Trading Strategy Analysis with Machine Learning

Jupyter Lab & Freqtrade

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Analysis Design

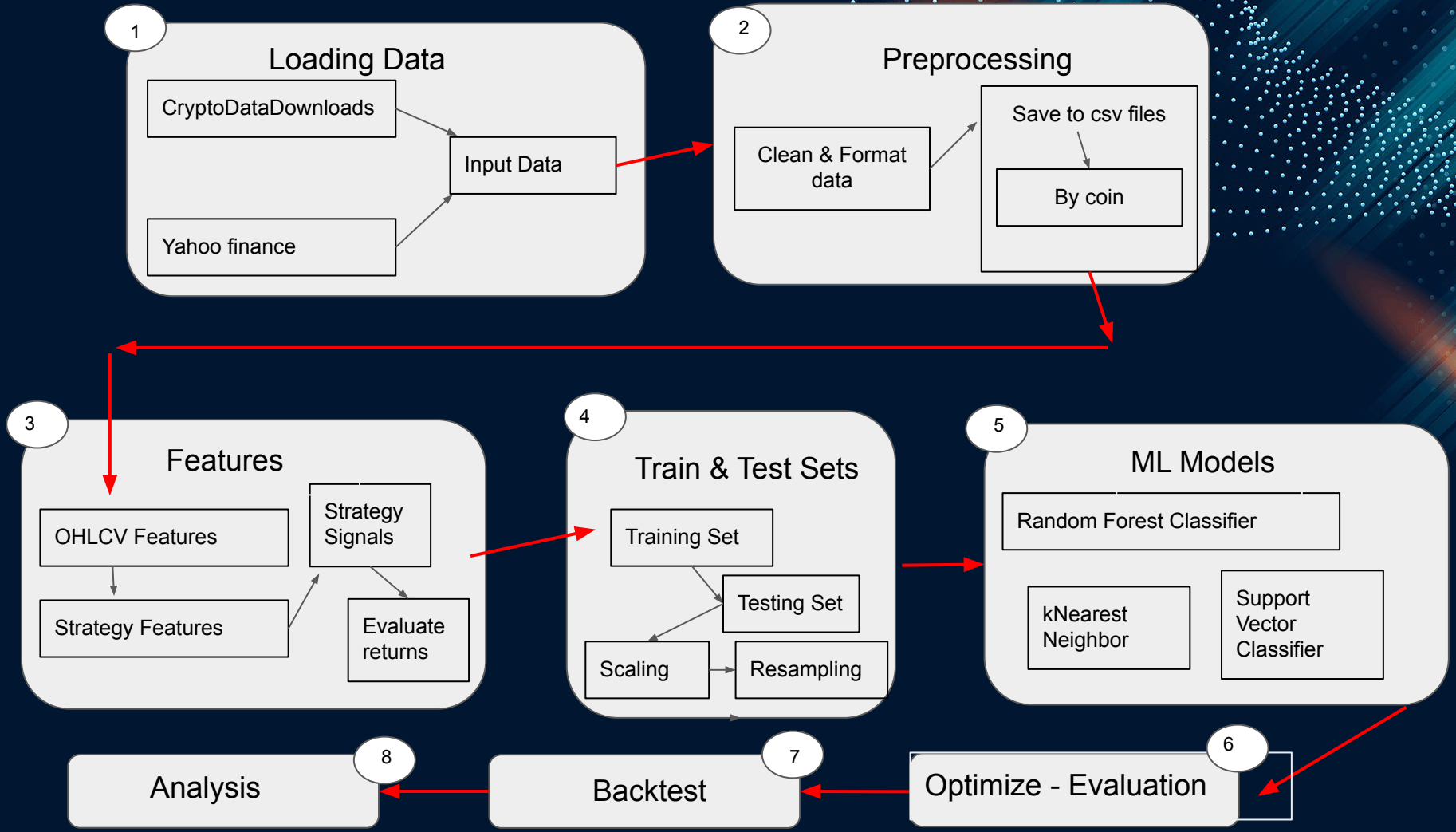
2 Trading Strategies

EMA Crossover	SMA-RSI-BB
–Exponential Moving Average–	–SimpleMoving Average– –Relative Strength Index– –Bollinger Bands–
*Indicators identify: price trend	*Indicators identify: price trend, momentum, and volitility

Machine Learning models:

1. **S**upport **V**ector **C**lassifier
2. **R**andom **F**orest **C**lassifier
3. **kN**earest **N**eighbor Classifier

Data: BTC/USD data 2018 to 2023.


