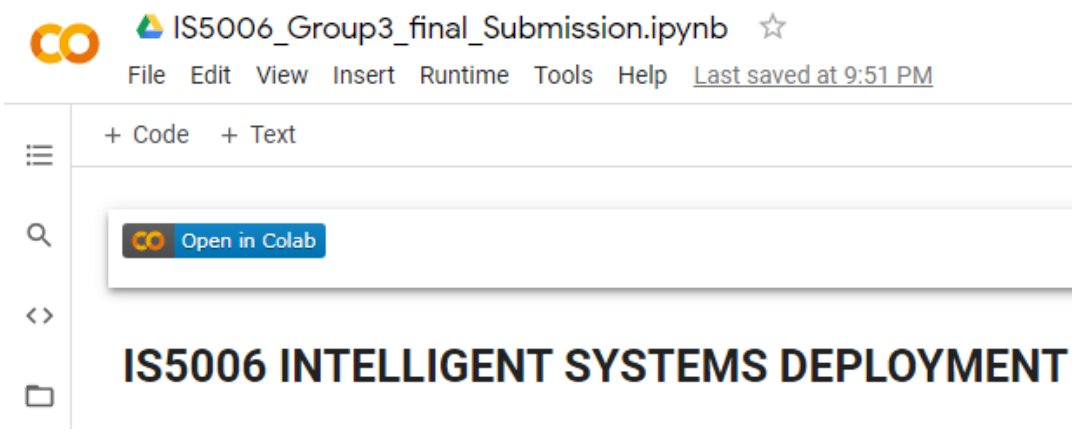
How to setup the environment for your model

To setup the environment, you will need the following:

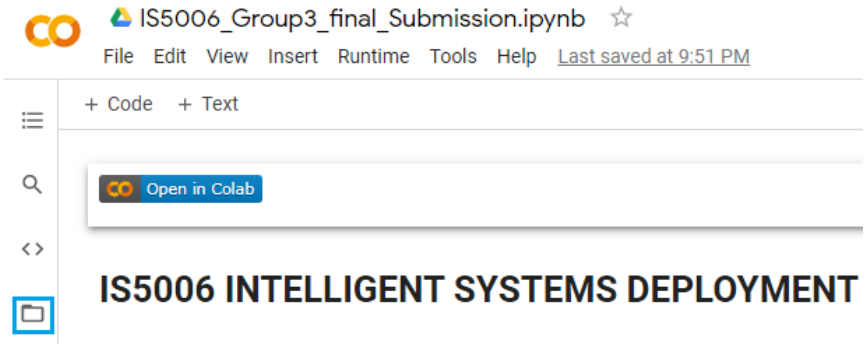
- Access to Google Colab (https://colab.research.google.com/notebooks/intro.ipynb#recent=true)
- Ensure that this Google spreadsheet link (https://docs.google.com/spreadsheets/d/1uJKZmnutuXwjMWl3sZ0GjJWprb_x9Cpf8kM2XdRIPUQ/edit#gid=1825553735) is active **(See Appendix 1)**
- Ensure that you have the following files ("IS5006_Group3_final_Submission.ipynb", "client_secret.json", "client_secret_2.json", "decision_tree_regressor_EOS.pkl", "decision_tree_regressor_ETH.pkl", "Group3_database_secretkeye.json")

How to re-create your model

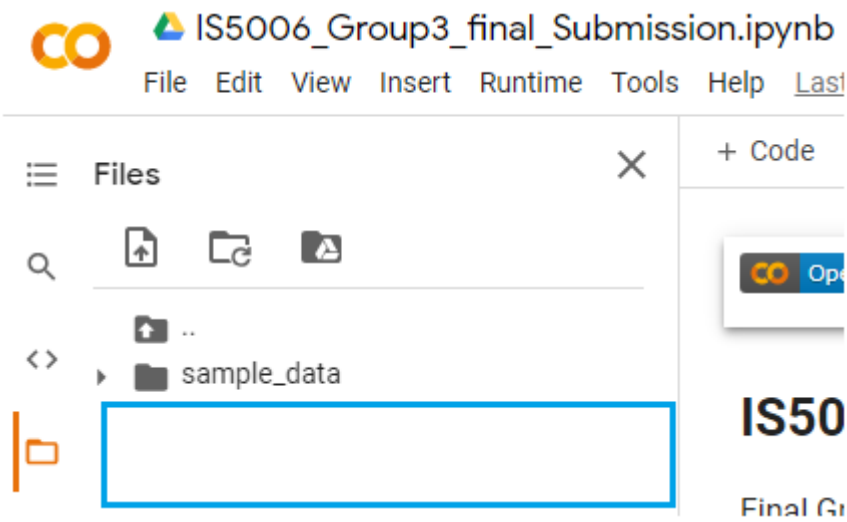
Step 1) Log in to Google Colab and upload the file "IS5006_Group3_final_Submission.ipynb", you should see this screen below



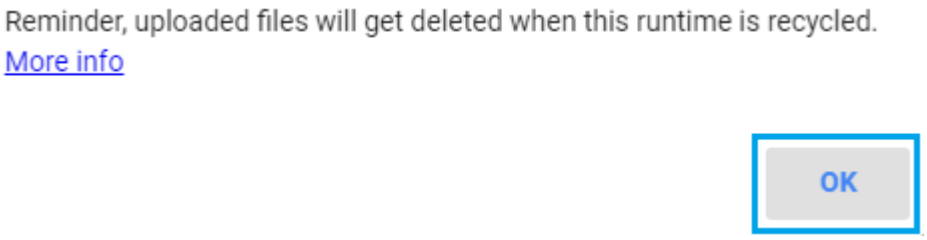
Step 2) To insert the necessary dependency files, click the blue rectangular box



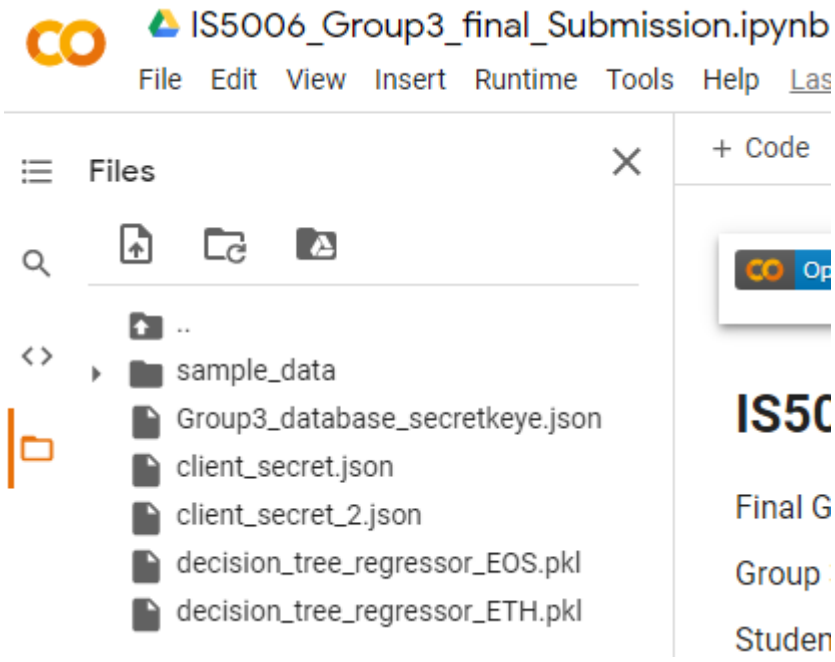
Step 3) Select the five files ("client_secret.json", "client_secret_2.json", "decision_tree_regressor_EOS.pkl", "decision_tree_regressor_ETH.pkl", "Group3_database_secretkeye.json") and drag them into the blue rectangular box



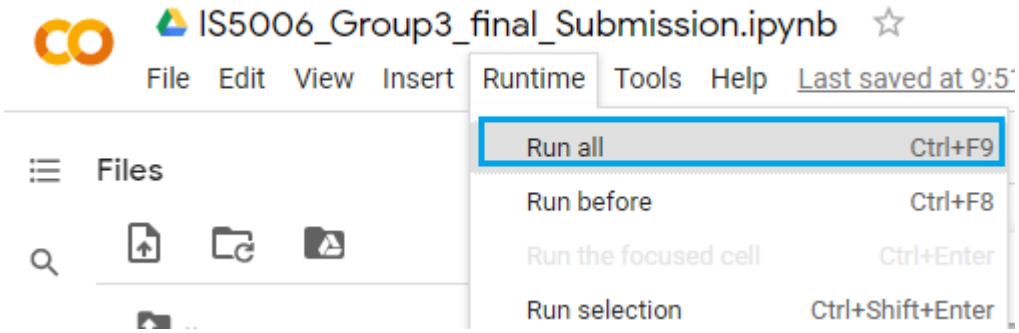
Step 4) A reminder will appear if this is your first time, click the blue rectangular box



