Automate crypto trading using Machine Learning

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Background

Trading Bot :

- Computer Program Interacts directly with Market using API
- Can Buy and Sell without human Interaction
- Can be used for:
  - ❑ Cost Reduction
  - ❑ Optimize Operations
  - ❑ Defensive mechanism
  - ❑ Maximize profits

Why I Use it ??

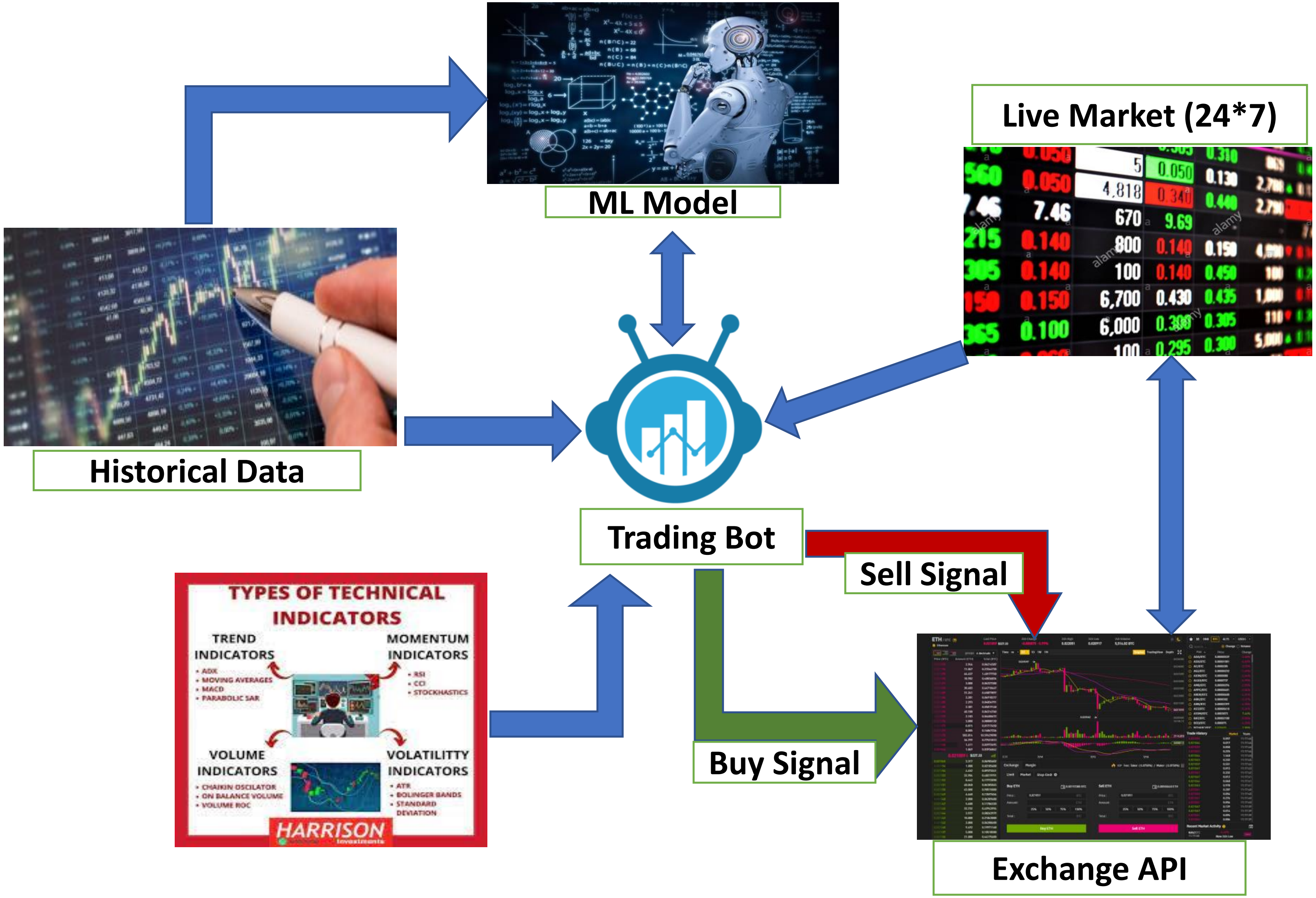
❑ 24*7 Open Market → Hard for Human to monitor

❑ Avoid Human emotional parameters of Fear and Greed → implies Maximum Profit

❑ Fast and better analytics and pattern recognition using technical indicators and machine learning

Problem Statement [Goals]

- Create a **Trading Bot** that Buy/Sell automatically 24/7
- Do **Scalp Trading** i.e., frequent buy and sell quickly in this case [within 1-3 Hr]
- Use 1 Hour **Candle stick chart** with technical indicator like EMA,SMA,MACD to find the pattern
- Use historical data with technical indicator to predict/forecast the upward or downward trend
- Use machine learning with technical indicators to predict the trend with values of high and lows



ML Model

Live Market (24*7)