1
Loading Data
CryptoDataDownloads
Yahoo finance
Input Data
2
Preprocessing
Clean & Format data
Save to csv files
By coin
3
Features
OHLCV Features
Strategy Features
Strategy Signals
Evaluate returns
4
Train & Test Sets
Training Set
Testing Set
Scaling
Resampling
5
ML Models
Random Forest Classifier
kNearest Neighbor
Support Vector Classifier
6
Optimize - Evaluation
7
Backtest
8
Analysis

Analysis fail

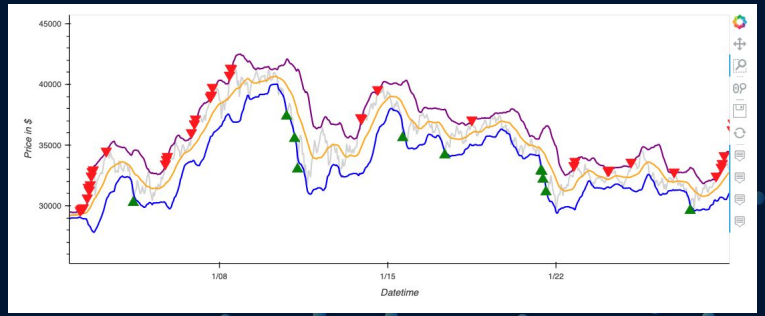
*****DATAFRAME IS DESCENDING*****

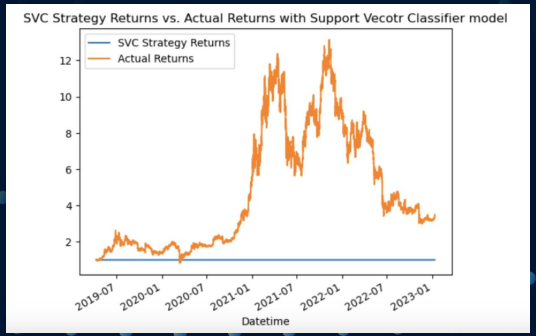
*****FORGOT TO RESAMPLE*****

```
svc_testing_report = classification_report(y_test, svc_pred)
print(svc_testing_report)
```

	precision	recall	f1-score	support
0	0.66	1.00	0.80	21763
1	0.00	0.00	0.00	11195
accuracy			0.66	32958
macro avg	0.33	0.50	0.40	32958
weighted avg	0.44	0.66	0.53	32958