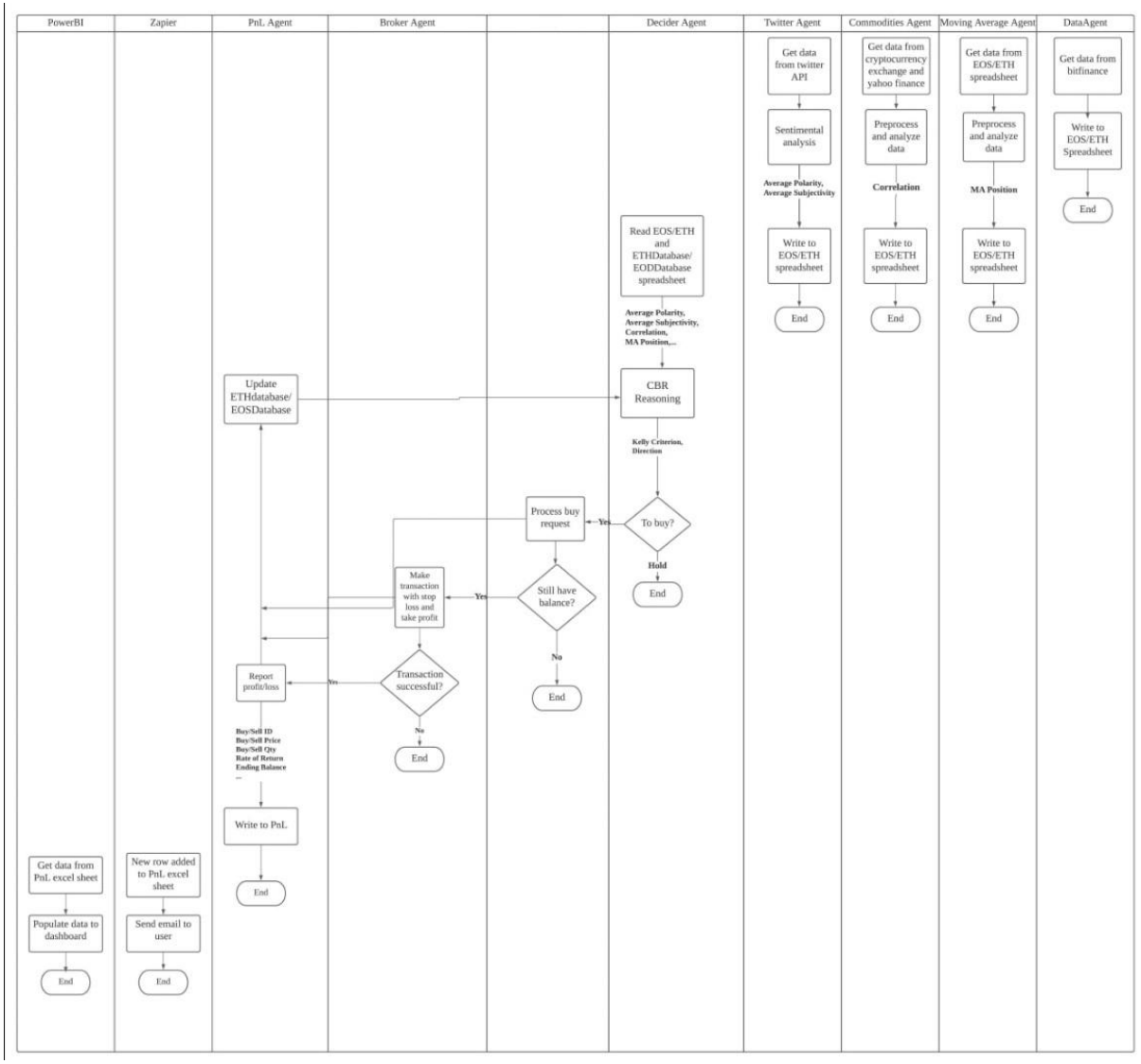
The files will appear in the directory as shown below if you have successfully dragged the files into the directory



Step 5) To run the model, click the blue rectangular box

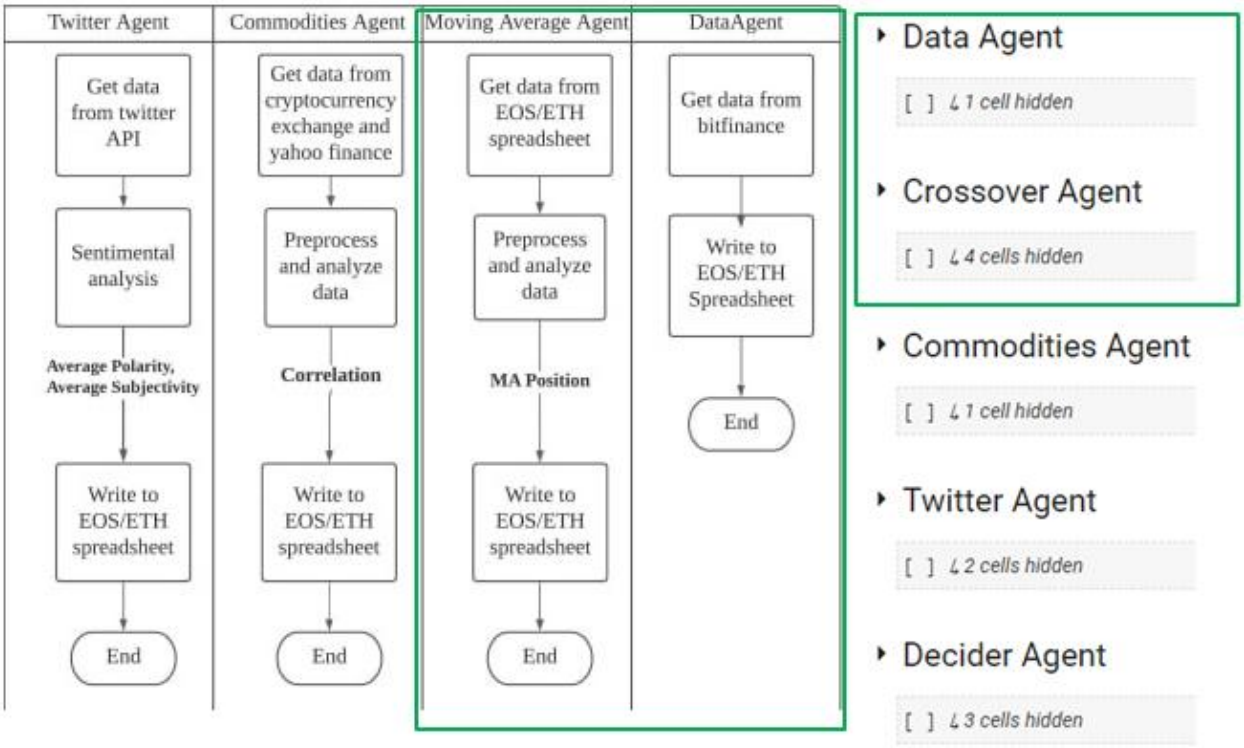


Flow chart of the model

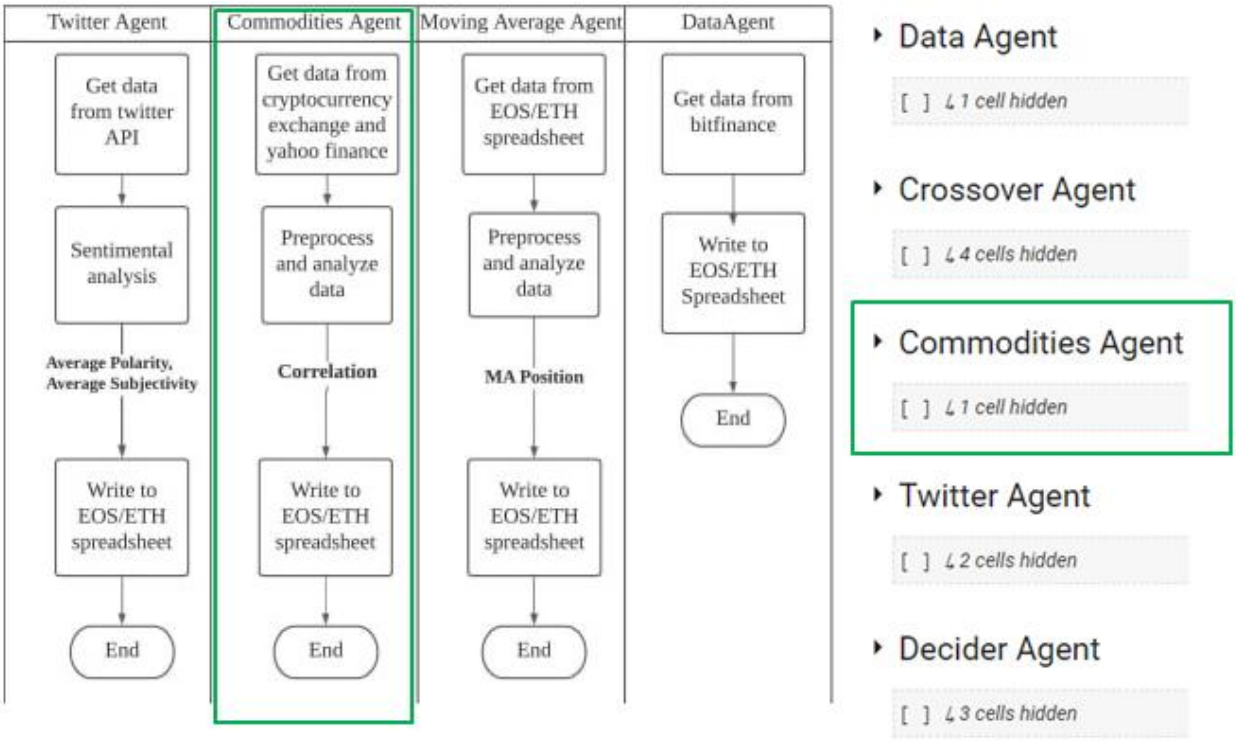


To understand the flow chart better, description of the flowchart will be provided with respect to the program "IS5006_Group3_final_Submission.ipynb".

Part 1) N Pull Agents



For the N pull agents, there are 3 pulling agents in our system. The first pulling agent consists of the data agent and moving average agent. Data for the desired cryptocurrencies are obtained from bitfinance using Data Agent and written into the Google spreadsheet. Then the cross over agent will obtain the moving average position from the close prices before inserting the values into Google spreadsheet. While cross over agent is being executed, commodities and twitter agents are also being executed concurrently using threading.