Historical Data

Trading Bot

Sell Signal

Buy Signal

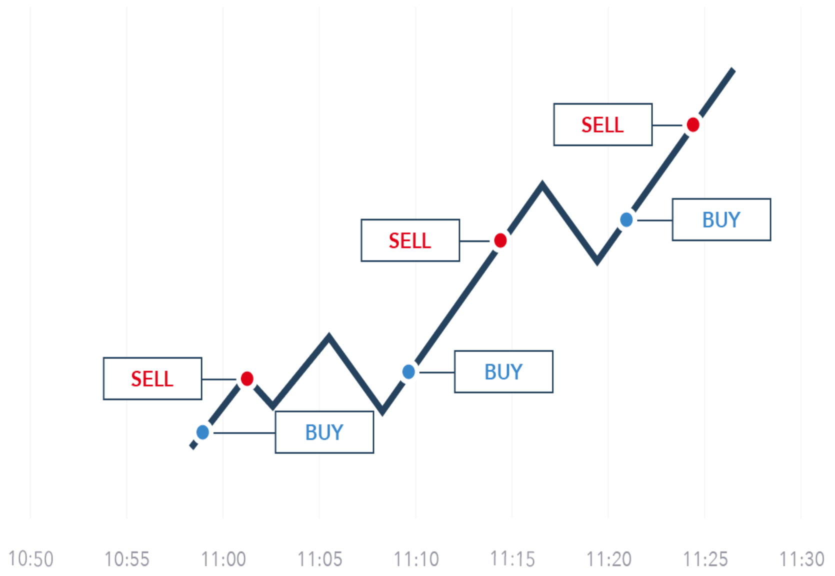
Exchange API

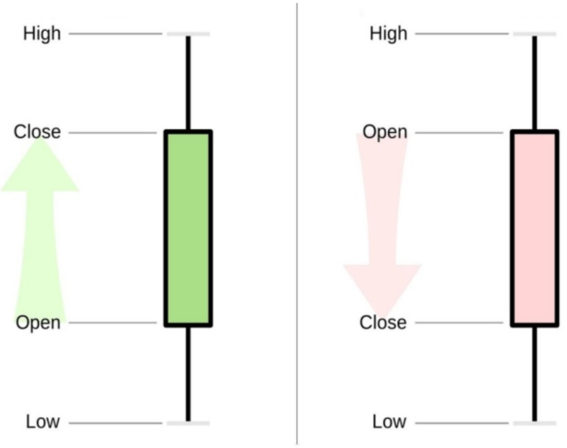
Background

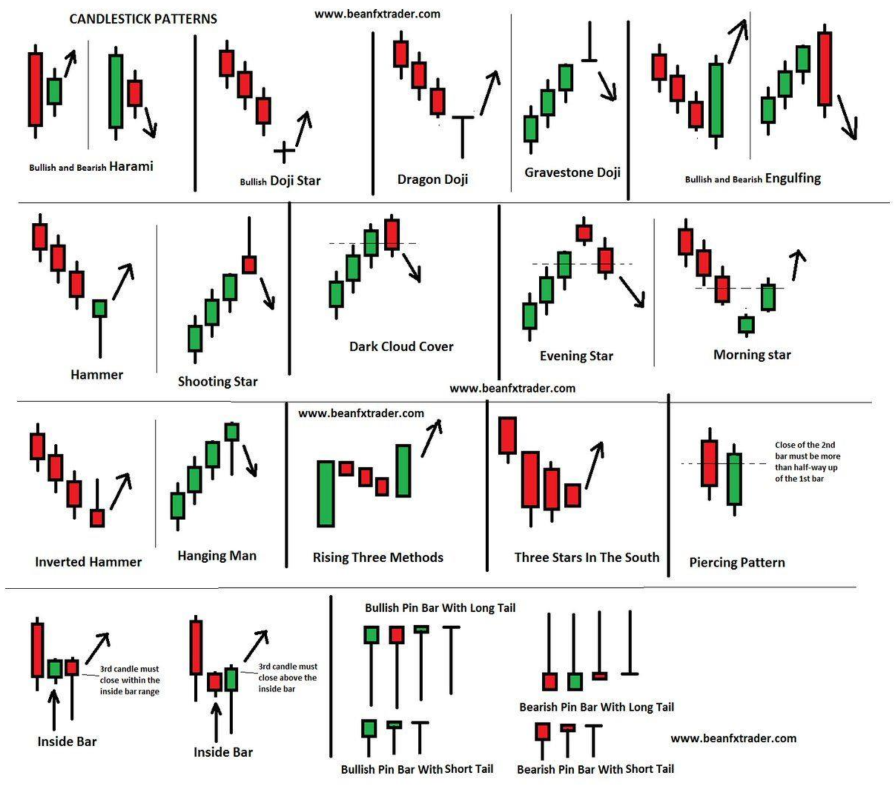
❑ Scalp Trading

- Quick Buy/Sell Strategies

❑ Candlestick Chart & Pattern






CANDLESTICK PATTERNS
www.beanfxtrader.com
Bullish and Bearish Harami
Bullish Doji Star
Dragon Doji
Gravestone Doji
Bullish and Bearish Engulfing
Hammer
Shooting Star
Dark Cloud Cover
Evening Star
Morning star
www.beanfxtrader.com
www.beanfxtrader.com
Inverted Hammer
Hanging Man
Rising Three Methods
Three Stars In The South
Close of the 2nd bar must be more than half-way up of the 1st bar
Piercing Pattern
3rd candle must close within the inside bar range
Inside Bar
3rd candle must close above the inside bar
Inside Bar
Bullish Pin Bar With Long Tail
Bearish Pin Bar With Long Tail
Bullish Pin Bar With Short Tail
Bearish Pin Bar With Short Tail
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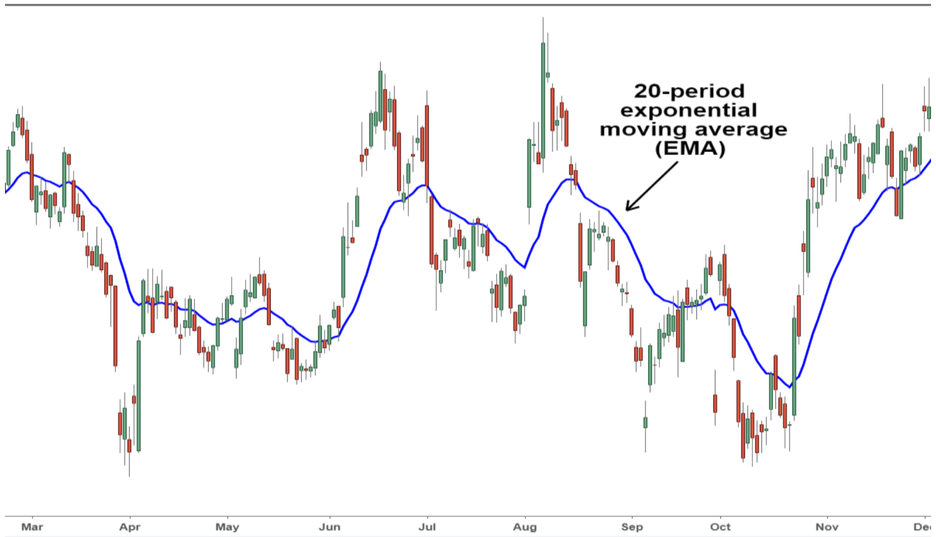
Technical Indicators used

