Crypto Trading Algo Project

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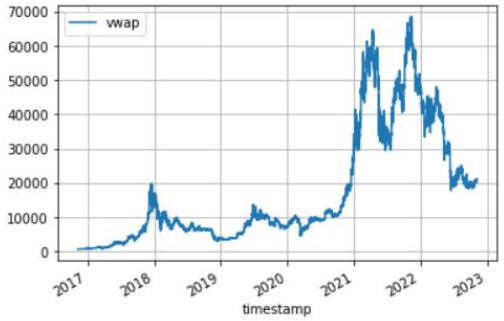
Background

- First released as open source in 2009 bitcoin is the longest-running and most well-known cryptocurrency.
- A major drawback of cryptocurrency trading is the volatility of the market.
- Cryptocurrency markets trade 24/7.
- Quick changing market dynamics can rapidly become an difficult task to manage.

Machine Learning Algorithms



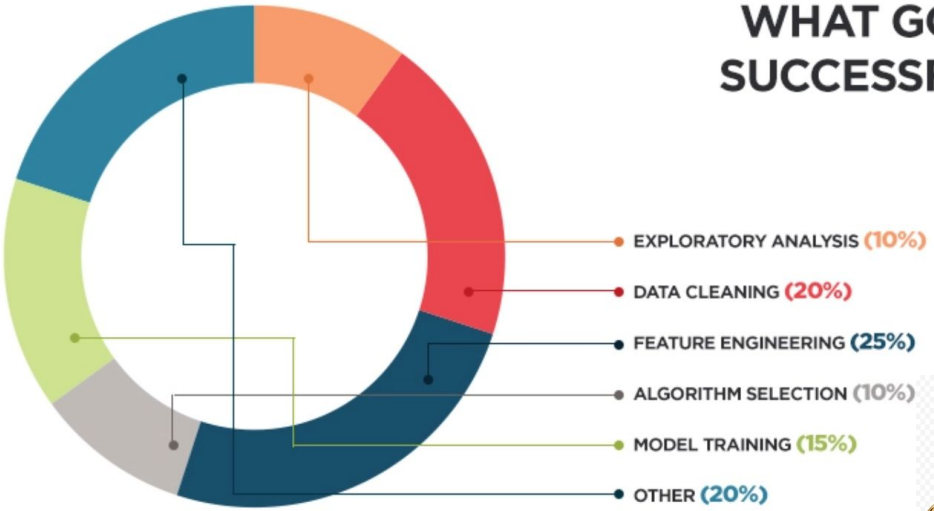
Problem Definition

- Building a trading algorithm that will allow you to determine the ideal times to be purchasing and selling Bitcoin by comparing the short and long term pricing trends.
- We'll use multiple trend and momentum indicators we create from our data to be used as features to enhance the performance of our prediction model.

Data Preparation

- Load libraries and py packages
- Import the BTC-USD dataset from Alpaca API into a Pandas DataFrame.
- Data Cleaning
- Preparing classification data
- Generate trading signals using short and long window SMA values