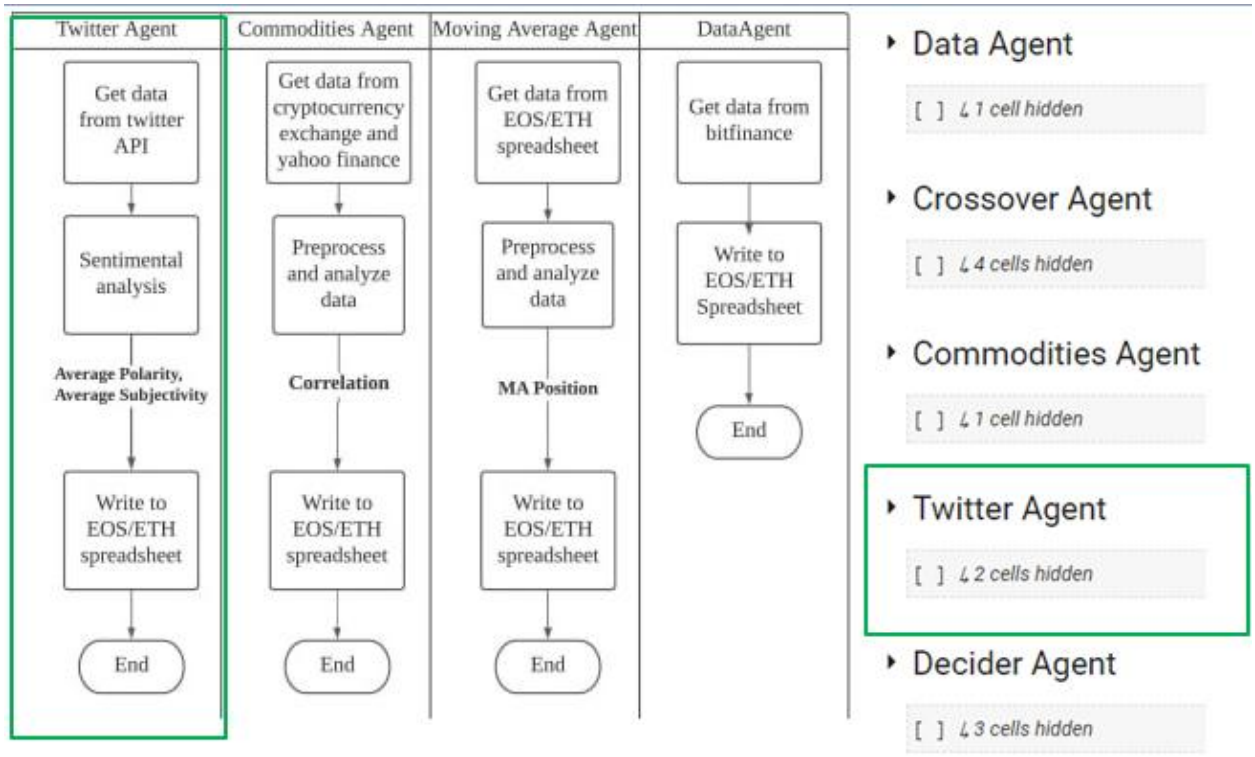


News and online articles on suggestions which commodities and stocks have good correlations with cryptocurrencies were researched.

The following commodities and stocks show good correlation:

- Soybean Futures
- Sugar
- S&P500
- QQQ ETF
- Vaneck Semiconductor ETF
- Dow Jones Industrial
- MicroStrategy Incorporated (bitcoin orientated company)
- Riot Blockchain Inc
- Paypal, Master
- TSLA
- Chicago Mercantile Exchange
- Square
- IBm
- Amazon

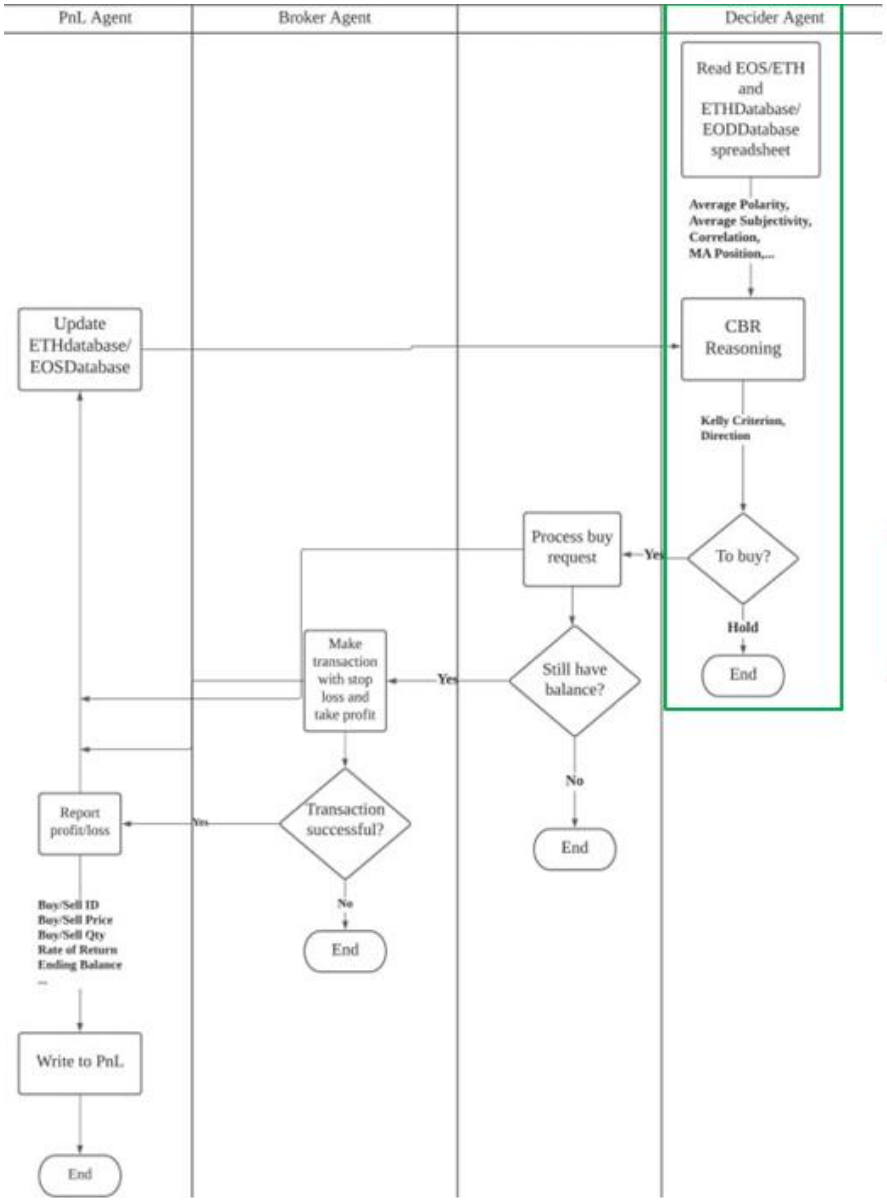
Using the direction of percentage price change of the above commodities and stocks in the past 5 minutes closed, we predict what is the direction of percentage price change of ETH and EOS in the next 5 minutes using a Machine Learning Decision Tree regressor.



For the twitter agent, it will search on twitter using tweepy API for specific words and words with hashtags relating to the cryptocurrency of interest. Once it find the recent 100 tweets, it will take the tweets within the last 30 seconds based on their timestamps and preprocess the tweets to clean unnecessary data. Then sentiment analysis is performed on the cleaned tweet texts to obtain the average polarity score and average subjectivity score.

