Alpa Sheladia

Will Turner

Arbetrade

Algorethmic Trading Platform

Machine Learning Models To Predict Future Stock Movement

Algorithmic Trading

Objective:

- Using NLP / Logistic Regression to Predict Future Stock Movement
- Program that allows a user to choose a stock from the S&P 500 or VIX to run a logistic regression model to predict the price movement of particular stock's on the future trade based on current sentiments of Reuters news articles related to that organization.
- This platform performs data training using various models to provide best analysis to help traders decide whether to buy or sell the stock or simply just hold on for now.

News API

.PHP

YAHOO! FINANCE

Bloomberg

Google Finance

FRED 25 YEARS

ECONOMIC DATA | SINCE 1991

iex cloud

REUTERS

Data Collections

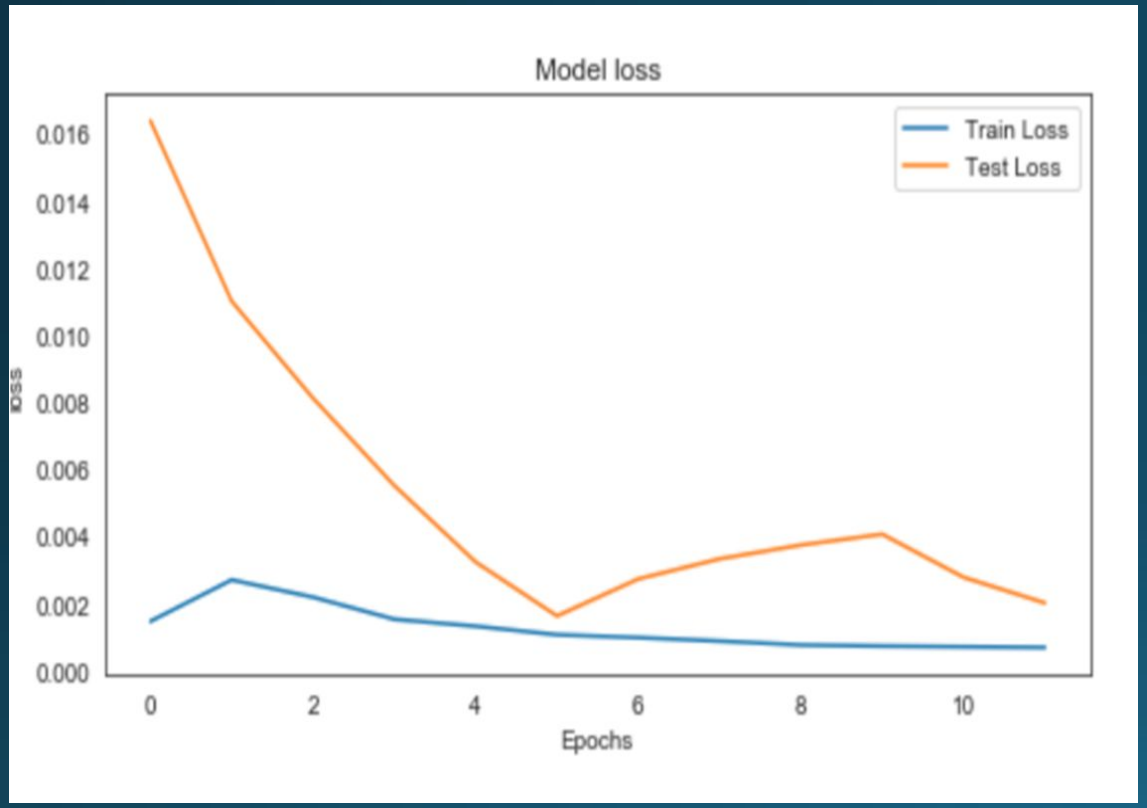
VIX (Chicago Board Options Exchange) , SPY S&P500 (The SPDR S&P 500 Trust ETF), news Articles from NewsAPI, and Tweets from twitter API

News events and social media comments
Positive reactions
Negative reactions
Client Sentiment increases
Client Sentiment decreases
Shares are overbought
Shares are oversold
Price of shares fall
Price of shares rise

Multi Model Utilization for Time Series Prediction (SPY & VIX)

- Load Data.
- Define Keras Model.
- Compile Keras Model.
- Fit Keras Model.
- Evaluate Keras Model.
- Tie It All Together.
- Make Predictions
- Tune the Model
- Save the Model
- Summarize the Model
- Separate Train and Test Datasets
- Plot Learning Curves
- Learn a New Dataset
- Use Functional API

Overfitting/Underfitting Goldilocks Model



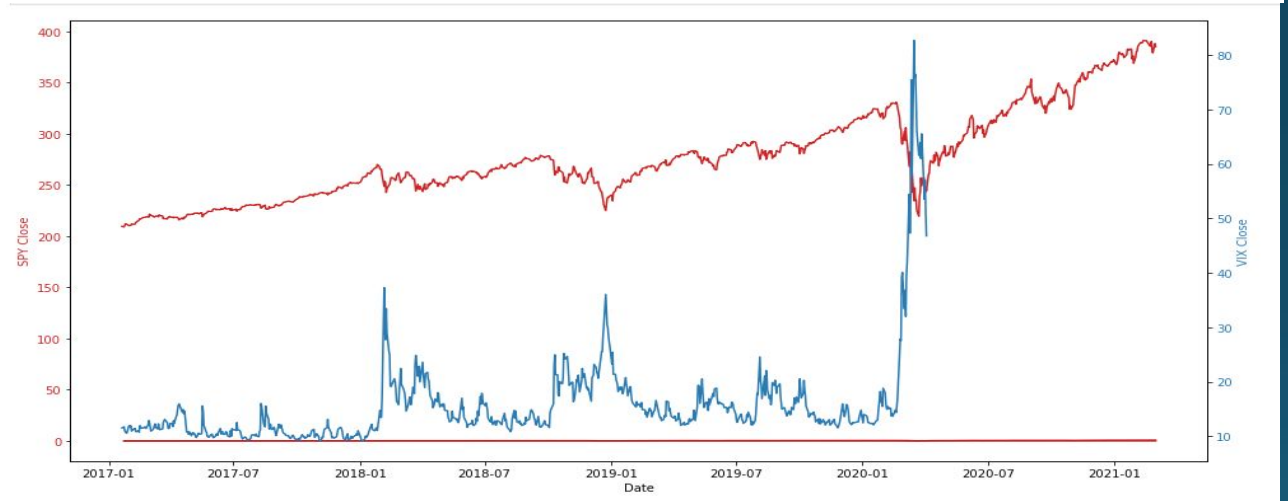
	SPY Close
SPY Close	1.000000
Daily Returns	0.016913
Cumulative Returns	1.000000
VIX Close	0.020031
SPX 1M 25DP Vol BVOL INDEX	0.055138
SPX 1M 25DC Vol BVOL INDEX	0.042125
SPX 1M 100 Vol BVOL INDEX	0.054247
P/C Ratio	0.095845
P/C Spread	0.078251
P/ATM Ratio	0.032382
P/ATM Spread	0.053968
ATM/C Ratio	0.119789
ATM/C Spread	0.095295
FICC_Spread	-0.417186
TEDSPREAD	-0.009074
Gold_Close	0.617284
Delta_10Y2Y	-0.892567
10Y_Yield	0.016433
Delta_10Y3M	-0.906892