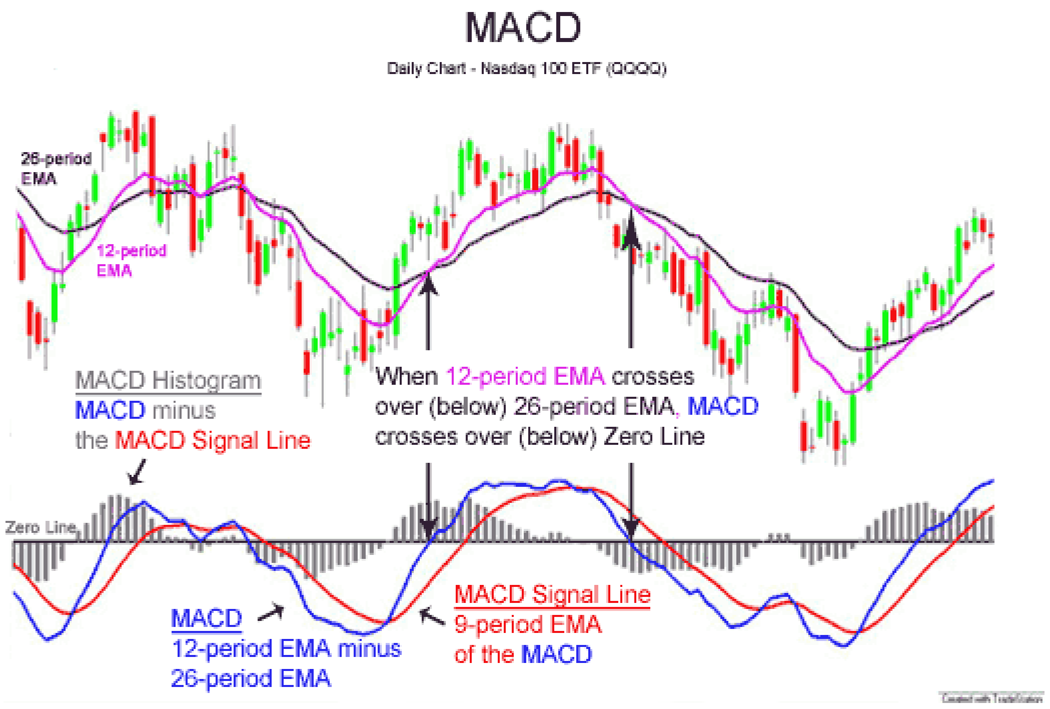
❑ EMA

- Exponential Moving average
- EMA = Closing price x multiplier + EMA (previous day) x (1-multiplier)