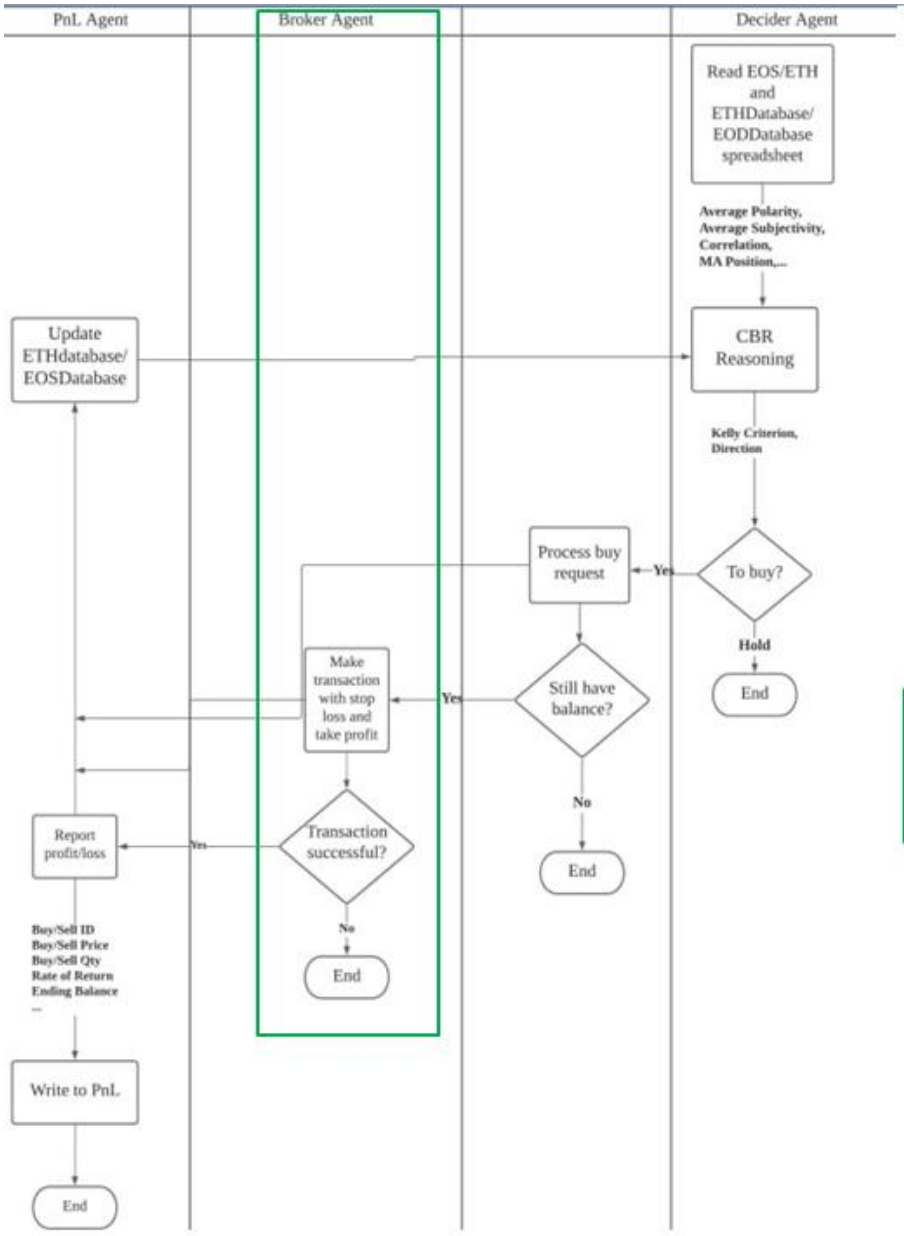
Once all twitter, commodities and moving average agent obtain their respective outputs, the outputs are being written to EOSDatabase and ETHDatabase spreadsheets.

Part 2) Decider Agent



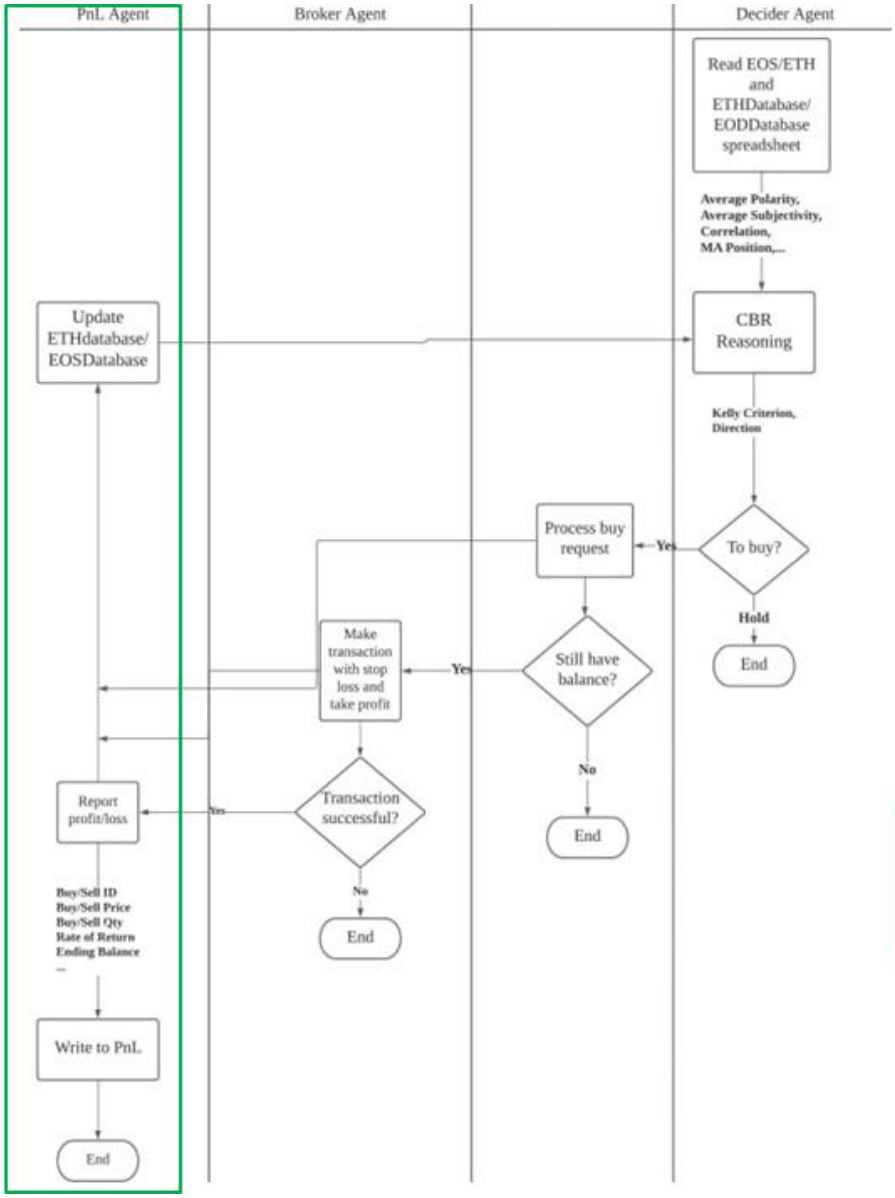
The decider agent then uses k-Nearest Neighbours (KNN) as our algorithm for Case-based reasoning to output Kelly Criterion and a buy or sell signal using the inputs from the N pull agents. The KNN is trained on the existing cases which are stored on the database and provide the direction. After we get the direction, we need to figure out how much fund to allocate and we use the Kelly Criterion. The Kelly Criterion is a mathematical formula that helps investors and gamblers calculate what percentage of their money they should allocate to each investment or bet.

Part 3) Broker Agent



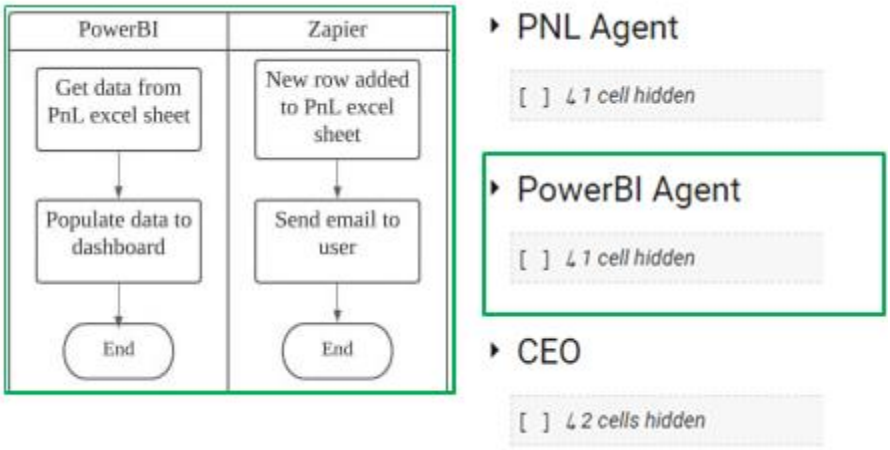
The broker agent will attempt to make a transaction based on the outputs from the decider agent. The broker agent will check for the remaining USD balance first. Then it will try to execute based on the decision of the decider agent. Any position will be monitored using risk management tactics with a stop loss/take profit. Any position at the end of the 5 minute time interval will be squared off to prevent risk of holding on to the cryptocurrency. The broker agent will then output all the buy/sell executions to the PNL agent for recording purposes.

Part 4) PNL Agent



If there are transactions observed by the broker agent, the profit and losses will be computed by the PNL agent which is then being written into the PnL Sheet.

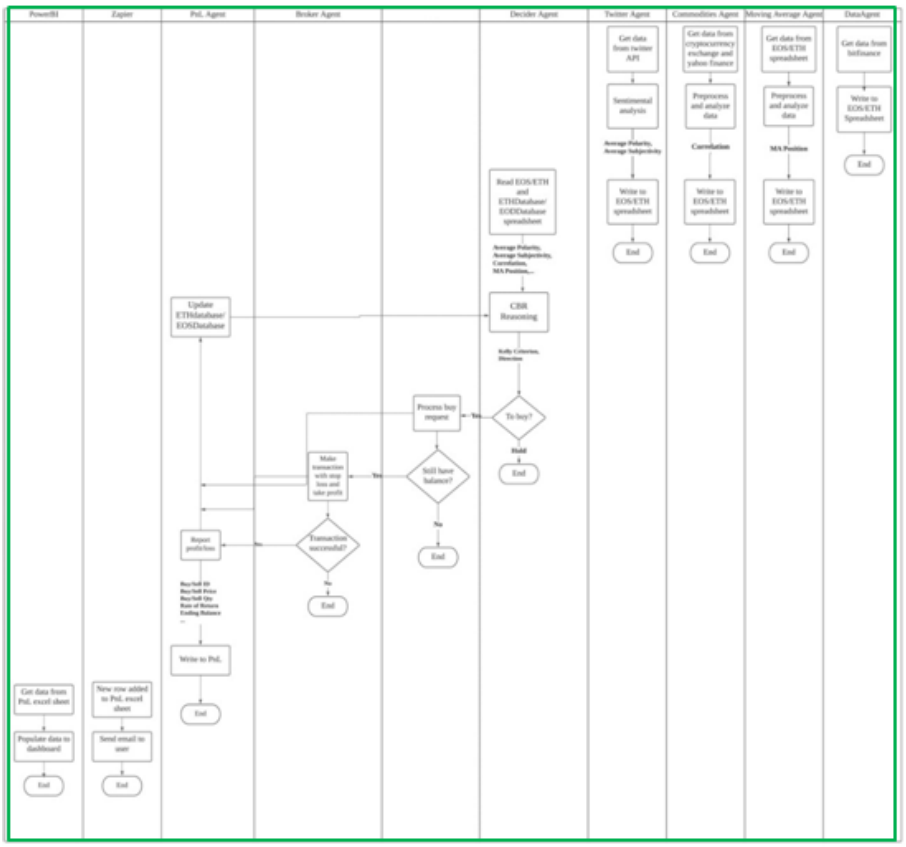
Part 5) PowerBI Agent



After the PNL agent, there is ZAPIER extracting data from the PnL spreadsheet and sending an email to CEO **(See Appendix 2)**.