SPY and VIX Data Visualization

```
[11]: # Combine SPY & VIX Dataframes
all_data = pd.concat([spy_data, vix_data],axis="columns", join="inner")
all_data.head()
```

[11]:

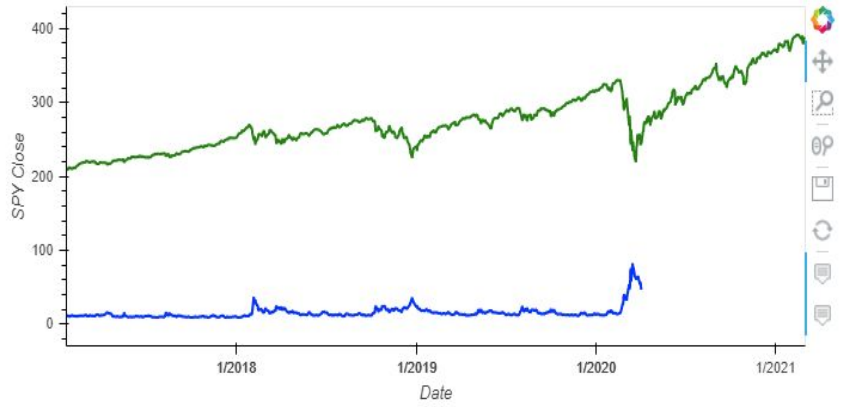
Date	SPY Close	Daily Returns	Cumulative Returns	VIX Close
2017-01-20	212.961365	NaN	NaN	11.54
2017-01-23	212.407181	-0.002602	-0.002602	11.77
2017-01-24	213.769119	0.006412	0.003793	11.07
2017-01-25	215.619400	0.008656	0.012481	10.81
2017-01-26	215.394012	-0.001045	0.011423	10.63



Overlay Chart of SPY and VIX

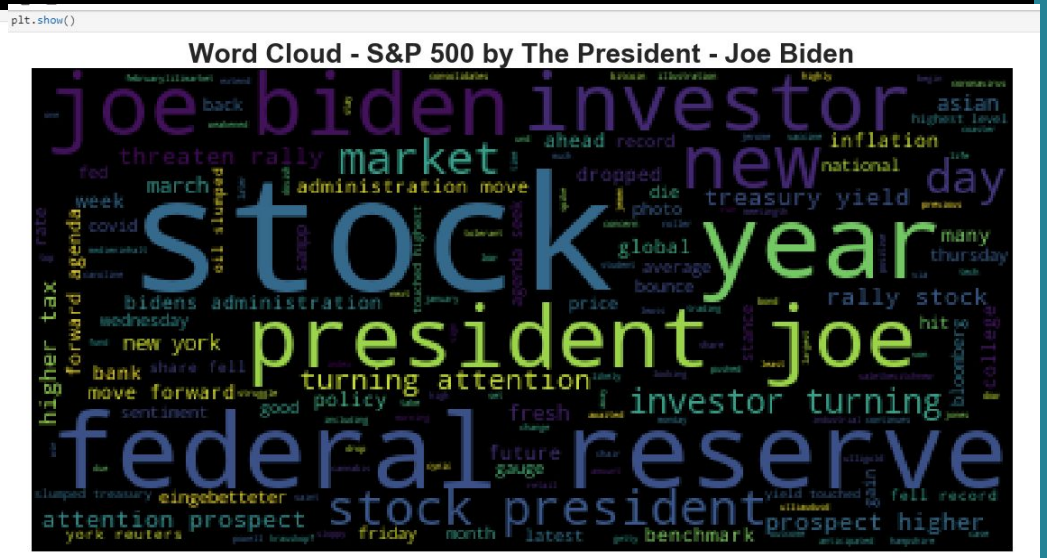
Date	SPY Close	Daily Returns	Cumulative Returns	VIX Close
2017-01-20	209.600113	NaN	NaN	11.54
2017-01-23	209.054703	-0.002602	-0.002602	11.77
2017-01-24	210.395096	0.006412	0.003793	11.07
2017-01-25	212.216156	0.008655	0.012481	10.81
2017-01-26	211.994339	-0.001045	0.011423	10.63

```
spy_data.hvplot.line(x='Date', y='SPY Close',
                     line_color="green") * vix_data.hvplot.line(
                    x='Date', y='VIX Close', line_color="blue")
```