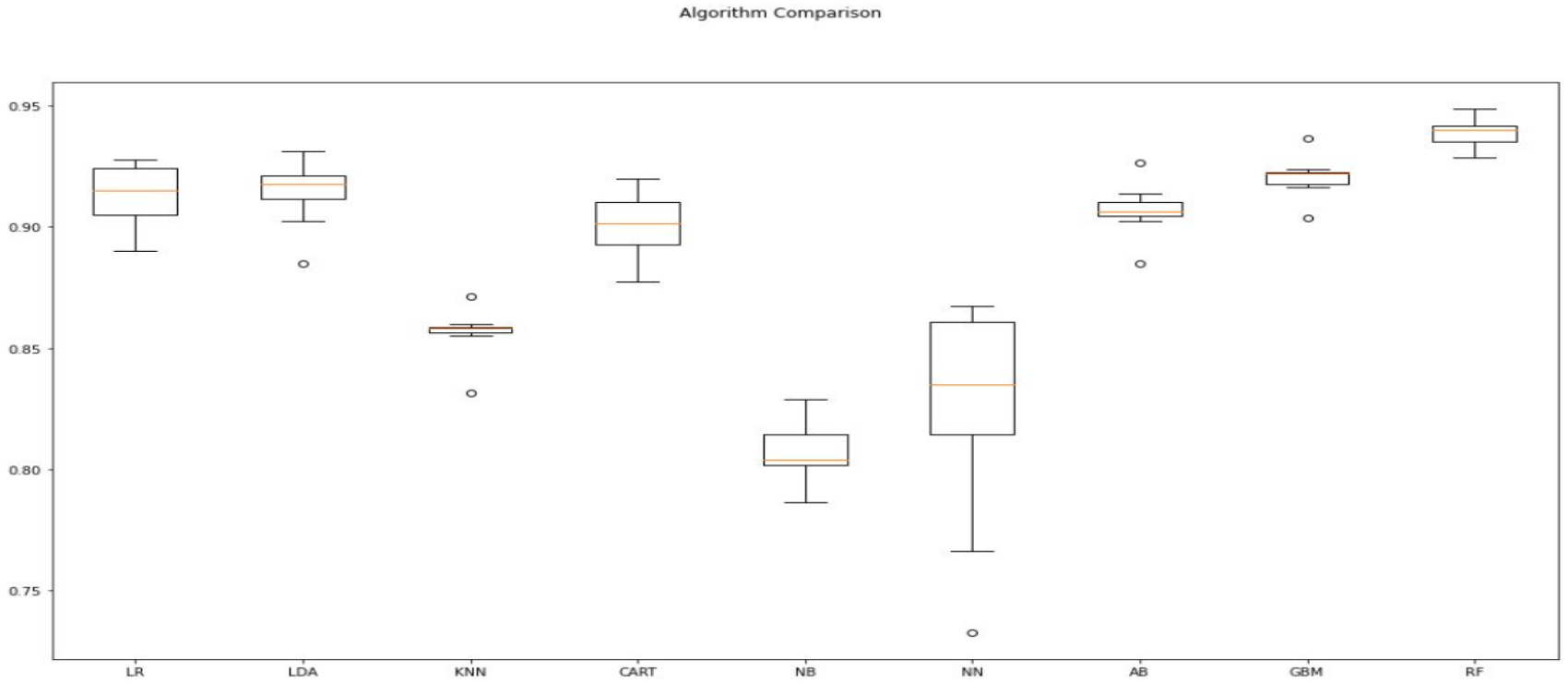
Feature Engineering



Technical Indicators

- Moving average
- Stochastic oscillator
- Relative strength index (RSI)
- Rate of change (ROC)
- Momentum (MOM)