*****Strategy is selling on the uptrend*****



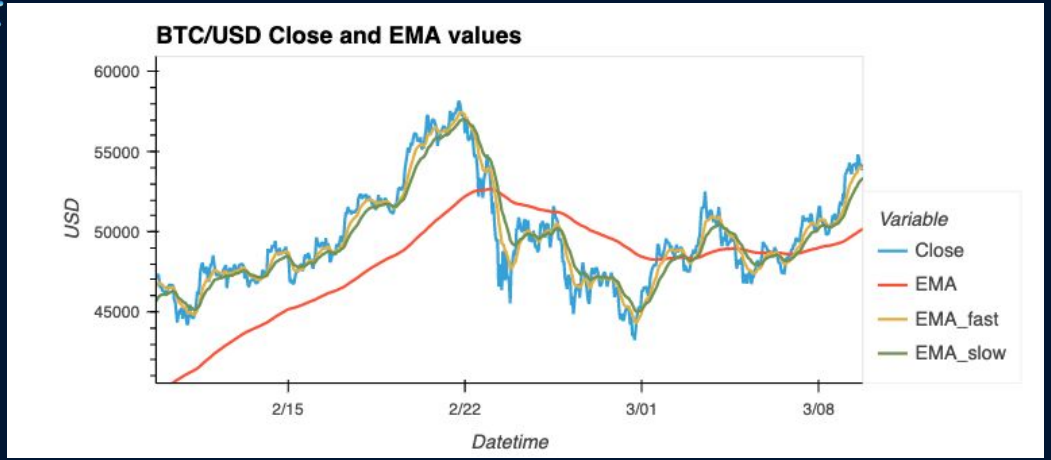


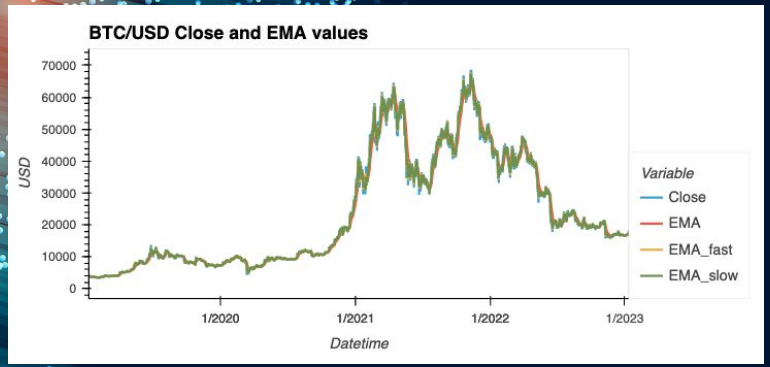
“There is often more insight in Failure than in success”

—Someone Famous

EMA!

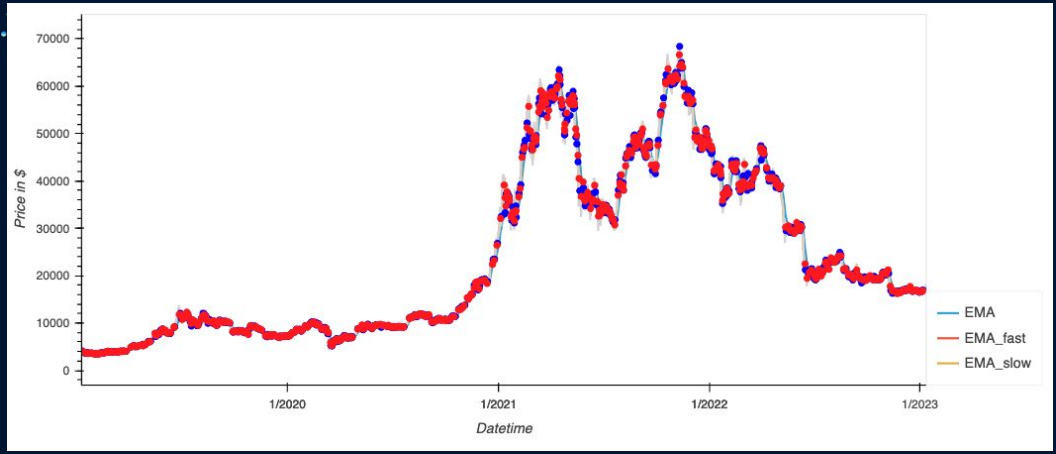
EMA =200, EMA middle window=26
EMA short window = 12

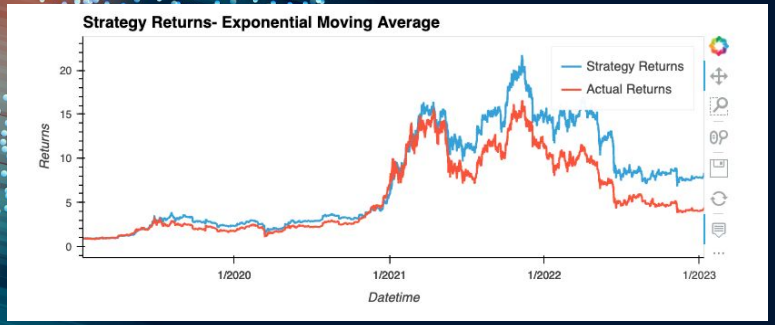




EMA!