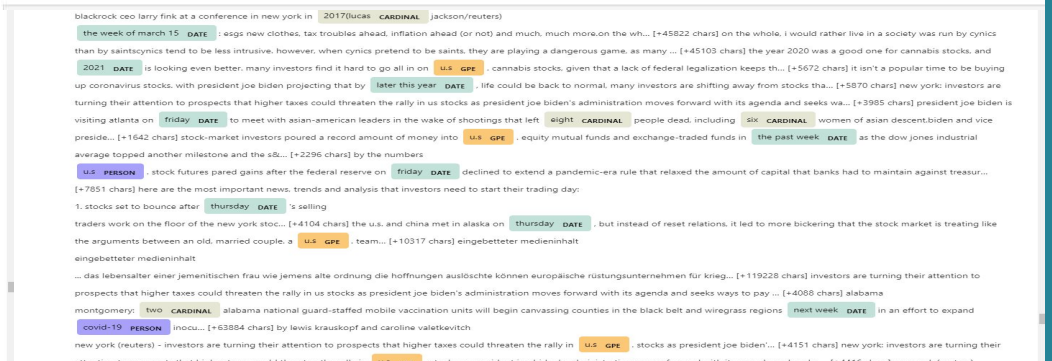
Closing data of SPY vs. VIX

Sentiment Analysis



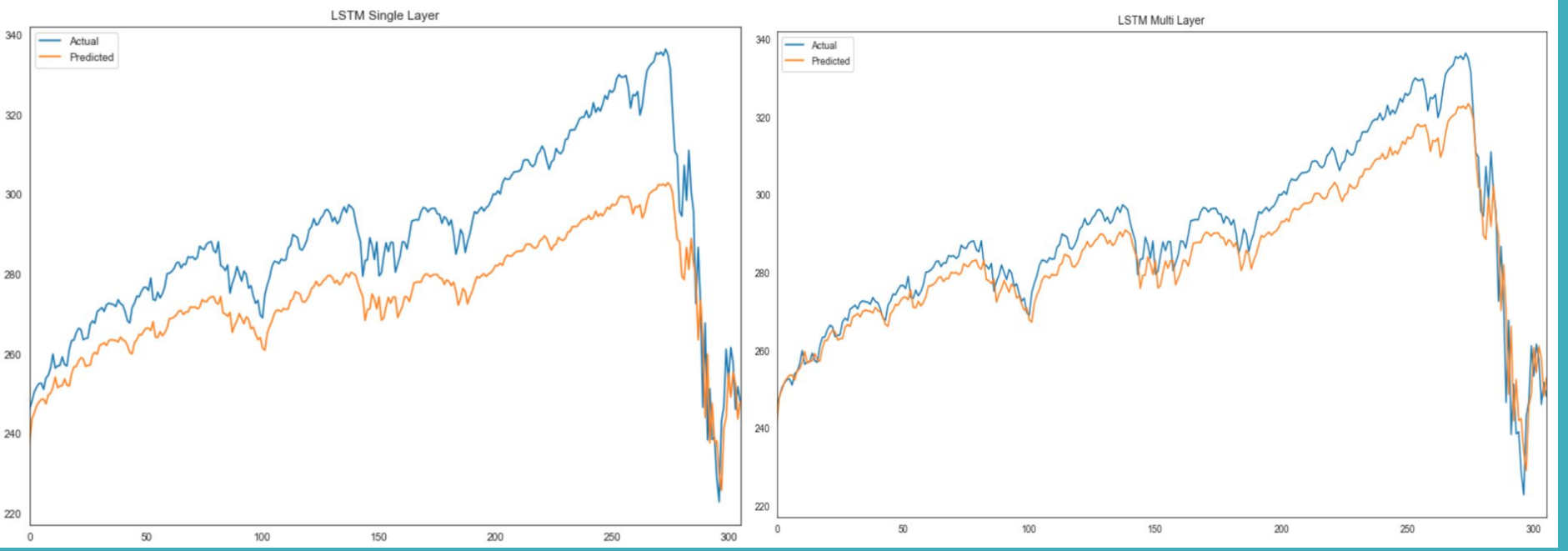
SP500 Compound	SP500 Negative	SP500 Neutral	SP500 Positive
0.296	0.0	0.954	0.046
0.250	0.0	0.953	0.047
0.296	0.0	0.942	0.058
0.296	0.0	0.947	0.053
0.000	0.0	1.000	0.000

	Date	Biden Compound	Biden Negative	Biden Neutral	Biden Positive	Biden Text	Biden Tokens
0	2021-03-20 13:21:46	-0.4588	0.081	0.919	0.000	blackrock ceo larry fink at a conference in ne...	[blackrock, ceo, larry, fink, conference, new,...
1	2021-03-20 13:21:46	-0.5106	0.178	0.777	0.045	on the whole, i would rather live in a society...	[whole, would, rather, live, society, run, cyn...
2	2021-03-20 12:45:00	0.4767	0.085	0.782	0.133	the year 2020 was a good one for cannabis stoc...	[year, good, one, cannabis, stock, looking, ev...
3	2021-03-20 10:45:00	-0.3252	0.062	0.938	0.000	it isn't a popular time to be buying up corona...	[isnt, popular, time, buying, coronavirus, sto...
4	2021-03-20 05:40:11	-0.1027	0.071	0.870	0.060	new york: investors are turning their attentio...	[new, york, investor, turning, attention, pros...