Data from PNL agent is also being fed to PowerBI agent for visualization, the CEO can request an email from the data visualization team to view the analysis of the data using PowerBI **(See Appendix 3)**.

Part 6) CEO



▸ Data Agent

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▸ Crossover Agent

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▸ Commodities Agent

[ ] 1 cell hidden

▸ Twitter Agent

[ ] 2 cells hidden

▸ Decider Agent

[ ] 3 cells hidden

▸ Broker Agent

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▸ PNL Agent

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▸ PowerBI Agent

[ ] 1 cell hidden

▸ CEO

[ ] 2 cells hidden

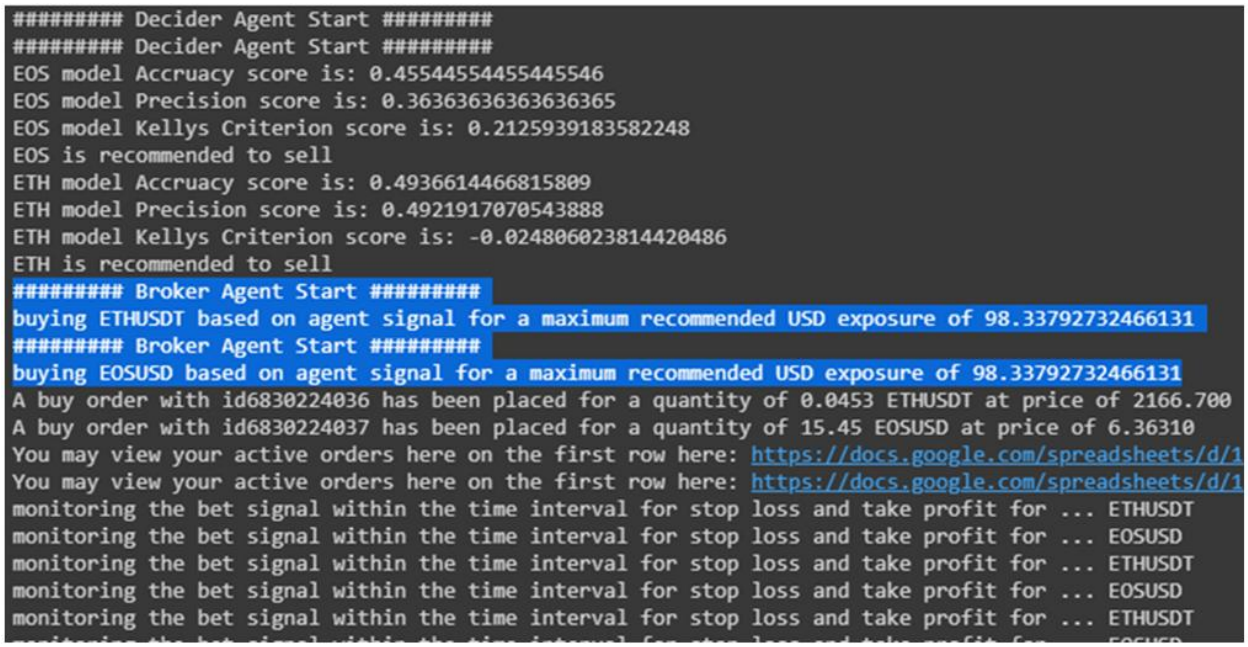
The CEO portion is where all the other agents run within. The information obtained about the buy or sell of each cryptocurrency after the end of each 5 minutes interval will also be updated into the ETHDatabase and EOSDatabase Google spreadsheet.

How Kelly Criterion affects the writing of data to the PnL spreadsheet.

If Kelly Criterion is negative, no data will be written to the PnL spreadsheet as no transaction is being made as it is negative weightage on the CBR decision. PNL agent will update PnL spreadsheet only if there are transactions.

If Kelly Criterion is positive and it is a buy signal, the highlighted portion below is what will be printed out In the program. As the broker agent starts, it will receive a message noting that we should trust the Decider model and it will begin to allocate funds based on how much USD is remaining. After a buy order is placed, one of three following situations can happen:

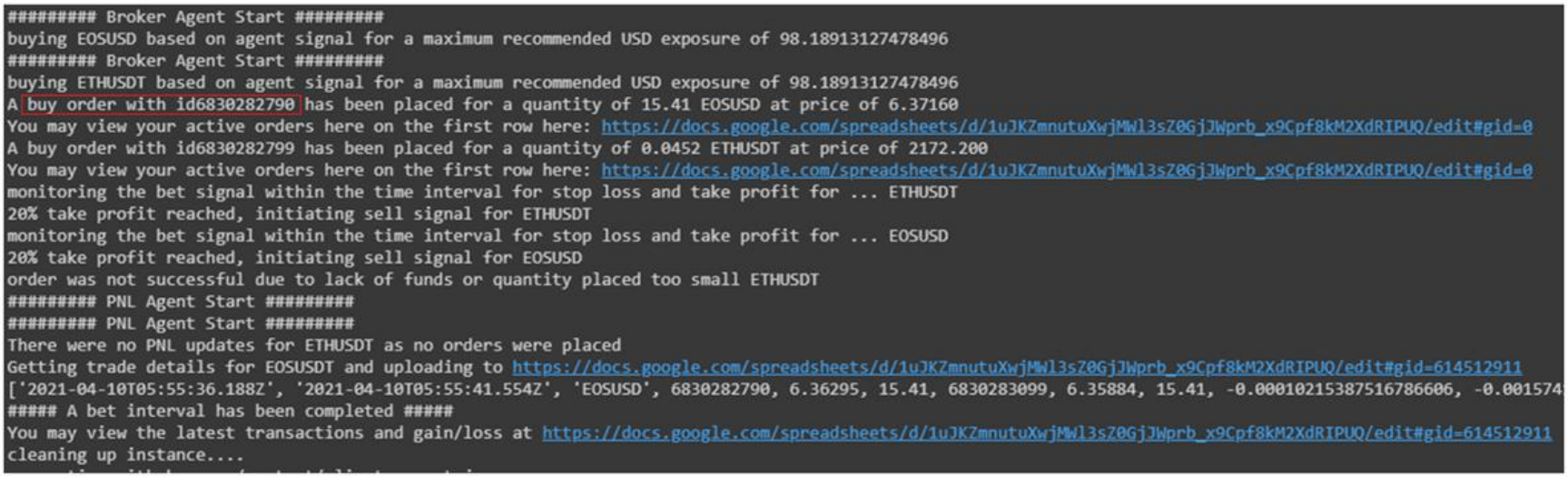
1. Take profit
2. Stop loss
3. Sell off at the end (Sell off will occur if no take profit or stop loss)



In all the three situations mentioned, the order can be unsuccessful as shown in the highlighted portion below as it can be due to either of the following reasons

- Not enough funds
- Quantity order to place based on Kelly criterion or funds is too small to be accepted by the market

In the event, there is a 20% take profit or 20% stop loss, this message will appear.



The buy ID in the red box for EOSUSDT that was immediately market sold due to the take profit with the sell ID in green box was updated in the PnL excel sheet , the PnL will then compute the relevant profit or loss percentages.

Buy Order Start	Sell Order End	Symbol	Buy Trade ID	Buy Price	Buy Quantity	Sell Trade ID	Sell Price	Sell Quantity	Theoretical PNL (%)	Theoretical PNL (USD)	Actual PNL (%)	Actual PNL (USD)	Ending Balance (USD)	Rate of Return %	P.A Return %
-04-10T05:54:14	-04-10T05:54:19	EOSUSD	6830277243	6.36718	14.66	6830277366	6.35873	30.11	-0.00101771899	-0.0149197604	-0.00132711812	-0.03995952682	1869.507401	-0.06524629939	-1
2021-04-10T05:	2021-04-10T05:	EOSUSD	6830282790	6.36295	15.41	6830283099	6.35884	15.41	-0.00010215387	-0.00157419121	-0.00064592681	-0.00995373215	1862.793368	-0.06860331612	-1

However, the 20% take profit or 20% stop loss can also fail due to lack of liquidity and will eventually be cancelled as shown in the highlighted portion in the “Orders” sheet below. All orders that are unfulfilled will be cancelled at the end of each interval to prevent unnecessary risk of holding onto assets as shown in the highlighted row below.