Signal Values: 1 = 25675 0= 9446





Cumulative Returns Sum:

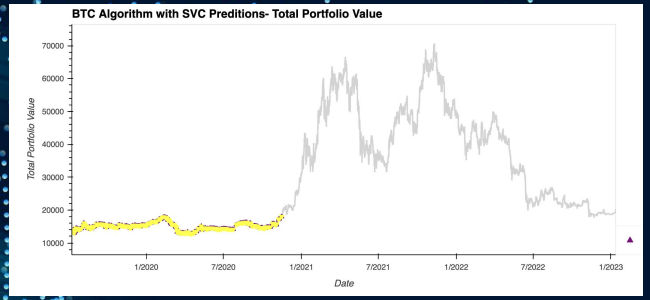
Actual Returns $200,219.52

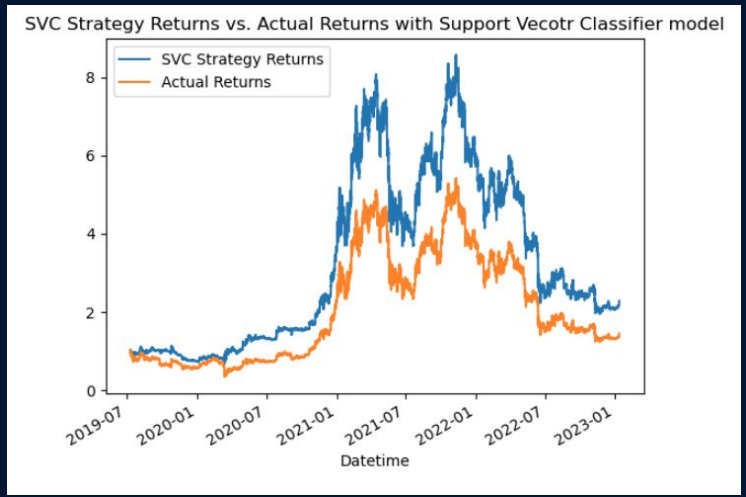
Strategy Returns $264, 108.83

models!

20% training
80% test

Support Vector Classifier






```
svc_testing_report = classification_report(y_test, svc_pred)
print(svc_testing_report)
```

	precision	recall	f1-score	support
0	0.46	0.35	0.40	8361
1	0.78	0.85	0.81	22414
accuracy			0.71	30775
macro avg	0.62	0.60	0.60	30775
weighted avg	0.69	0.71	0.70	30775

Cumulative Returns Sum of testing data:

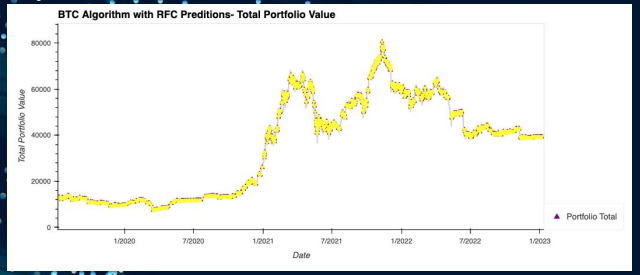
Actual Returns $63,400.48

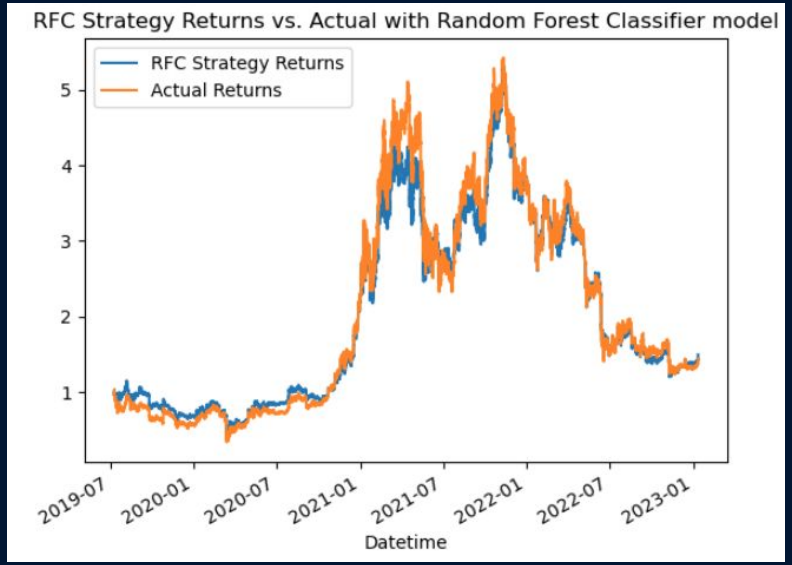
SVC-Strategy Returns $99,708.40

models!

20% training, 80% test

Random Forest Classifier
& kNearest Neighbor






```
print(forest_pred_report)
```

	precision	recall	f1-score	support
0	0.92	0.63	0.75	8361
1	0.88	0.98	0.92	22414
accuracy			0.88	30775
macro avg	0.90	0.81	0.84	30775
weighted avg	0.89	0.88	0.88	30775

Cumulative Returns Sum of testing data:

Actual Returns $63,400.48

RFC- Strategy Returns $62,060.44

01

SVC

*Best returns
* 1560 trades

*not good with volatility

53% portfolio returns

02

RFR

*Best balanced precision/Recall

*might do better in Backtesting

2% portfolio returns

03

kNN

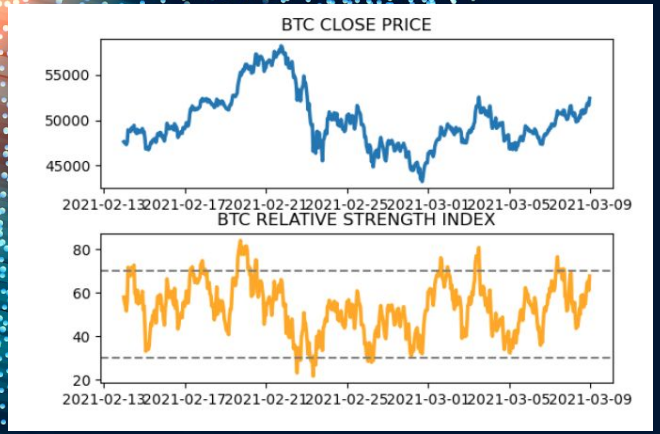
*Good happy medium

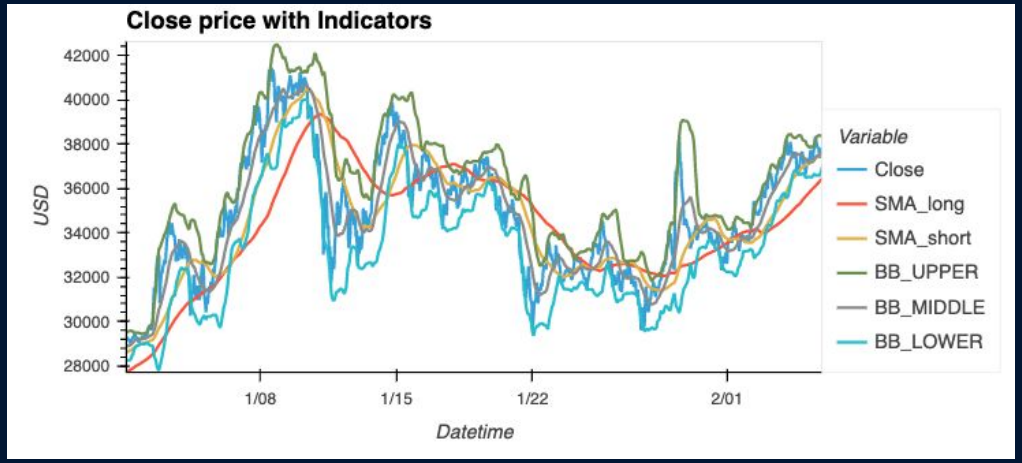
*not good with volatility

-2.5% portfolio returns

S-R-B!