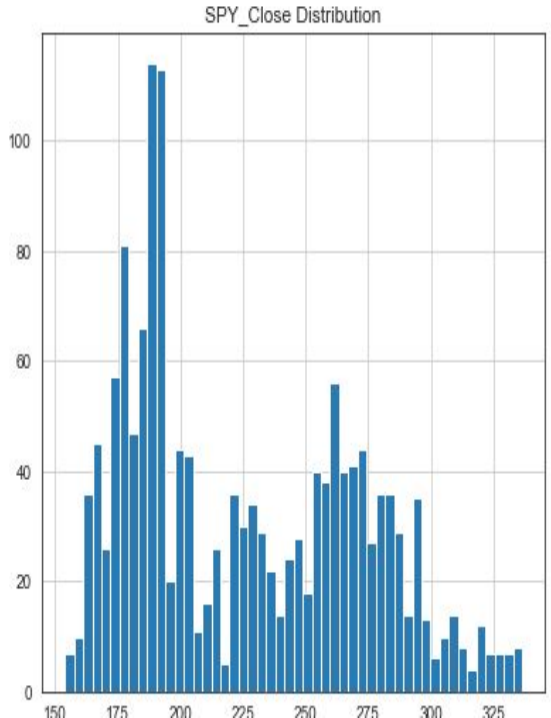


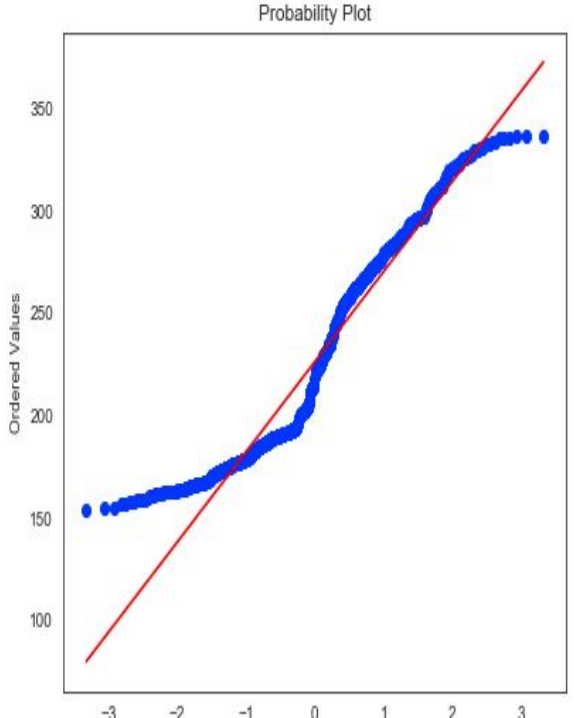
Word Cloud S&P 500

Word Cloud President Joe Biden



Single Layer – LTSM





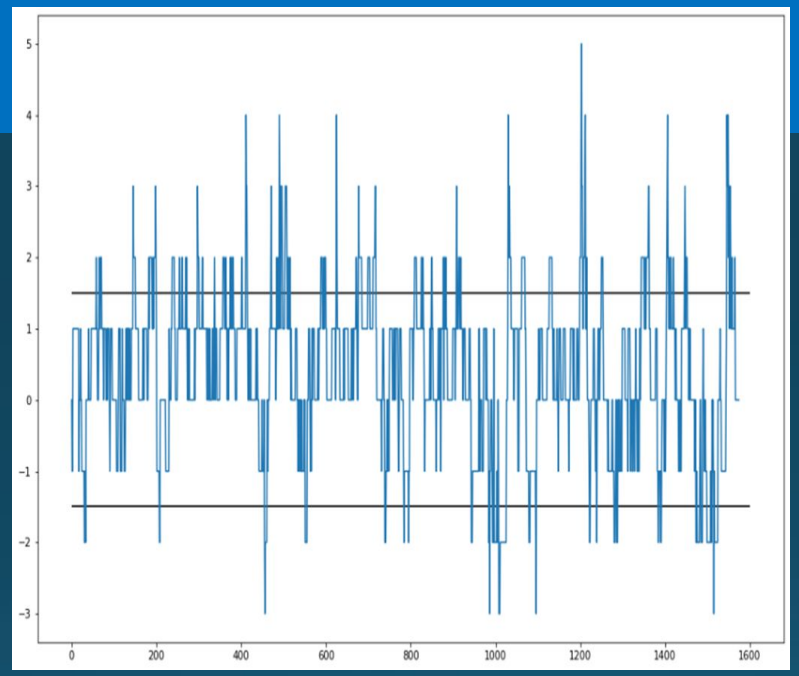
	Actual	Predicted
0	186.141541	189.222046
1	186.802124	188.892502
2	188.449036	189.217590
3	186.177689	190.028595
4	185.752426	188.910294

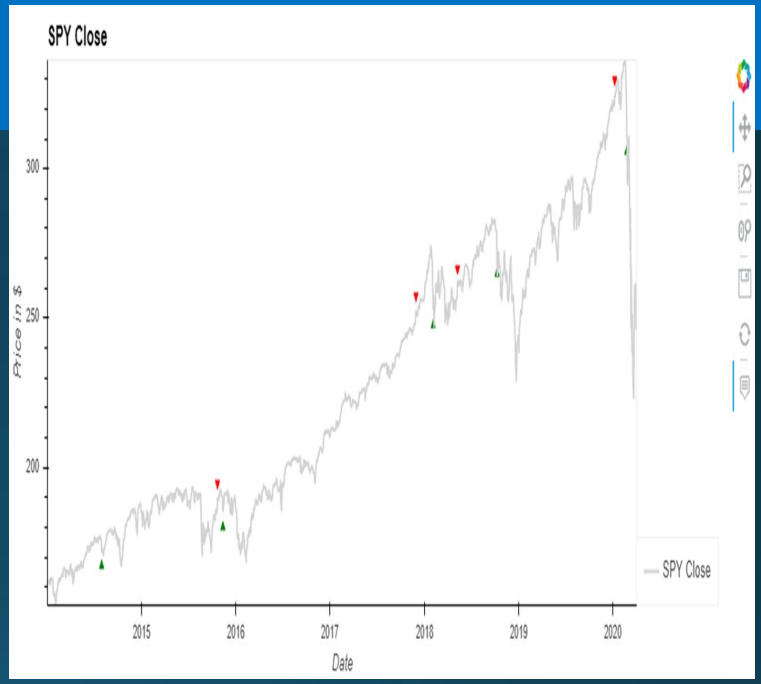
Multi- Layer - LTSM

Trading Signals as Input Data

	RSI Signal	bollinger_signal	MACD Signal	SMA Signal	CCI Signal
0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	-1.0	0.0	0.0
2	0.0	0.0	-1.0	0.0	0.0
3	0.0	0.0	1.0	0.0	0.0
4	0.0	0.0	1.0	0.0	0.0
...	...	...	...	...	...
1570	0.0	0.0	-1.0	1.0	0.0
1571	0.0	0.0	-1.0	1.0	0.0
1572	0.0	0.0	-1.0	1.0	0.0
1573	0.0	0.0	-1.0	1.0	0.0
1574	0.0	0.0	-1.0	1.0	0.0