❑ MACD

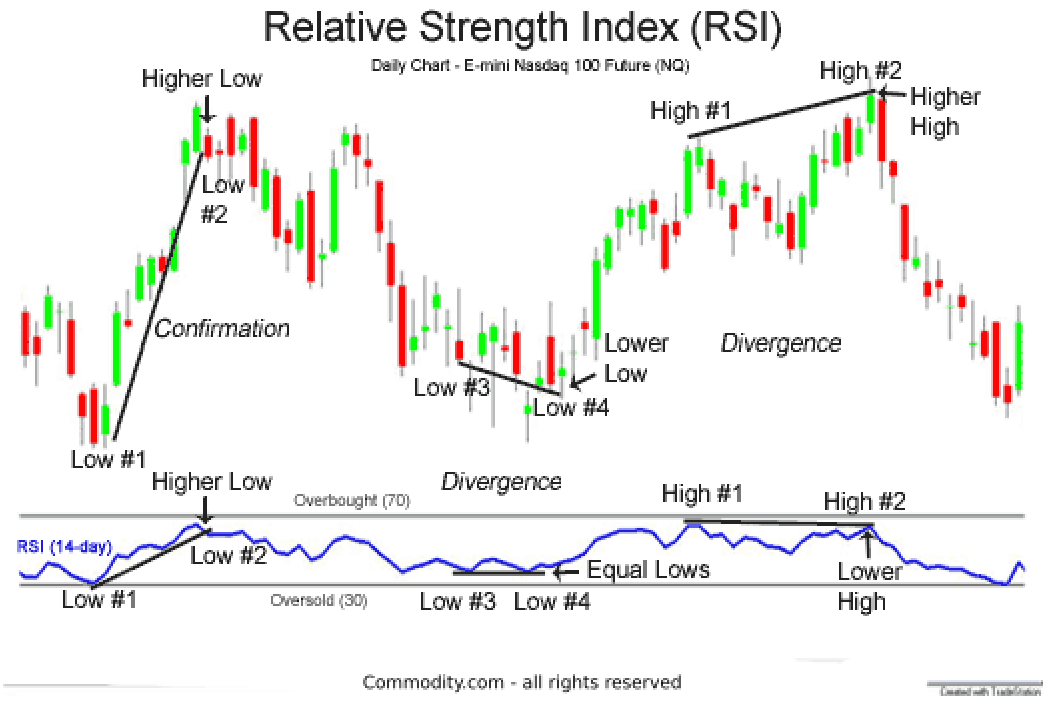
- moving average convergence divergence



Technical Indicators used

❑ RSI

- Resistance Support Index



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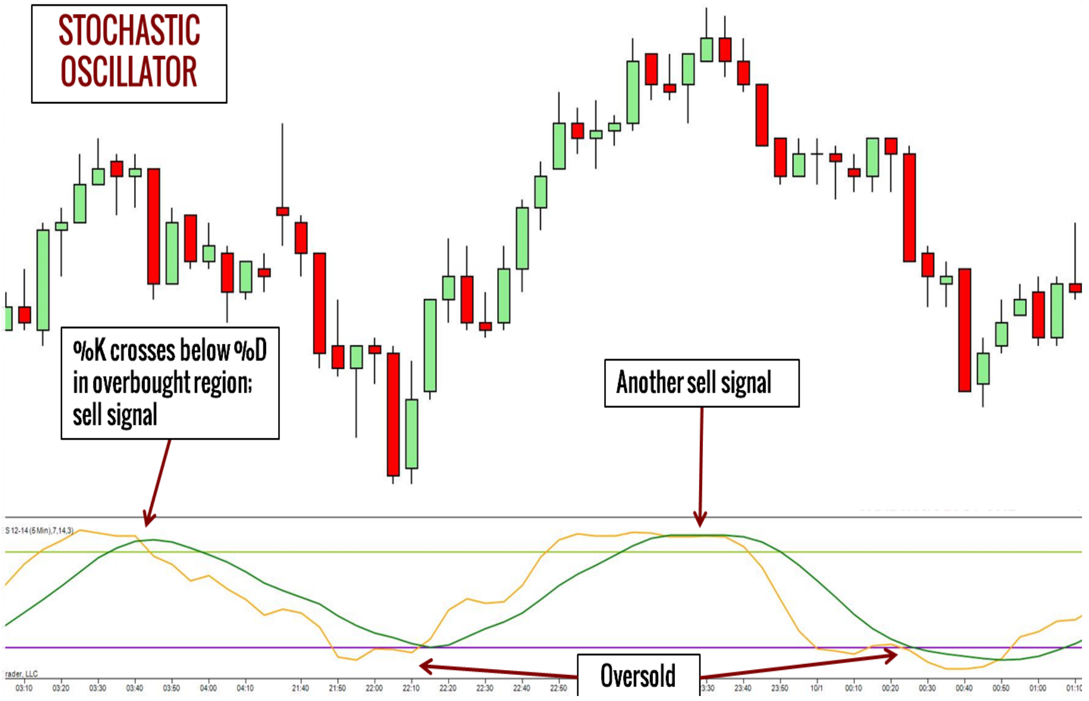
❑ Stochastic Oscillator



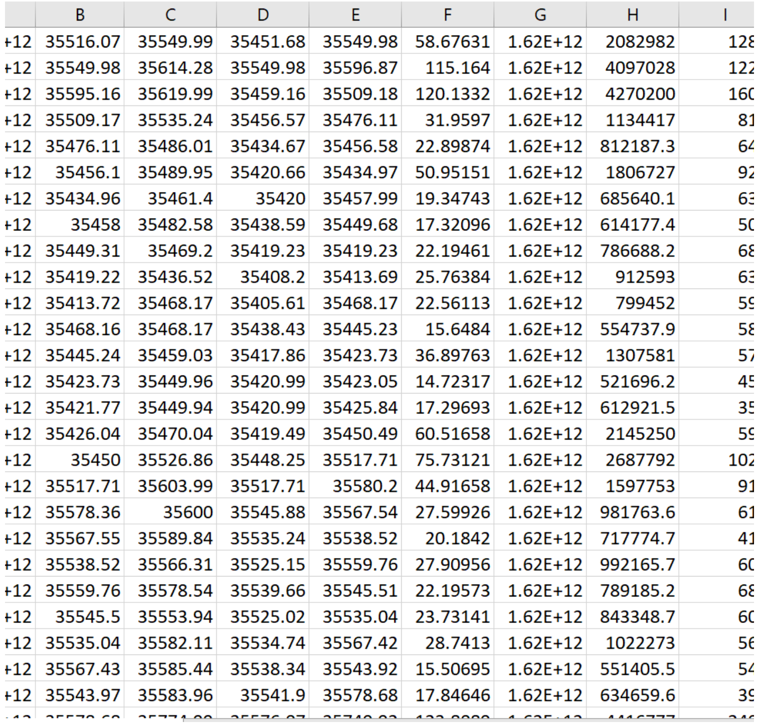
Data Set & Exploration tools

Data Source : Binance Exchange [BTC/USDT] https://data.binance.vision/data/spot/daily/klines/BTCUSDT/1h/

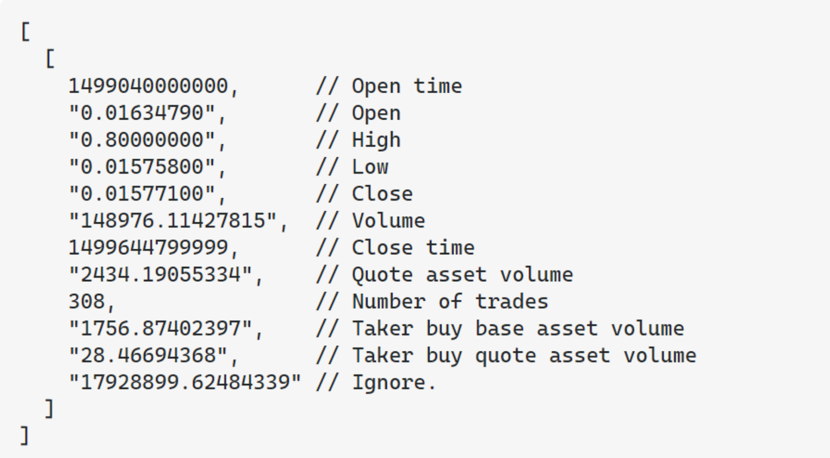
Training Data Set : created train.csv from latest 4 Years data of 1 Hr Candle chart [2017-01 to 2021-05] containing labeled attributes of High ,Low , open, close, volume