	A	B	C	D	E	
	id	clientOrderId	symbol	side	status	t
	6830314651	07879bf6a62a1e	EOSUSD	buy	new	li
	6830314621	925d7bc6c0039l	ETHUSDT	buy	new	li
	6830301968	9d4b4f234ba5fe	ETHUSDT	buy	filled	li
	6830302294	12e152cc753c6	EOSUSD	sell	filled	r
	6830301958	4075621a6e588	EOSUSD	buy	filled	li
	6830288292	ad6d7801700f72	ETHUSDT	buy	canceled	li
	6830288827	76663e8178cab	EOSUSD	sell	filled	r
	6830288293	2151d1f0141b4c	EOSUSD	buy	filled	li
	6830282799	e293c8eb60447	ETHUSDT	buy	canceled	li

As mentioned earlier, the broker agent will conclude the trade by squaring off with a market order to prevent unnecessary risk of holding onto the asset if both take profit and stop loss are not triggered within the time interval. This messaged displayed shows the ETH buy in red box and EOS buy ID in green box.

```
######### Broker Agent Start #########
buying ETHUSDT based on agent signal for a maximum recommended USD exposure of 97.85741568064431
######### Broker Agent Start #########
buying EOSUSD based on agent signal for a maximum recommended USD exposure of 97.85741568064431
A buy order with id6830370597 has been placed for a quantity of 0.0449 ETHUSDT at price of 2179.200
You may view your active orders here on the first row here: https://docs.google.com/spreadsheets/d/1uJKZmnutuXwjMWl3sZ0GjJWprb_x9Cpf8kM2XdRIPUQ/edit#gid=0
A buy order with id6830370723 has been placed for a quantity of 15.33 EOSUSD at price of 6.38010
You may view your active orders here on the first row here: https://docs.google.com/spreadsheets/d/1uJKZmnutuXwjMWl3sZ0GjJWprb_x9Cpf8kM2XdRIPUQ/edit#gid=0
monitoring the bet signal within the time interval for stop loss and take profit for ... ETHUSDT
monitoring the bet signal within the time interval for stop loss and take profit for ... EOSUSD
monitoring the bet signal within the time interval for stop loss and take profit for ... ETHUSDT
monitoring the bet signal within the time interval for stop loss and take profit for ... EOSUSD
```

```
monitoring the bet signal within the time interval for stop loss and take profit for ... ETHUSDT
monitoring the bet signal within the time interval for stop loss and take profit for ... EOSUSD
monitoring the bet signal within the time interval for stop loss and take profit for ... ETHUSDT
a market sale order has been put to square off the bet for EOSUSD
a market sale order has been put to square off the bet for ETHUSDT
######### PNL Agent Start #########
```

The PnL sheet will also be updated with the buy IDs and the respective squaring off sell IDs, the relevant profit and loss will be computed by the PNL agent.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Buy Order Start	Sell Order End	Symbol	Buy Trade ID	Buy Price	Buy Quantity	Sell Trade ID	Sell Price	Sell Quantity	Theoretical PNL (%)	Theoretical PNL (USD)	Actual PNL (%)	Actual PNL (USD)	Ending Balance (USD)	Rate of Return %	P.A Return %
-04-10T05:54:14.	-04-10T05:54:19	EOSUSD	6830277243	6.36718	14.66	6830277366	6.35873	30.11	-0.00101771899	-0.0149197604	-0.001327118128	-0.03995952682	1869.507401	-0.06524629939	-1
2021-04-10T05:!	2021-04-10T05:!	EOSUSD	6830282790	6.36295	15.41	6830283099	6.35884	15.41	-0.00010215387	-0.00157419121	-0.00064592681	-0.00995373215	1862.793368	-0.06860331612	-1
2021-04-10T05:!	2021-04-10T05:!	EOSUSD	6830288293	6.36172	15.39	6830288827	6.35753	15.39	-0.00052187144	-0.00803160151	-0.00065862691	-0.01013626818	1861.12355	-0.06943822523	-1
2021-04-10T05:!	2021-04-10T05:!	EOSUSD	6830301958	6.35905	15.38	6830302294	6.35489	15.38	0.000353826436	0.00544185059	-0.00065418576	-0.01006137709	1957.960728	-0.02101963577	-0.9995709548
2021-04-10T06:!	2021-04-10T06:	EOSUSD	6830370723	6.37175	15.33	6830373135	6.36791	15.33	0.000023541413	0.000360889865	-0.00060266017	-0.00923878055	1953.448588	-0.02327570585	-0.9998151683
2021-04-10T06:!	2021-04-10T06:	ETHUSDT	6830370597	2177.007	0.0449	6830373148	2177.046	0.0449	0.001393197174	0.000062554553	0.000017914503	0.000000804361	1953.448588	-0.02327570585	-0.9998151683

Data that is used, whether you brought in external data such as actual social media etc.

Data are collected from 1st Mar 2021 to 31st Mar 2021 for training the model. In addition to the prices pulled from bitfinance, we also pulled data from twitter, online and news articles for Commodities and Twitter Agents.

For Commodities Agent, we research on news and online articles on suggestions which commodities and stocks that have good correlations with Cryptocurrencies and found out that the following is good:

- **Soybean Futures**
- **Sugar**
- **S&P500**
- **QQQ ETF**
- **Vaneck Semiconductor ETF**
- **Dow Jones Industrial**
- **MicroStrategy Incorporated (bitcoin orientated company)**
- **Riot Blockchain Inc**
- **Paypal**
- **Master**
- **TSLA**
- **Chicago Mercantile Exchange**
- **Square**
- **IBm**
- **Amazon**

```
'ETH-USD','EOS-USD','ZS=F', 'SB=F',  'SPY', 'QQQ', 'SMH', '^DJI', 'MSTR',
'RIOT',  'PYPL', 'MA', 'TSLA', 'CME', 'SQ', 'IBM', 'AMZN'
```

To train the model, data have been collected at 5 minutes interval for 31 days resulting in 44,640 datasets for ETH and EOS each.

Based on their direction of percentage price change in the past 5 minutes closed, we predict what is the direction of percentage price change of ETH and EOS in the next 5 minutes. We use Machine Learning Decision Tree Classifier to get an output of a BUY/SELL signal for ETH/EOS. The output is a one-hot state of 1 mapping to a positive direction and -1 mapping to a negative direction. However this presents inaccuracy. So we changed the classifier to a regressor to get values between -1 and 1. This allows the KNN CBR to obtain a range of inputs from Commodity

Agent for training. We managed to achieve more than 50% accuracy using such a Machine Learning Model.

For Twitter Agent, sentiment analysis of tweet texts is performed based on targeted search using Twitter API and Natural Language Processing. It searches on Twitter for text that contains the name of cryptocurrency with hashtag (e.g. #ETH/USDT) and any of these 16 words below:

1. profit
2. recommendation
3. lose
4. gain
5. lost
6. short
7. long
8. hold
9. hodl
10. trade
11. buy
12. sell
13. loss
14. price
15. climb
16. drop

Then it obtains the recent 100 tweets specified in the search along with their timestamps. Below are samples used to search in Twitter for EOS and ETH cryptocurrencies.

(#eosusdt OR #eos) (profit OR recommendation OR lose OR gain OR lost OR short OR long OR hold OR hodl OR trade OR buy OR sell OR loss OR price OR climb OR drop)

(#ethusdt OR #eth OR #ethereum) (profit OR recommendation OR lose OR gain OR lost OR short OR long OR hold OR hodl OR trade OR buy OR sell OR loss OR price OR climb OR drop)

For the training of the model, 2098 tweet texts were collected for EOS while 71,370 tweet texts were collected for ETH. Selenium was used to collect the data instead of the Twitter API due to the limitation of the Twitter API not being able to return more than 3200 tweet texts for a search.

It was found that sentiment analysis performed on preprocessed tweet texts yield different results from the ones without pre-processing. Therefore, it is necessary to preprocess the tweet text by cleaning up the unnecessary data so that we can have cleaner and standardized data for sentiment analysis.

The data is cleaned up by:

- Convert characters in tweet text to lower case
- Remove any strings starting with a "@"
- Remove any strings starting with a "#"
- Remove any strings starting with a "$"
- Remove the "\n" string
- Remove any hyperlinks
- Remove url/website that didn't use http, is only checking for .com websites, so words that are seperated by a . are not removed
- Remove {link}
- Remove &text; html chars
- Remove [video]
- Remove all remaining characters that aren't letters, white space, or the following #:)(/\='] that are used in emojis or hashtags