1575 rows × 5 columns



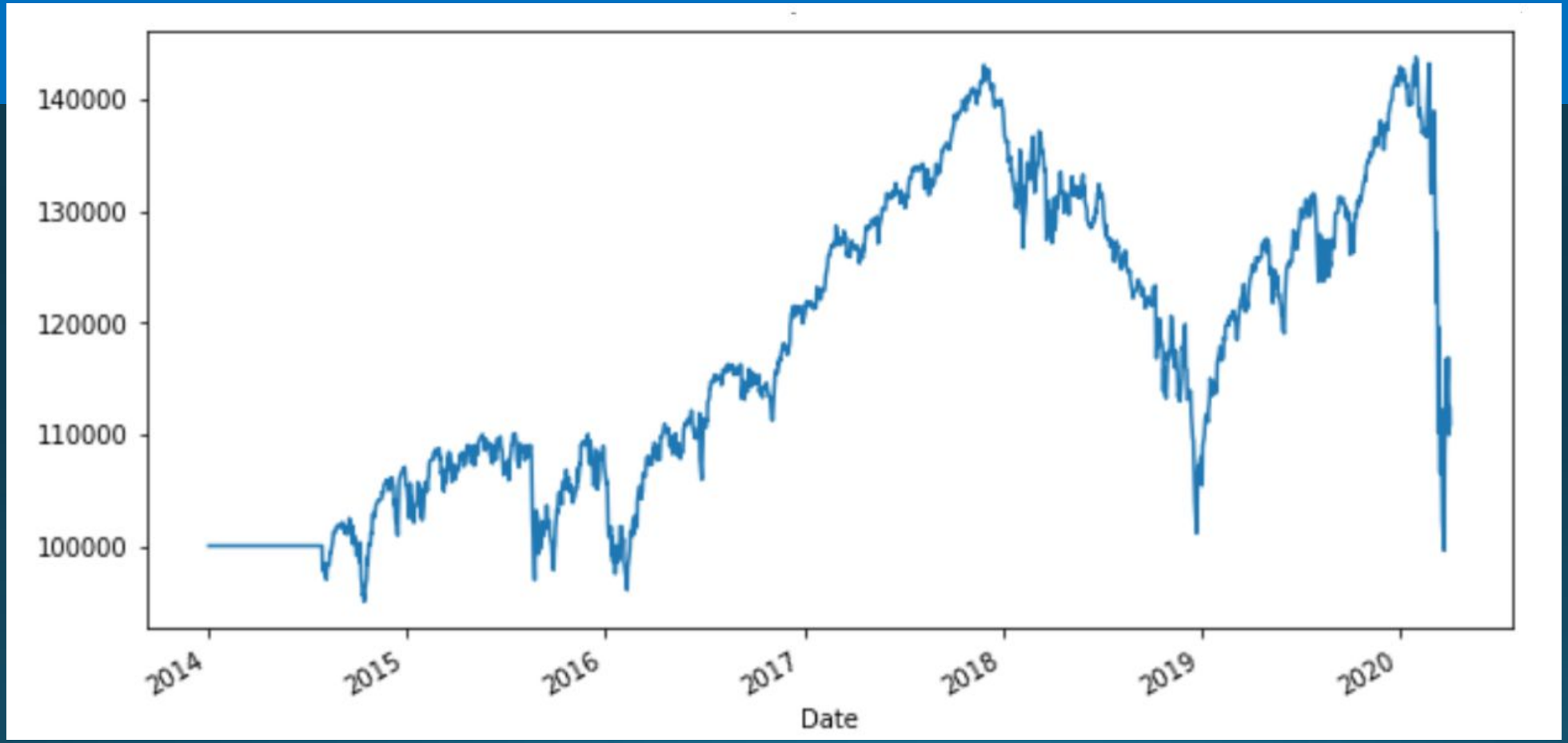


Signals

Generating Signals

Buy/Sells

Profit & Loss


140000
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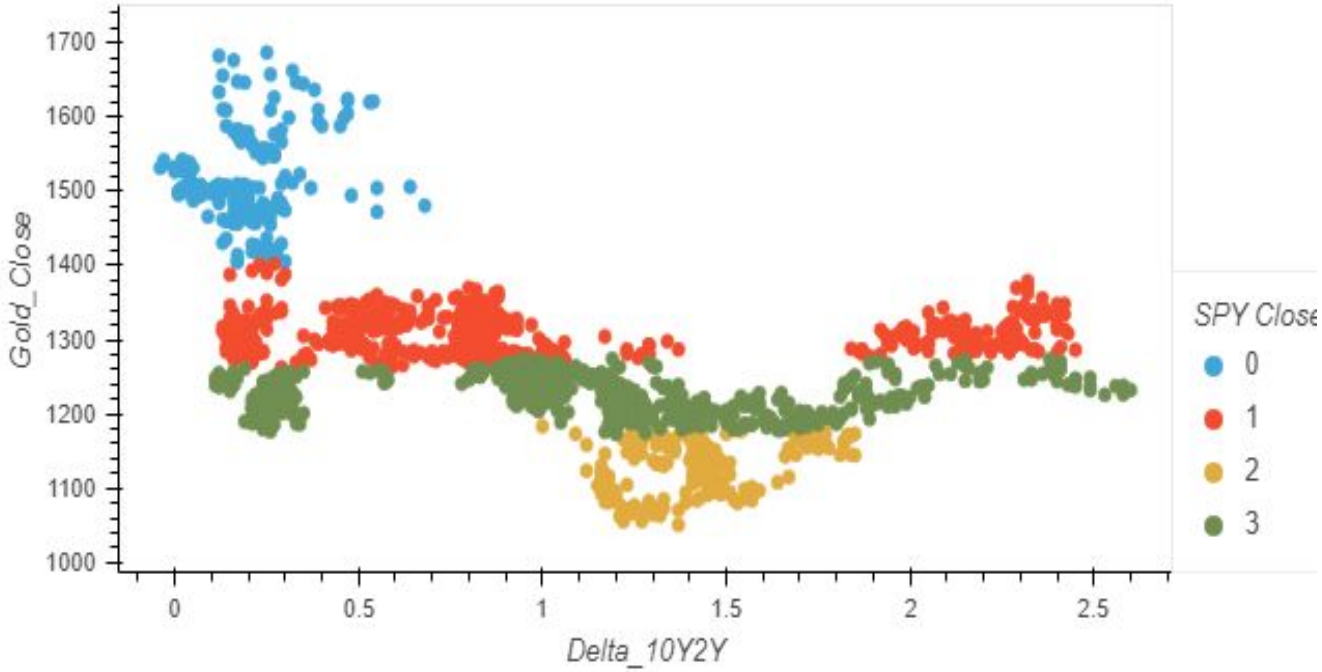
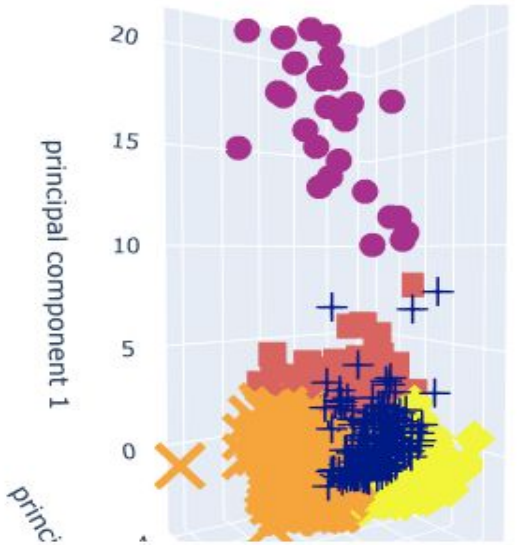
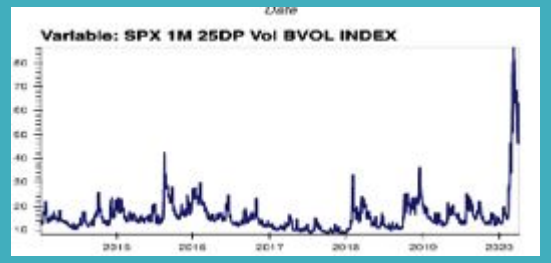
Date