Test Data Set : 40% of the data is Splited for test and train

Tools: Python, Pandas, Beautiful Soup, Machine learning models

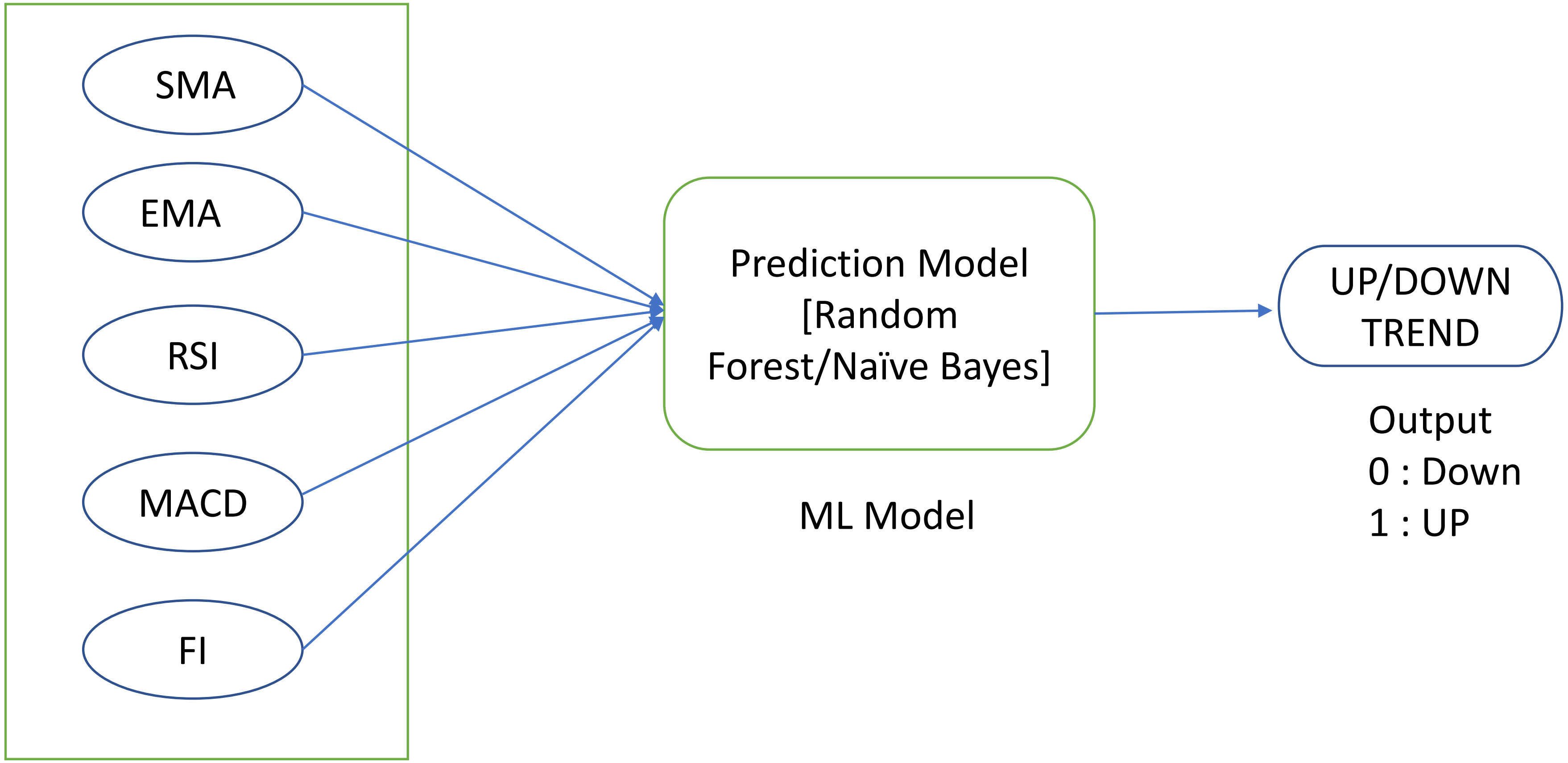


	B	C	D	E	F	G	H	I
+12	35516.07	35549.99	35451.68	35549.98	58.67631	1.62E+12	2082982	128
+12	35549.98	35614.28	35549.98	35596.87	115.164	1.62E+12	4097028	122
+12	35595.16	35619.99	35459.16	35509.18	120.1332	1.62E+12	4270200	160
+12	35509.17	35535.24	35456.57	35476.11	31.9597	1.62E+12	1134417	81
+12	35476.11	35486.01	35434.67	35456.58	22.89874	1.62E+12	812187.3	64
+12	35456.1	35489.95	35420.66	35434.97	50.95151	1.62E+12	1806727	92
+12	35434.96	35461.4	35420	35457.99	19.34743	1.62E+12	685640.1	63
+12	35458	35482.58	35438.59	35449.68	17.32096	1.62E+12	614177.4	50
+12	35449.31	35469.2	35419.23	35419.23	22.19461	1.62E+12	786688.2	68
+12	35419.22	35436.52	35408.2	35413.69	25.76384	1.62E+12	912593	63
+12	35413.72	35468.17	35405.61	35468.17	22.56113	1.62E+12	799452	59
+12	35468.16	35468.17	35438.43	35445.23	15.6484	1.62E+12	554737.9	58
+12	35445.24	35459.03	35417.86	35423.73	36.89763	1.62E+12	1307581	57
+12	35423.73	35449.96	35420.99	35423.05	14.72317	1.62E+12	521696.2	45
+12	35421.77	35449.94	35420.99	35425.84	17.29693	1.62E+12	612921.5	35
+12	35426.04	35470.04	35419.49	35450.49	60.51658	1.62E+12	2145250	59
+12	35450	35526.86	35448.25	35517.71	75.73121	1.62E+12	2687792	102
+12	35517.71	35603.99	35517.71	35580.2	44.91658	1.62E+12	1597753	91
+12	35578.36	35600	35545.88	35567.54	27.59926	1.62E+12	981763.6	61
+12	35567.55	35589.84	35535.24	35538.52	20.1842	1.62E+12	717774.7	41
+12	35538.52	35566.31	35525.15	35559.76	27.90956	1.62E+12	992165.7	60
+12	35559.76	35578.54	35539.66	35545.51	22.19573	1.62E+12	789185.2	68
+12	35545.5	35553.94	35525.02	35535.04	23.73141	1.62E+12	843348.7	60
+12	35535.04	35582.11	35534.74	35567.42	28.7413	1.62E+12	1022273	56
+12	35567.43	35585.44	35538.34	35543.92	15.50695	1.62E+12	551405.5	54
+12	35543.97	35583.96	35541.9	35578.68	17.84646	1.62E+12	634659.6	39



```
[
  [
    1499040000000,      // Open time
    "0.01634790",       // Open
    "0.80000000",       // High
    "0.01575800",       // Low
    "0.01577100",       // Close
    "148976.11427815",  // Volume
    1499644799999,      // Close time
    "2434.19055334",    // Quote asset volume
    308,                // Number of trades
    "1756.87402397",    // Taker buy base asset volume
    "28.46694368",      // Taker buy quote asset volume
    "17928899.62484339" // Ignore.
  ]
]
```

ML Workflow



SMA

EMA

RSI

MACD

FI

Prediction Model [Random Forest/Naïve Bayes]