Simple Moving Average Relative Strength Index
Bollinger Bands





Rolling Windows:
SMAlong = 100 SMAshort = 50 RSI = 14
Bollinger Bands = 20, with 2.5 std

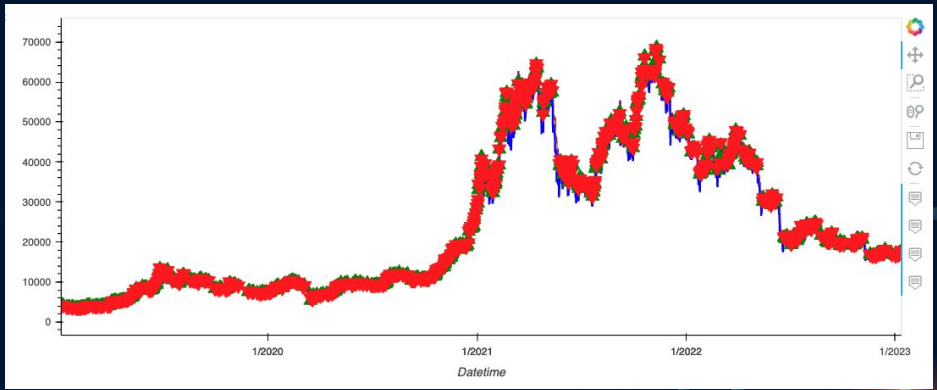
SRB Strategy Results

No Buy signals all Sell

BB_lower and RSI oversold never align
For this dataset for buy signal

Signals:

0 = 33432
-1 = 1789



Cumulative Returns Sum:

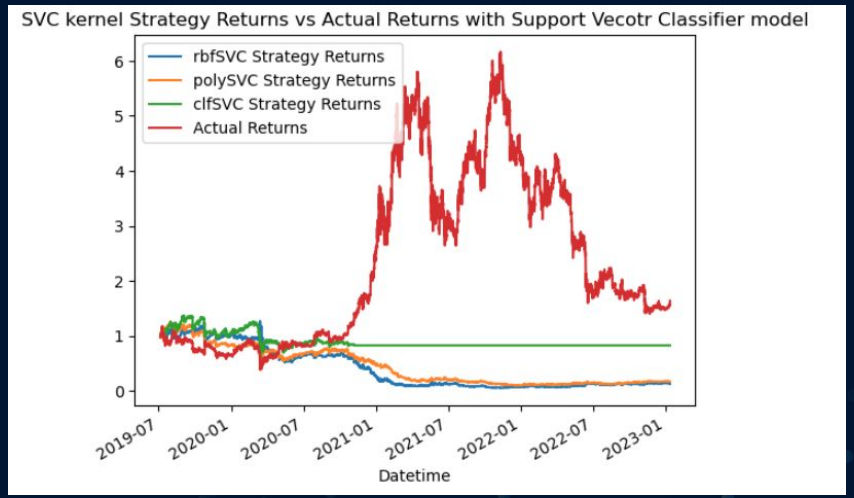
Actual Returns $207,229.02
Strategy Returns $22,885.53

Given this biased data, could models turn it around , even slightly?