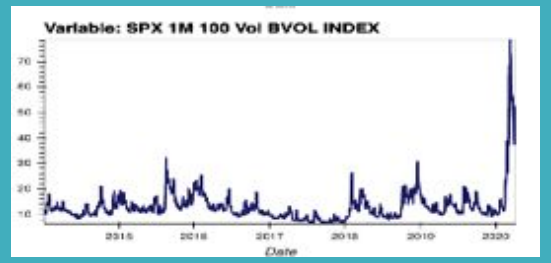


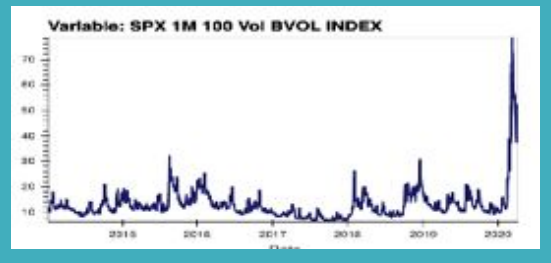


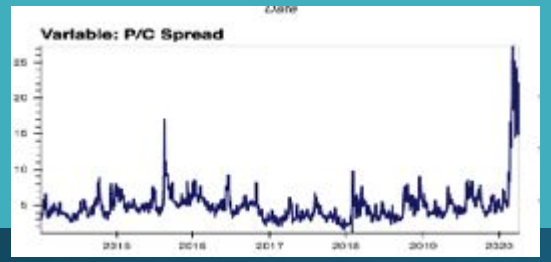
K-means and Initialized 3D-Kmean

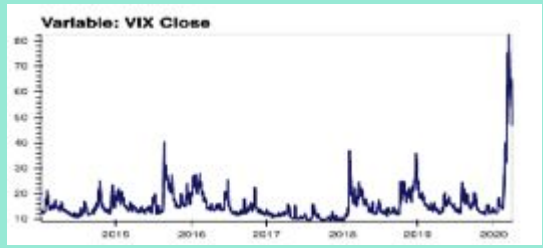
Economic Data

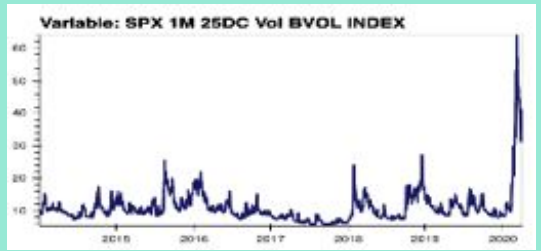


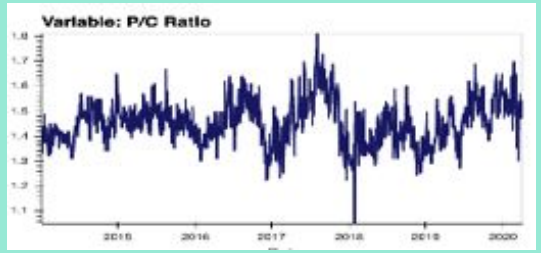


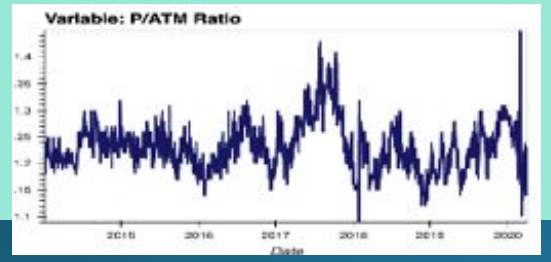


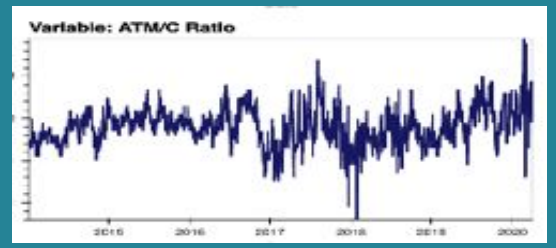


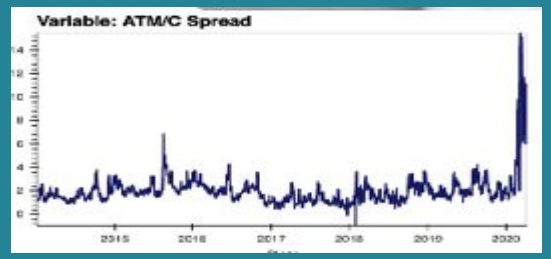


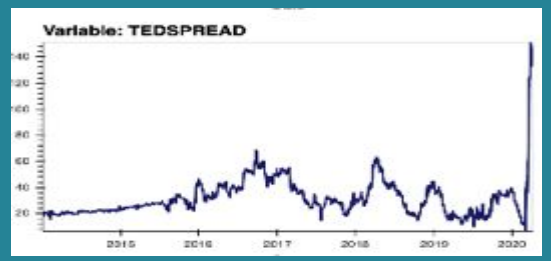


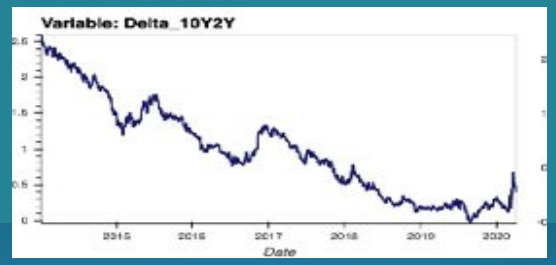


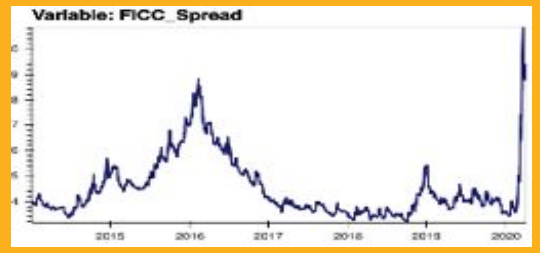


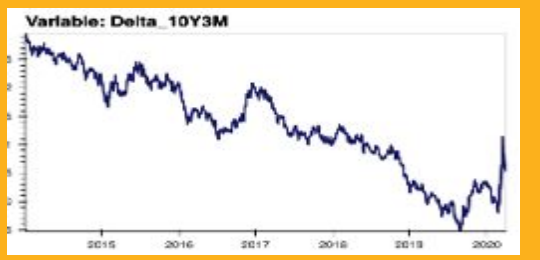








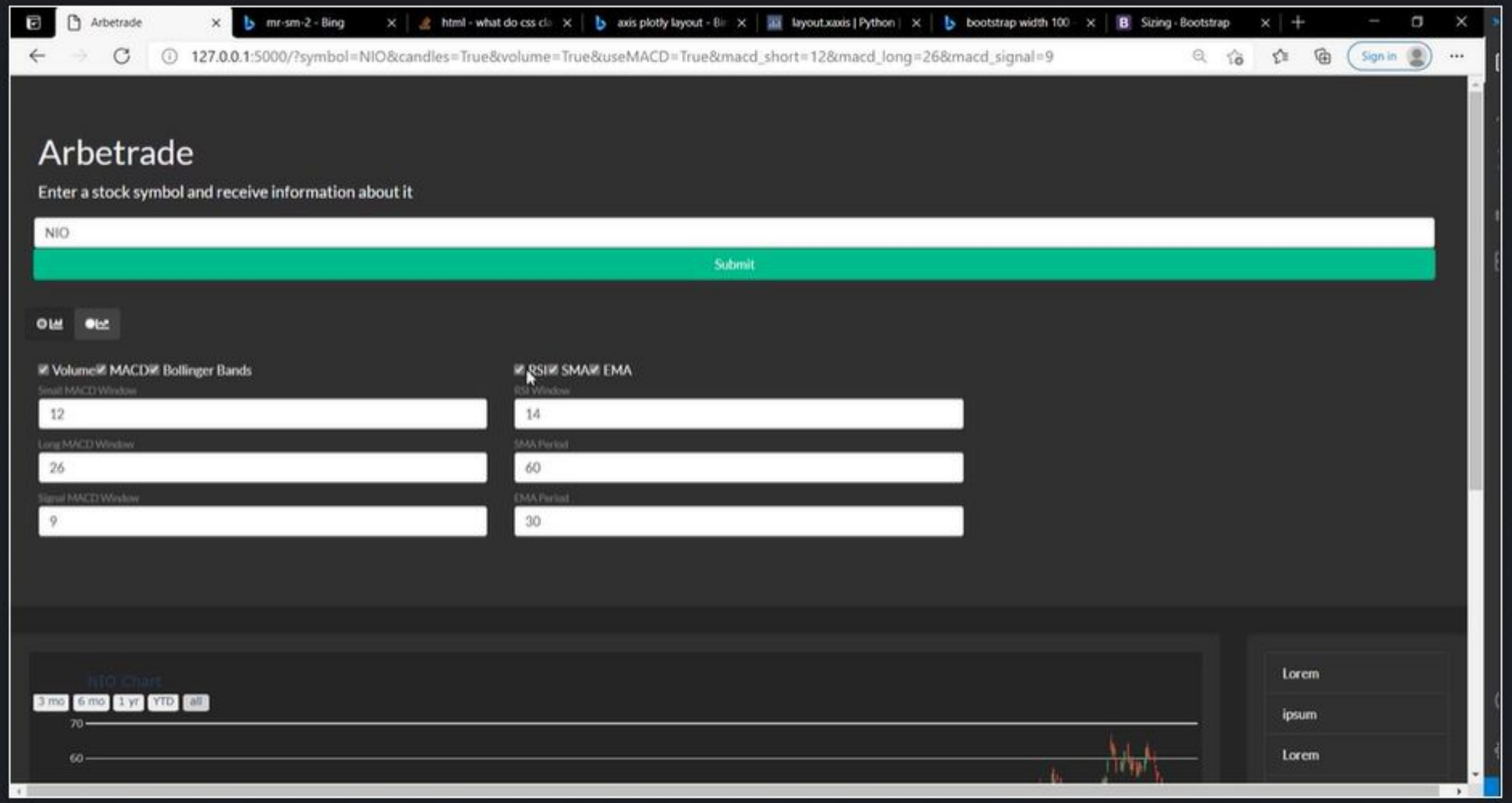




Web-Based Front End Dashboard

http://britter.ml:5001

FrontEnd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axis plotly layout - Bi
layout.xaxis | Python
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Sizing - Bootstrap