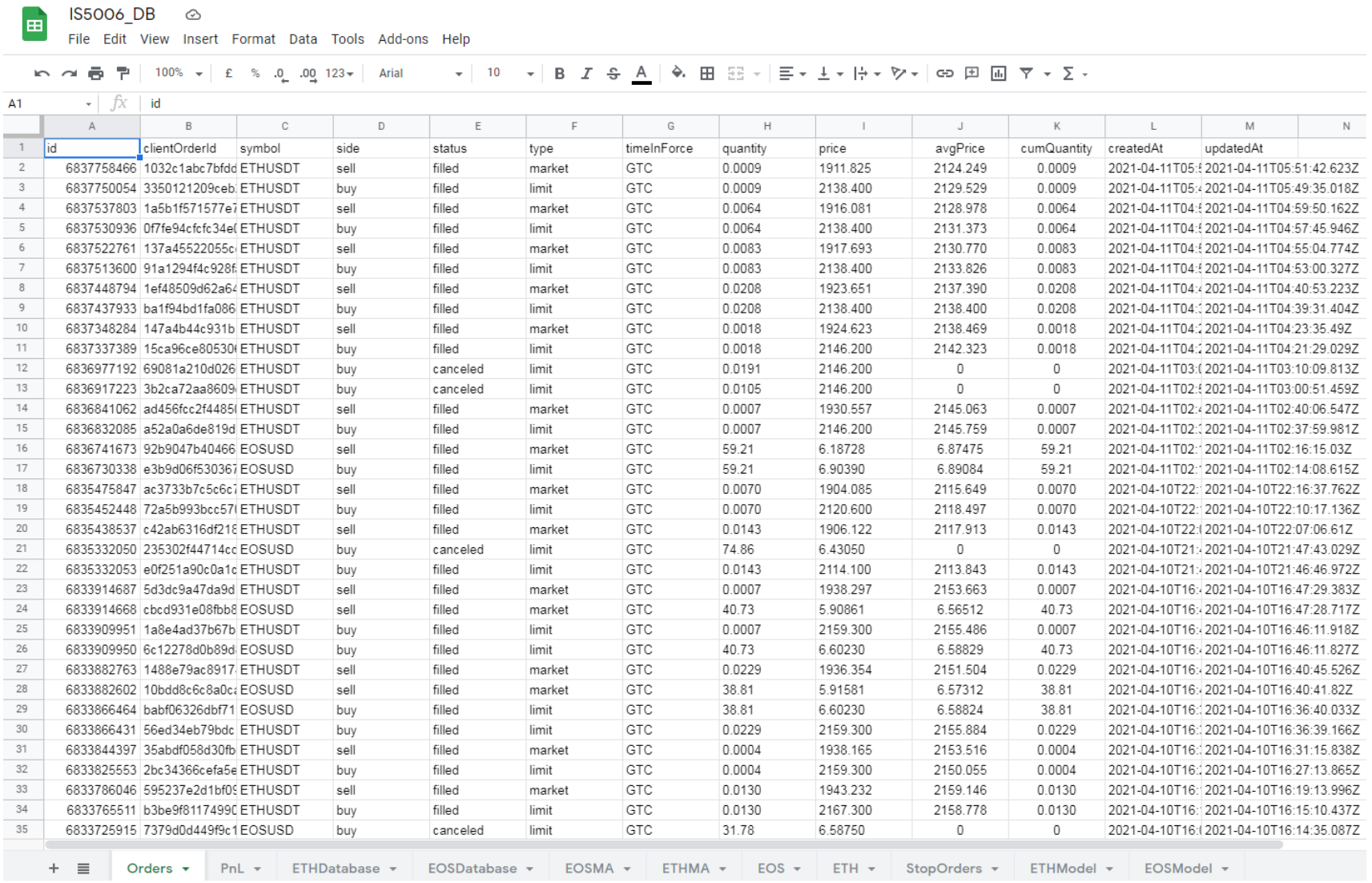
After cleaning up the data, sentiment analysis is performed on the cleaned tweet text. Sentiment analysis is the process of determining the attitude or the emotion of the writer, i.e., whether it is neutral or positive or negative. The sentiment function of textblob returns two properties which are polarity, and subjectivity. Polarity value is a float which lies in the range of [-1,1] where 1 means positive statement and -1 means a negative statement. Subjectivity is also a float value which lies in the range of [0,1]. Subjective sentences generally refer to personal opinion, emotion or judgment whereas objective refers to factual information.

With the polarity and subjectivity scores for each of the tweets, the TwitterAgent select the tweets based on a specific timeframe (e.g. 30 seconds before the TwitterAgent is called) to find the average polarity and subjectivity scores. The average polarity and subjectivity scores are then provided as input to the KNN CBR as shown below.

```
At time 2021-04-07 09:45:56.751444
For ETH/USDT
Number of tweets 11 Average Polarity Score 0.04772727272727273 Average Subjectivity Score 0.06742424242424243
For EOS/USDT
Number of tweets 0 Average Polarity Score 0 Average Subjectivity Score 0
At time 2021-04-07 09:51:03.011591
For ETH/USDT
Number of tweets 7 Average Polarity Score -0.008387445887445886 Average Subjectivity Score 0.1982142857142857
For EOS/USDT
Number of tweets 0 Average Polarity Score 0 Average Subjectivity Score 0
At time 2021-04-07 09:56:08.855796
For ETH/USDT
Number of tweets 6 Average Polarity Score 0.07777777777777777 Average Subjectivity Score 0.1152777777777778
For EOS/USDT
Number of tweets 0 Average Polarity Score 0 Average Subjectivity Score 0
```

Appendix 1

If the link is active, you will be redirected to see this page even if you are not logged in on your Gmail account.