ML Model

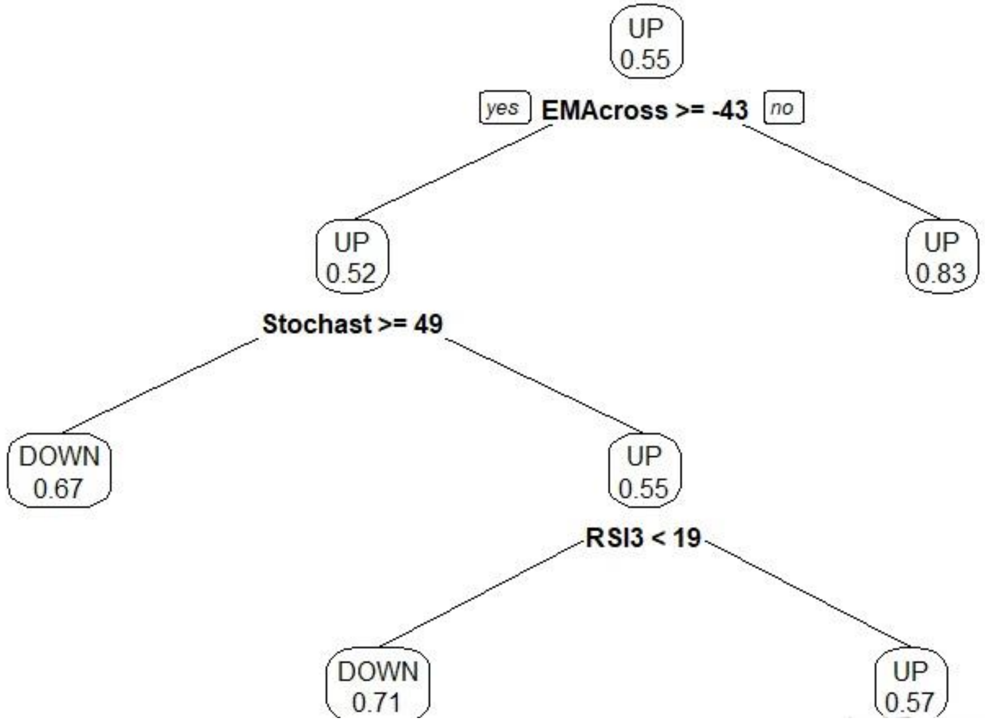
UP/DOWN TREND

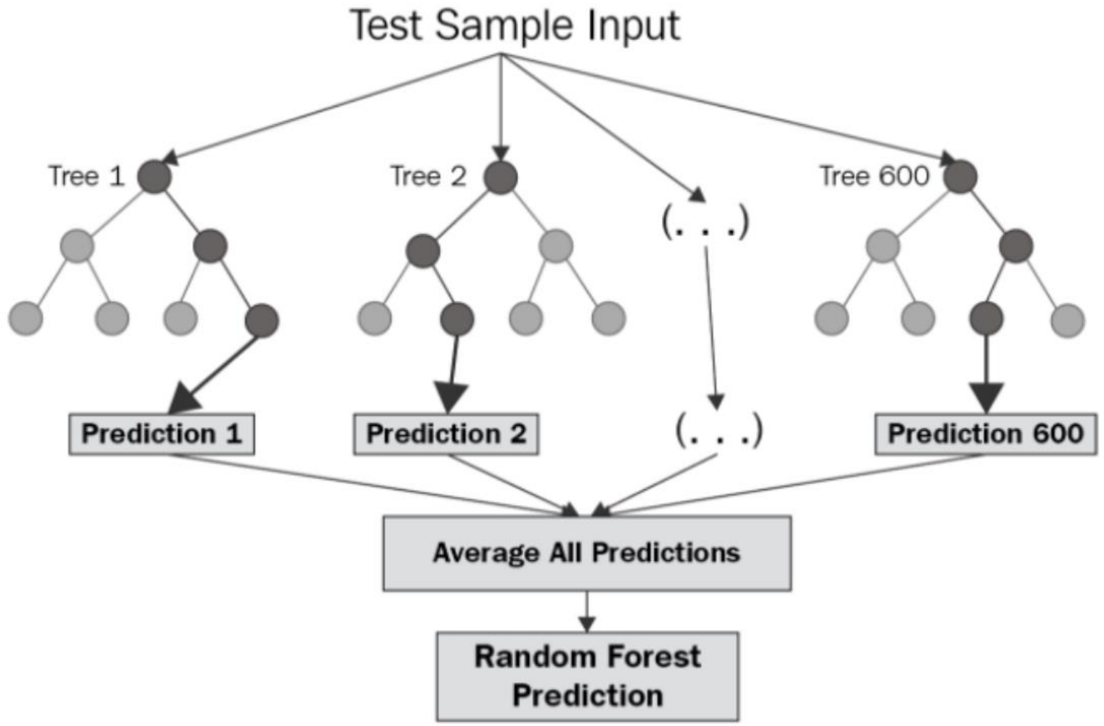
Output
0 : Down
1 : UP

Input : Technical Indicator

Random Forest

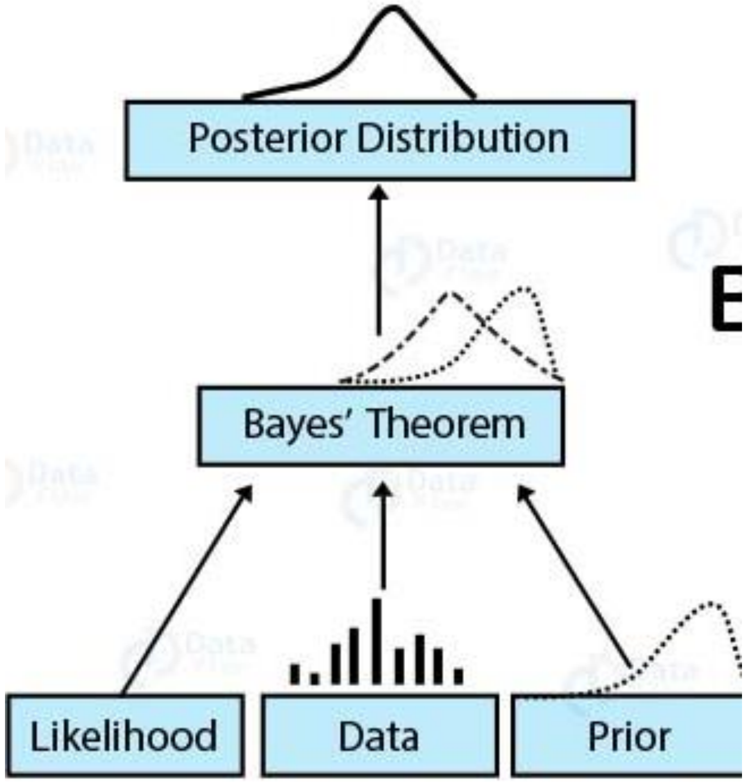
- Decision tree algorithm
- Easy to find non-linear trends
- Relationship between tech indicators