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Sign in
Arbetrade
Enter a stock symbol and receive information about it
NIO
Submit
Volume MACD Bollinger Bands
RSI SMA EMA
Small MACD Window
12
Long MACD Window
26
Signal MACD Window
9
RSI Window
14
SMA Period
60
EMA Period
30
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6 mo
1 yr
YTD
all
70
60
Lorem
ipsum
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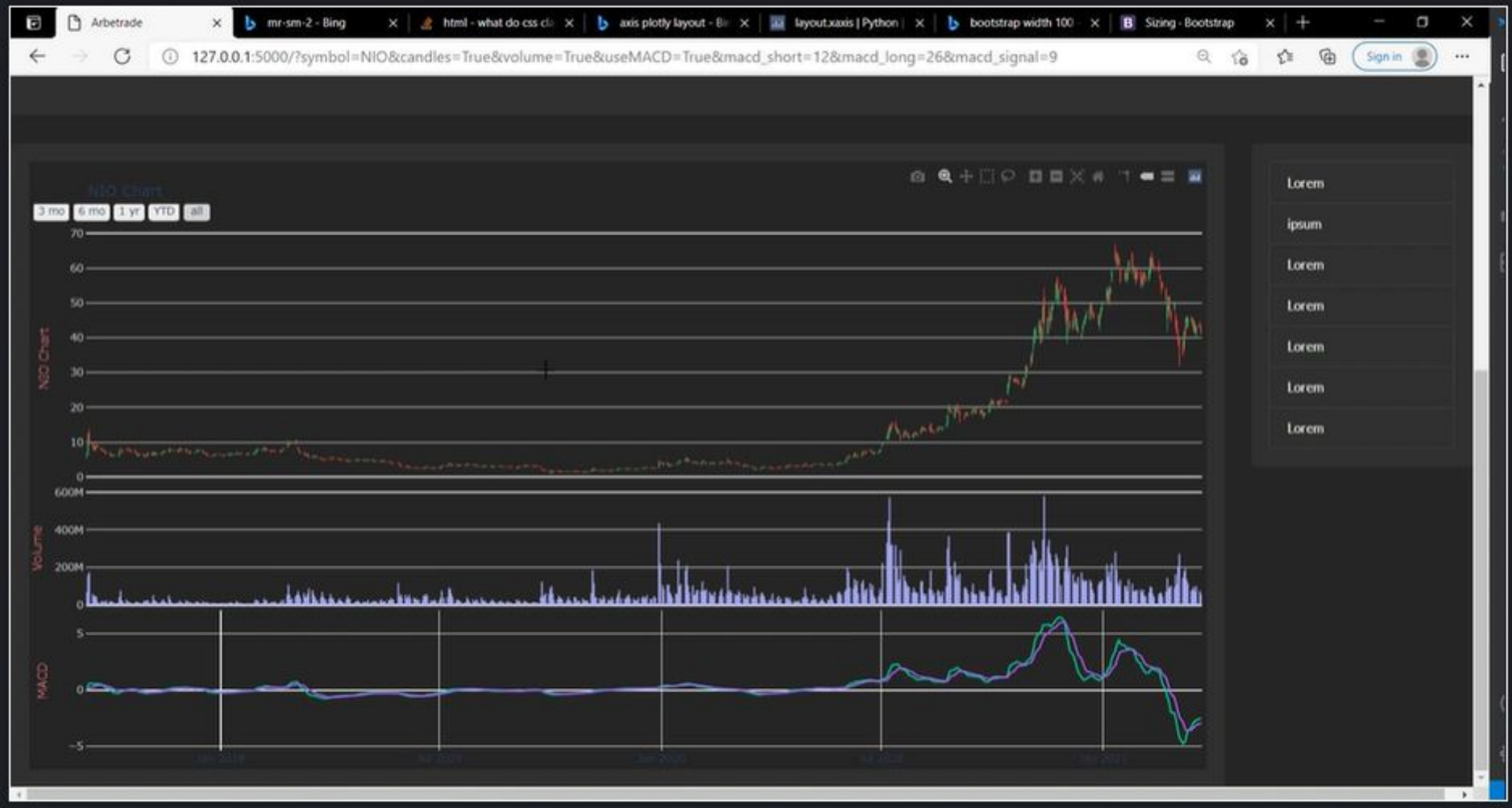
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Sizing - Bootstrap
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Sign in
NIO Chart
3 mo
6 mo
1 yr
YTD
all
70
60
50
40
30
20
10
0
600M
400M
200M
0
5
0
-5
Volume
MACD
Lorem
ipsum
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Lorem
Lorem
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Lorem