IS5006_DB

File Edit View Insert Format Data Tools Add-ons Help

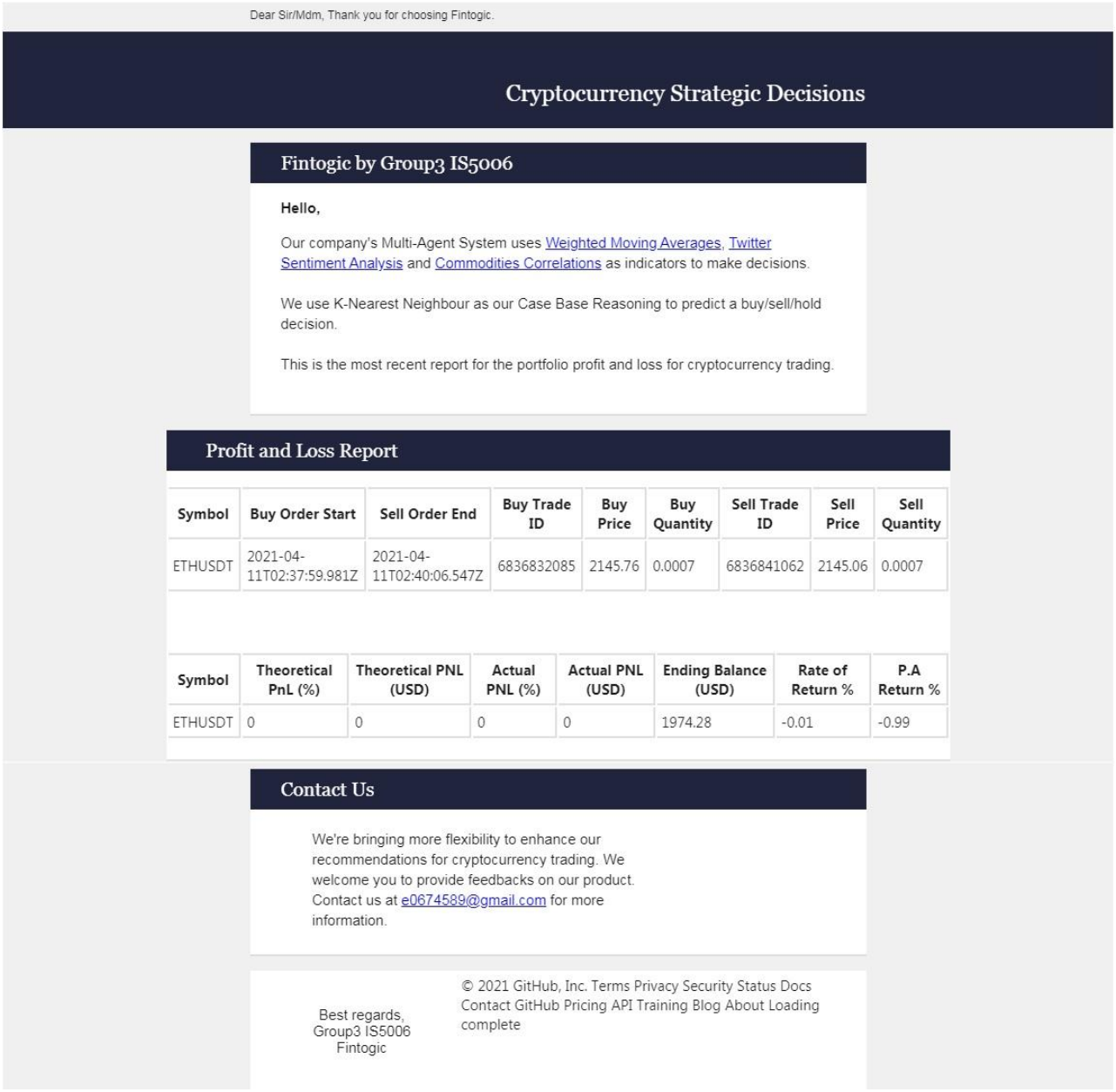
A1 | id

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	id	clientOrderId	symbol	side	status	type	timeInForce	quantity	price	avgPrice	cumQuantity	createdAt	updatedAt	
2	6837758466	1032c1abc7bfdd	ETHUSDT	sell	filled	market	GTC	0.0009	1911.825	2124.249	0.0009	2021-04-11T05:	2021-04-11T05:51:42.623Z	
3	6837750054	3350121209ceb	ETHUSDT	buy	filled	limit	GTC	0.0009	2138.400	2129.529	0.0009	2021-04-11T05:	2021-04-11T05:49:35.018Z	
4	6837537803	1a5b1f571577e7	ETHUSDT	sell	filled	market	GTC	0.0064	1916.081	2128.978	0.0064	2021-04-11T04:	2021-04-11T04:59:50.162Z	
5	6837530936	0f7fe94cfcfc34e(	ETHUSDT	buy	filled	limit	GTC	0.0064	2138.400	2131.373	0.0064	2021-04-11T04:	2021-04-11T04:57:45.946Z	
6	6837522761	137a45522055c	ETHUSDT	sell	filled	market	GTC	0.0083	1917.693	2130.770	0.0083	2021-04-11T04:	2021-04-11T04:55:04.774Z	
7	6837513600	91a1294f4c928f	ETHUSDT	buy	filled	limit	GTC	0.0083	2138.400	2133.826	0.0083	2021-04-11T04:	2021-04-11T04:53:00.327Z	
8	6837448794	1ef48509d62a64	ETHUSDT	sell	filled	market	GTC	0.0208	1923.651	2137.390	0.0208	2021-04-11T04:	2021-04-11T04:40:53.223Z	
9	6837437933	ba1f94bd1fa086	ETHUSDT	buy	filled	limit	GTC	0.0208	2138.400	2138.400	0.0208	2021-04-11T04:	2021-04-11T04:39:31.404Z	
10	6837348284	147a4b44c931b	ETHUSDT	sell	filled	market	GTC	0.0018	1924.623	2138.469	0.0018	2021-04-11T04:	2021-04-11T04:23:35.49Z	
11	6837337389	15ca96ce80530(	ETHUSDT	buy	filled	limit	GTC	0.0018	2146.200	2142.323	0.0018	2021-04-11T04:	2021-04-11T04:21:29.029Z	
12	6836977192	69081a210d026	ETHUSDT	buy	canceled	limit	GTC	0.0191	2146.200	0	0	2021-04-11T03:	2021-04-11T03:10:09.813Z	
13	6836917223	3b2ca72aa8609(	ETHUSDT	buy	canceled	limit	GTC	0.0105	2146.200	0	0	2021-04-11T02:	2021-04-11T03:00:51.459Z	
14	6836841062	ad456fcc2f4485(	ETHUSDT	sell	filled	market	GTC	0.0007	1930.557	2145.063	0.0007	2021-04-11T02:	2021-04-11T02:40:06.547Z	
15	6836832085	a52a0a6de819d	ETHUSDT	buy	filled	limit	GTC	0.0007	2146.200	2145.759	0.0007	2021-04-11T02:	2021-04-11T02:37:59.981Z	
16	6836741673	92b9047b40466	EOSUSD	sell	filled	market	GTC	59.21	6.18728	6.87475	59.21	2021-04-11T02:	2021-04-11T02:16:15.03Z	
17	6836730338	e3b9d06f530367	EOSUSD	buy	filled	limit	GTC	59.21	6.90390	6.89084	59.21	2021-04-11T02:	2021-04-11T02:14:08.615Z	
18	6835475847	ac3733b7c5c6c7	ETHUSDT	sell	filled	market	GTC	0.0070	1904.085	2115.649	0.0070	2021-04-10T22:	2021-04-10T22:16:37.762Z	
19	6835452448	72a5b993bcc57(	ETHUSDT	buy	filled	limit	GTC	0.0070	2120.600	2118.497	0.0070	2021-04-10T22:	2021-04-10T22:10:17.136Z	
20	6835438537	c42ab6316df218	ETHUSDT	sell	filled	market	GTC	0.0143	1906.122	2117.913	0.0143	2021-04-10T22:	2021-04-10T22:07:06.61Z	
21	6835332050	235302f44714cc	EOSUSD	buy	canceled	limit	GTC	74.86	6.43050	0	0	2021-04-10T21:	2021-04-10T21:47:43.029Z	
22	6835332053	e0f251a90c0a1c	ETHUSDT	buy	filled	limit	GTC	0.0143	2114.100	2113.843	0.0143	2021-04-10T21:	2021-04-10T21:46:46.972Z	
23	6833914687	5d3dc9a47da9d	ETHUSDT	sell	filled	market	GTC	0.0007	1938.297	2153.663	0.0007	2021-04-10T16:	2021-04-10T16:47:29.383Z	
24	6833914668	cbcd931e08fbb8	EOSUSD	sell	filled	market	GTC	40.73	5.90861	6.56512	40.73	2021-04-10T16:	2021-04-10T16:47:28.717Z	
25	6833909951	1a8e4ad37b67b	ETHUSDT	buy	filled	limit	GTC	0.0007	2159.300	2155.486	0.0007	2021-04-10T16:	2021-04-10T16:46:11.918Z	
26	6833909950	6c12278d0b89d	EOSUSD	buy	filled	limit	GTC	40.73	6.60230	6.58829	40.73	2021-04-10T16:	2021-04-10T16:46:11.827Z	
27	6833882763	1488e79ac8917	ETHUSDT	sell	filled	market	GTC	0.0229	1936.354	2151.504	0.0229	2021-04-10T16:	2021-04-10T16:40:45.526Z	
28	6833882602	10bdd8c6c8a0c	EOSUSD	sell	filled	market	GTC	38.81	5.91581	6.57312	38.81	2021-04-10T16:	2021-04-10T16:40:41.82Z	
29	6833866464	babf06326dbf71	EOSUSD	buy	filled	limit	GTC	38.81	6.60230	6.58824	38.81	2021-04-10T16:	2021-04-10T16:36:40.033Z	
30	6833866431	56ed34eb79bdc	ETHUSDT	buy	filled	limit	GTC	0.0229	2159.300	2155.884	0.0229	2021-04-10T16:	2021-04-10T16:36:39.166Z	
31	6833844397	35abdf058d30fb	ETHUSDT	sell	filled	market	GTC	0.0004	1938.165	2153.516	0.0004	2021-04-10T16:	2021-04-10T16:31:15.838Z	
32	6833825553	2bc34366cefa5e	ETHUSDT	buy	filled	limit	GTC	0.0004	2159.300	2150.055	0.0004	2021-04-10T16:	2021-04-10T16:27:13.865Z	
33	6833786046	595237e2d1bf0(	ETHUSDT	sell	filled	market	GTC	0.0130	1943.232	2159.146	0.0130	2021-04-10T16:	2021-04-10T16:19:13.996Z	
34	6833765511	b3be9f8117499(	ETHUSDT	buy	filled	limit	GTC	0.0130	2167.300	2158.778	0.0130	2021-04-10T16:	2021-04-10T16:15:10.437Z	
35	6833725915	7379d0d449f9c1	EOSUSD	buy	canceled	limit	GTC	31.78	6.58750	0	0	2021-04-10T16:	2021-04-10T16:14:35.087Z	

Orders | PnL | ETHDatabase | EOSDatabase | EOSMA | ETHMA | EOS | ETH | StopOrders | ETHModel | EOSModel

Appendix 2

Automated email sent by ZAPIER to CEO.



Dear Sir/Mdm, Thank you for choosing Fintogic.

Cryptocurrency Strategic Decisions

Fintogic by Group3 IS5006

Hello,

Our company's Multi-Agent System uses Weighted Moving Averages, Twitter Sentiment Analysis and Commodities Correlations as indicators to make decisions.

We use K-Nearest Neighbour as our Case Base Reasoning to predict a buy/sell/hold decision.

This is the most recent report for the portfolio profit and loss for cryptocurrency trading.

Profit and Loss Report

Symbol	Buy Order Start	Sell Order End	Buy Trade ID	Buy Price	Buy Quantity	Sell Trade ID	Sell Price	Sell Quantity
ETHUSDT	2021-04-11T02:37:59.981Z	2021-04-11T02:40:06.547Z	6836832085	2145.76	0.0007	6836841062	2145.06	0.0007

Symbol	Theoretical PnL (%)	Theoretical PNL (USD)	Actual PNL (%)	Actual PNL (USD)	Ending Balance (USD)	Rate of Return %	P.A Return %
ETHUSDT	0	0	0	0	1974.28	-0.01	-0.99

Contact Us

We're bringing more flexibility to enhance our recommendations for cryptocurrency trading. We welcome you to provide feedbacks on our product. Contact us at e0674589@gmail.com for more information.

Best regards,
Group3 IS5006
Fintogic

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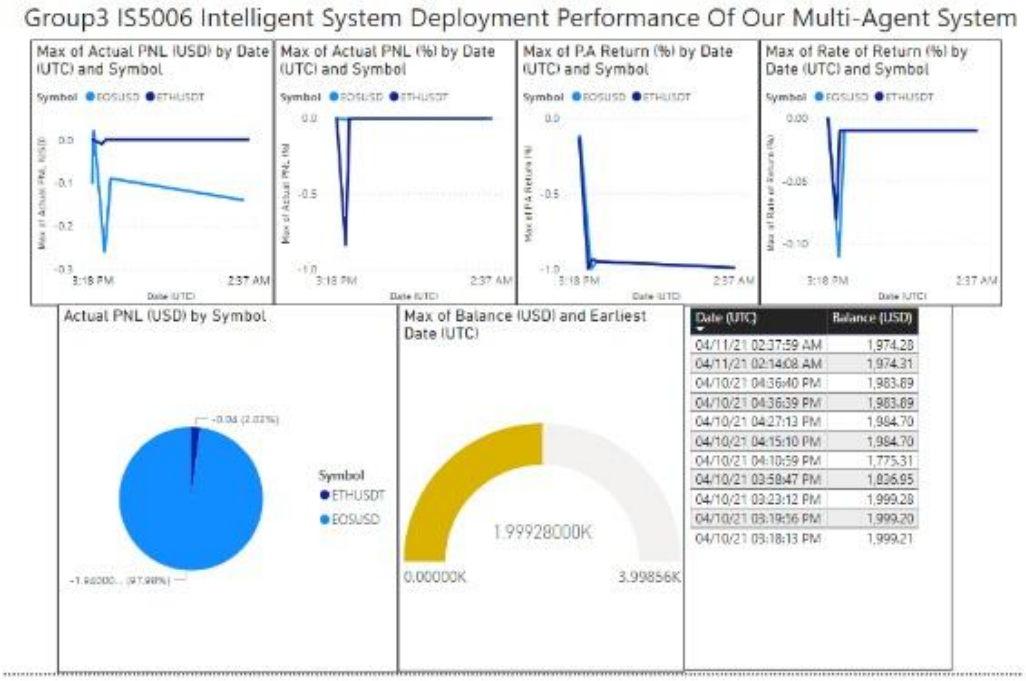
Appendix 3

PowerBI email sent by data visualization team to CEO by request.

Dear Sir/Mdm,

Please get the latest report for our Multi-Agent System Portfolio Performance generated using PowerBI:



Thank you.

Best regards,
Data Visualization Team
Group3 IS5006