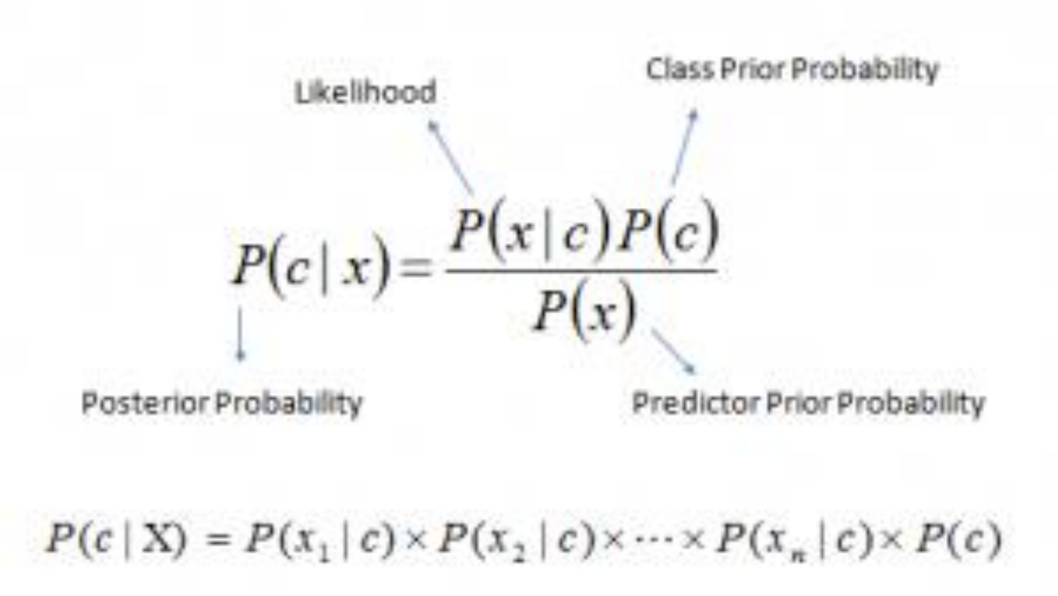




Naïve Bayes

- Classifier based on Bernoulli's probability
- Conditional Independence assumptions
- Based on Bayes Theorem