SRB Model Analysis

SVC & kNN get resampled
Not Random Forest

—SVC Model—
rbf kernel, poly kernel, clf kernel



—clf kernel

	precision	recall	f1-score	support
-1.0	0.17	0.31	0.22	1512
0.0	0.96	0.92	0.94	29363
accuracy			0.89	30875
macro avg	0.57	0.62	0.58	30875
weighted avg	0.92	0.89	0.91	30875

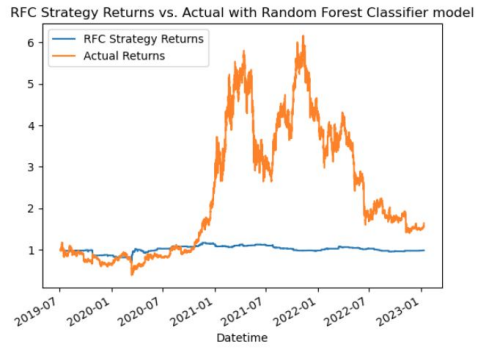
Cumulative Returns Sum:
clfActual Returns $23,169.68
Strategy Returns $72,159.74

Negative returns on portfolio Total for all kernels

SRB Model Analysis

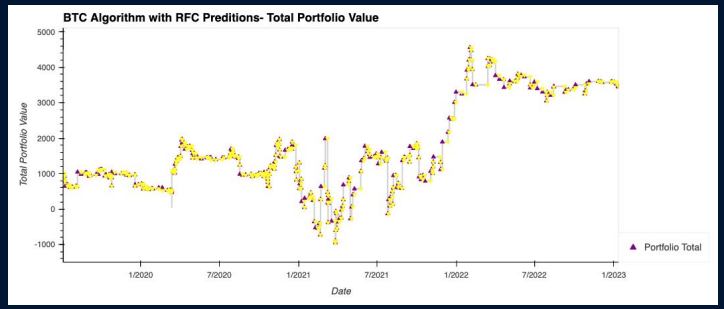
kNN resampled
Not Random Forest

—RFC Model—



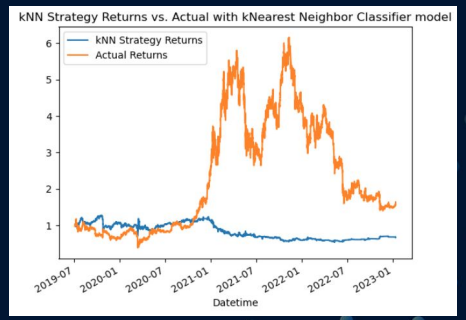
—WELL BALANCED?

	precision	recall	f1-score	support
-1.0	0.56	0.18	0.27	1512
0.0	0.96	0.99	0.98	29363
accuracy			0.95	30875
macro avg	0.76	0.59	0.62	30875
weighted avg	0.94	0.95	0.94	30875

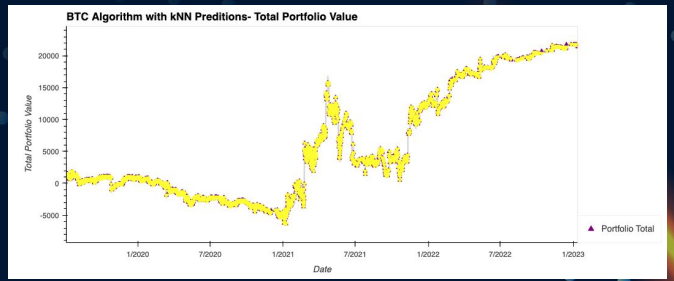


5% return on portfolio

—kNN Model—



	precision	recall	f1-score	support
-1.0	0.16	0.49	0.24	1512
0.0	0.97	0.86	0.91	29363
accuracy			0.84	30875
macro avg	0.56	0.68	0.58	30875
weighted avg	0.93	0.84	0.88	30875



10% return on portfolio

01

kNN

* balanced Classification #s

*good buy/sell/hold Timing

10% return on portfolio

02

RFC

*poor Recall on buy/sell

*precision good

5% return on portfolio

03

SVC

*did not handle volatility well, inconsistent across time

Return losses on portfolio

WHOA!

You still with me????.

Best Strategy for BTC 2019-2023:

EMA

best model: SVC/RFC

THERE IS MORE TO COME, EXCITED YET?

Marissa

Backtesting

Kausar

Freqtrade deployment

Edith

Freqtrade AI options