Ideas

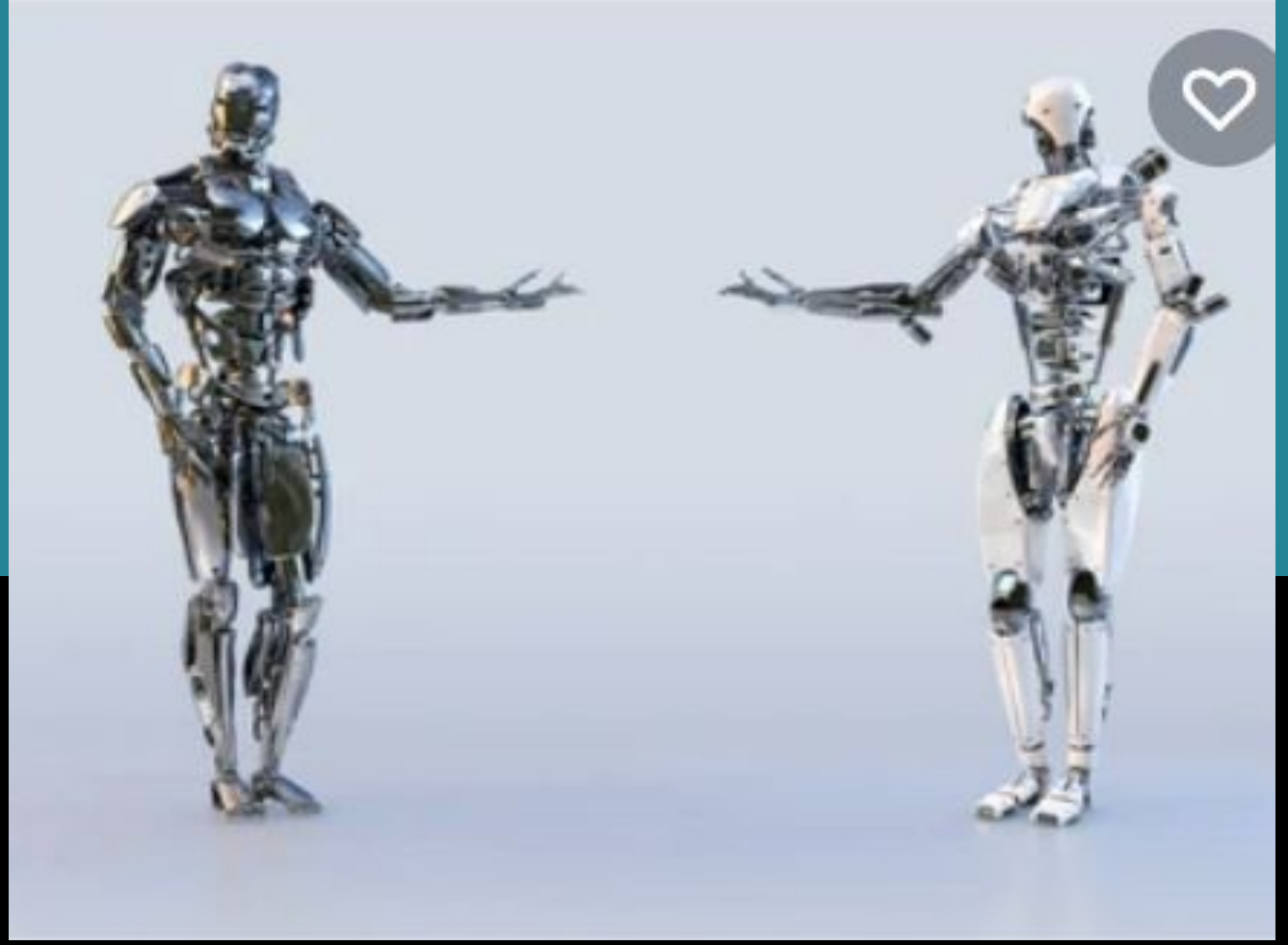
- Due to time constraints, the front-end dashboard is incomplete
- We wanted to be able to run our models on any security inputted in the dashboard
- Showing technical indicators signals to determine whether a stock would be a good buy and charting it (i.e if RSI>70 sell)
- Show news and sentiment
- Built-in backtesting

Abridgment of Project

- User will see reliable accurate information regarding the acquisition of stock and use the data to determine whether a user should buy or sell stocks or simply hold on to them for now.
- **We used several features and academic research to figure out that media plays crucial role in market volatility. We redefine sentiment and multivariate to extract data from news articles to see the affect on future prices of stocks**

- News Media and Social Media's influence: Extreme events let to biased and unbiased media coverage which affects stock prices based on the financial sentiment analysis.

- **This supervised learning project provides future stock price prediction using parameters, closing prices, sentiments , VIX, volume and Convolutional neural network. In deep learning, a convolutional neural network is a class of deep neural networks, most commonly applied to analyzing visual imagery. They are also known as shift invariant or space invariant artificial neural networks, based on their shared-weights architecture and translation invariance characteristics. We repurposed it to multivarious signal to get readable result in order to incorporate the information from all features and identifies the features significant to predict the price for the next day.**
- **Potential of this project is boundless, in addition to our future plans explained by Will, there is a possibility of using blockchain technology to make stock exchanges much more efficient through automation and decentralised.**

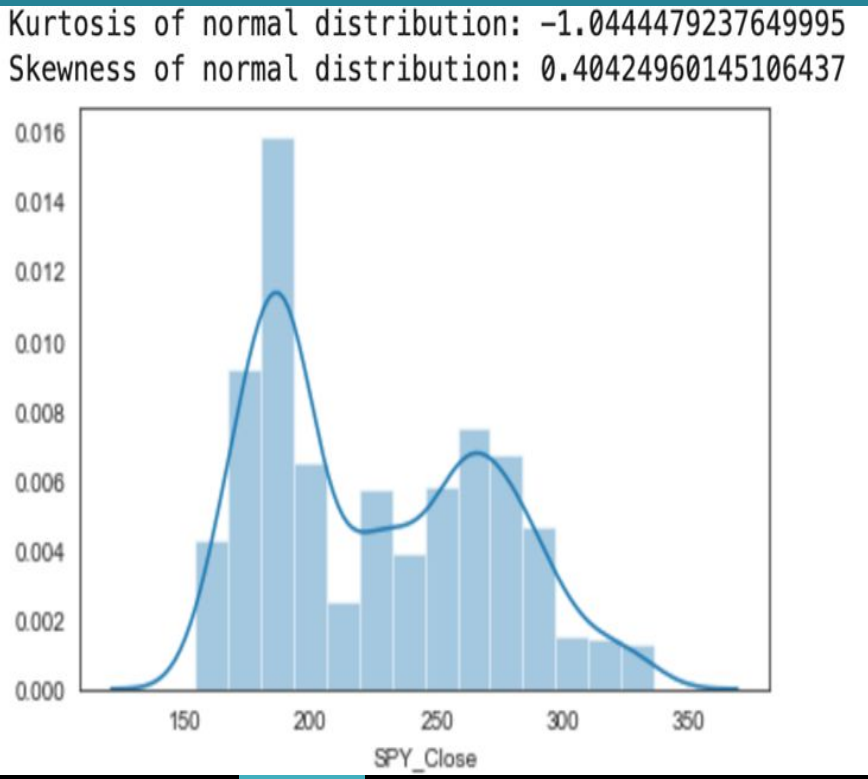


Any Questions?

Thank You

Arbetrade

Algorethmic Trading Platform



Annual Return	0.0830824
Cumulative Returns	0.53551
Annual Volatility	0.169198
Sharpe Ratio	0.491035
Sortino Ratio	0.663934

Visualizing S&P 500