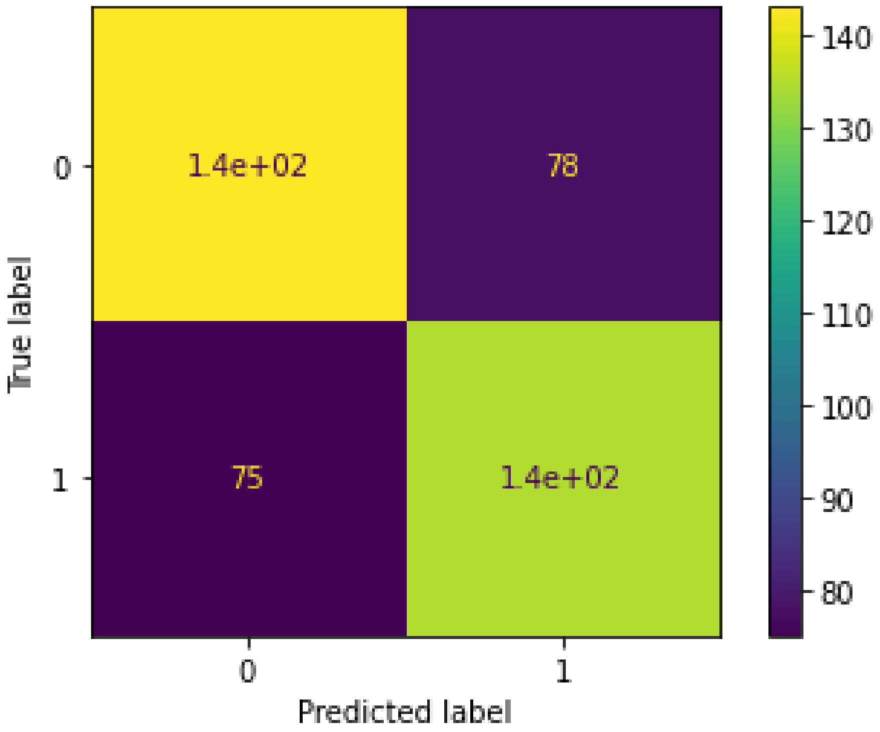


$$P(c|x) = \frac{P(x|c)P(c)}{P(x)}$$

$$P(c|X) = P(x_1|c) \times P(x_2|c) \times \cdots \times P(x_n|c) \times P(c)$$

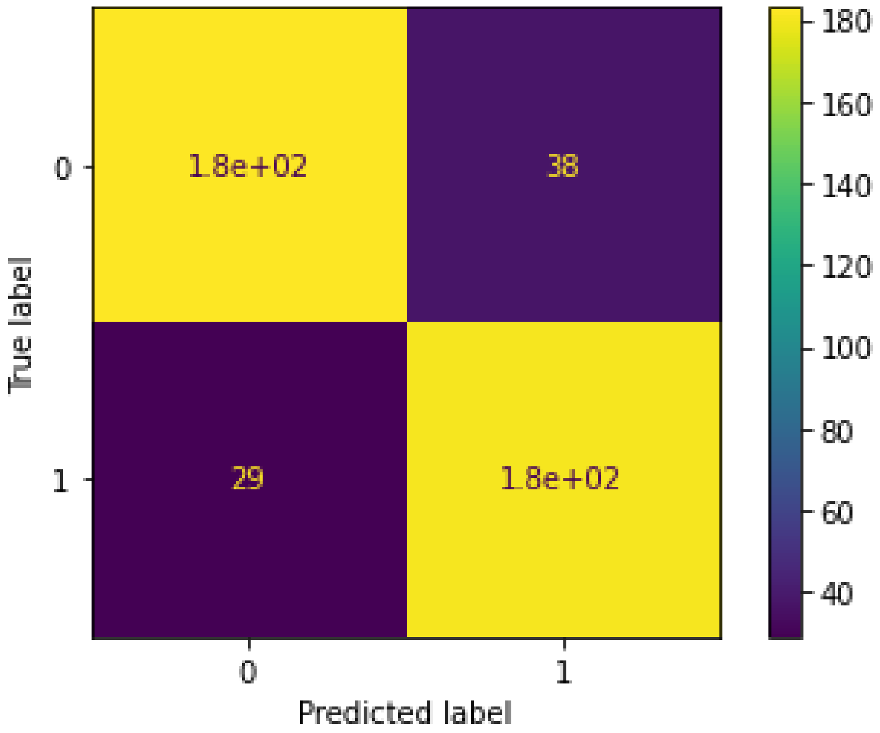
Confusion Matrices

```
[[143 78] [ 75 135]]
```



Random Forest

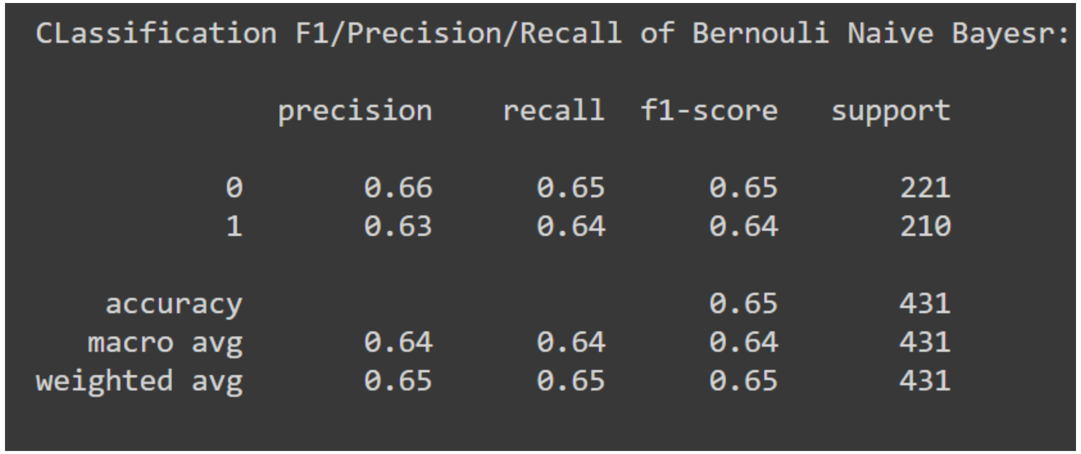
```
[[183 38] [ 29 181]]
```



Naïve Bayes

Evaluation Metrices Results & Summary

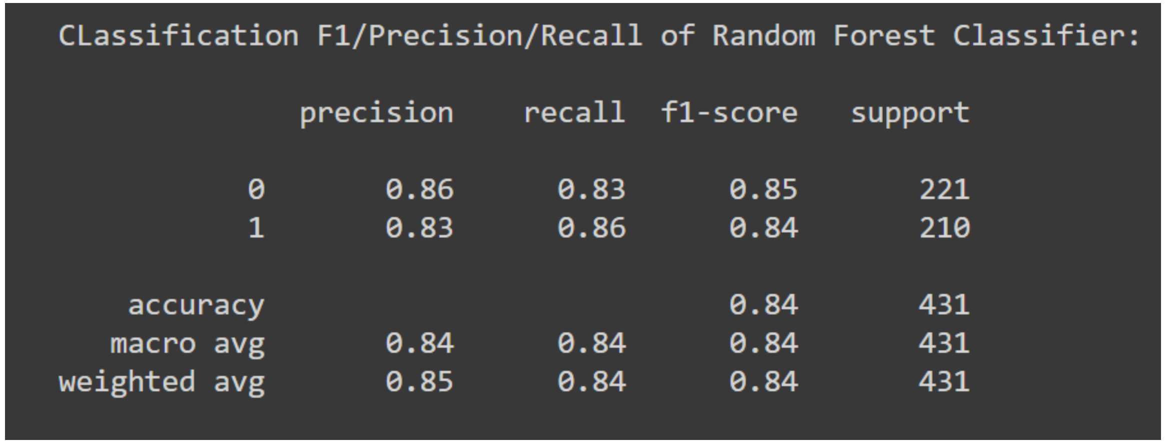
Accuracy : 84.45%



```
CLassification F1/Precision/Recall of Bernouli Naive Bayesr:

              precision    recall  f1-score   support

           0       0.66      0.65      0.65       221
           1       0.63      0.64      0.64       210

    accuracy                           0.65       431
   macro avg       0.64      0.64      0.64       431
weighted avg       0.65      0.65      0.65       431
```

Random Forest

Accuracy : 64.5%



```
CLassification F1/Precision/Recall of Random Forest Classifier:

              precision    recall  f1-score   support

           0       0.86      0.83      0.85       221
           1       0.83      0.86      0.84       210

    accuracy                           0.84       431
   macro avg       0.84      0.84      0.84       431
weighted avg       0.85      0.84      0.84       431
```

Naïve Bayes

Classifier with Best test accuracy : Random Forest

ML Model Improvements

Feature Selection normalized value and using Dimensionality Reduction like PCA

Use of Cross-Validation for Training Data set K-Fold using GridSearchCV

Future Enhancements

- ❑ Sentiment analysis using Google and Twitter trends
- ❑ use deep learning like reinforcement learning for better analysis and continuous change
- ❑ Retraining the model more frequently with latest data so it’s dynamic and adjusted according to the markets
- ❑ use risk adjustment feature like stop-loss in feature engineering itself

THANK YOU

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