Evaluate Algorithms and Models

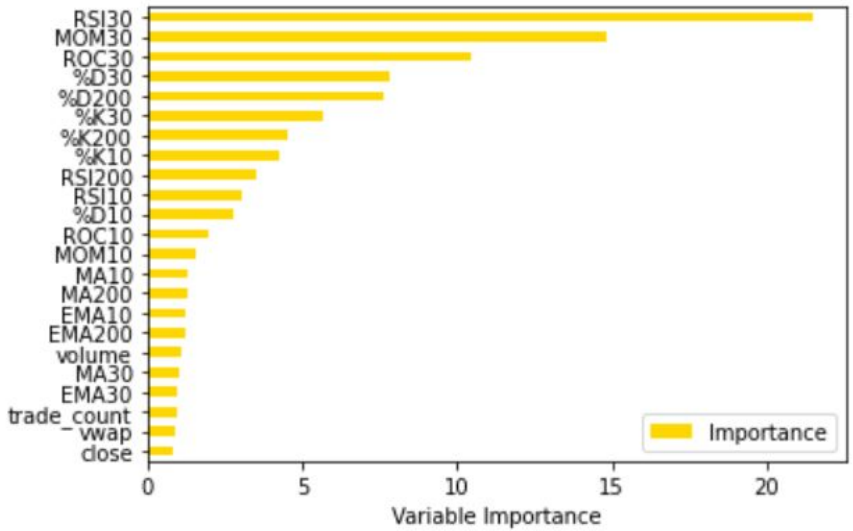


Finalize the Model

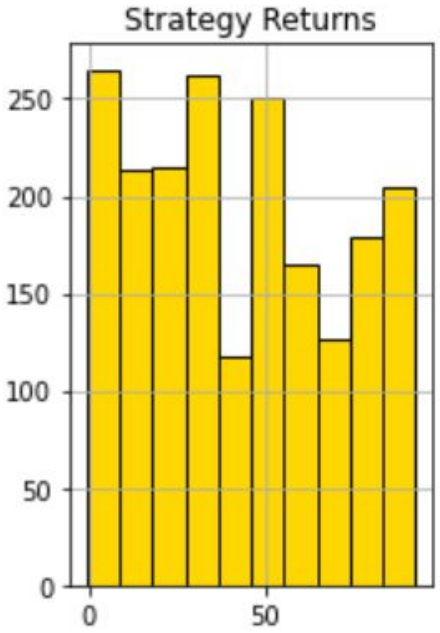
```
# estimate accuracy on validation set
predictions = rf_model.predict(X_validation)
print(accuracy_score(Y_validation, predictions))
print(confusion_matrix(Y_validation, predictions))
print(classification_report(Y_validation, predictions))
```

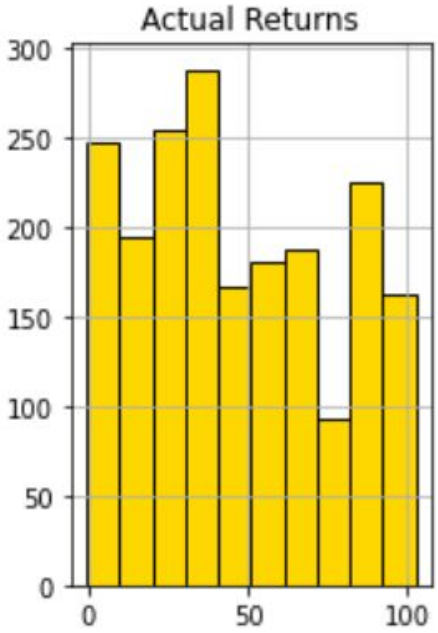
```
0.933
[[1014   69]
 [  65  852]]
              precision    recall  f1-score   support

         0.0       0.94      0.94      0.94      1083
         1.0       0.93      0.93      0.93       917

    accuracy                           0.93      2000
   macro avg       0.93      0.93      0.93      2000
weighted avg       0.93      0.93      0.93      2000
```

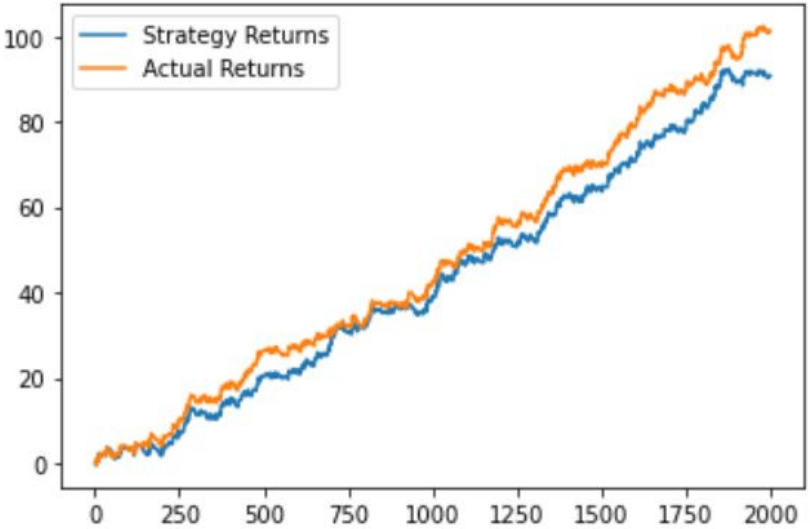
```
Text(0.5, 0, 'Variable Importance')
```



Back testing







Trading Signal Slip

- An hourly running log of our buy/sell signal. You can refresh the model at the top of each hour manually and track if what your trading position should be.

]:

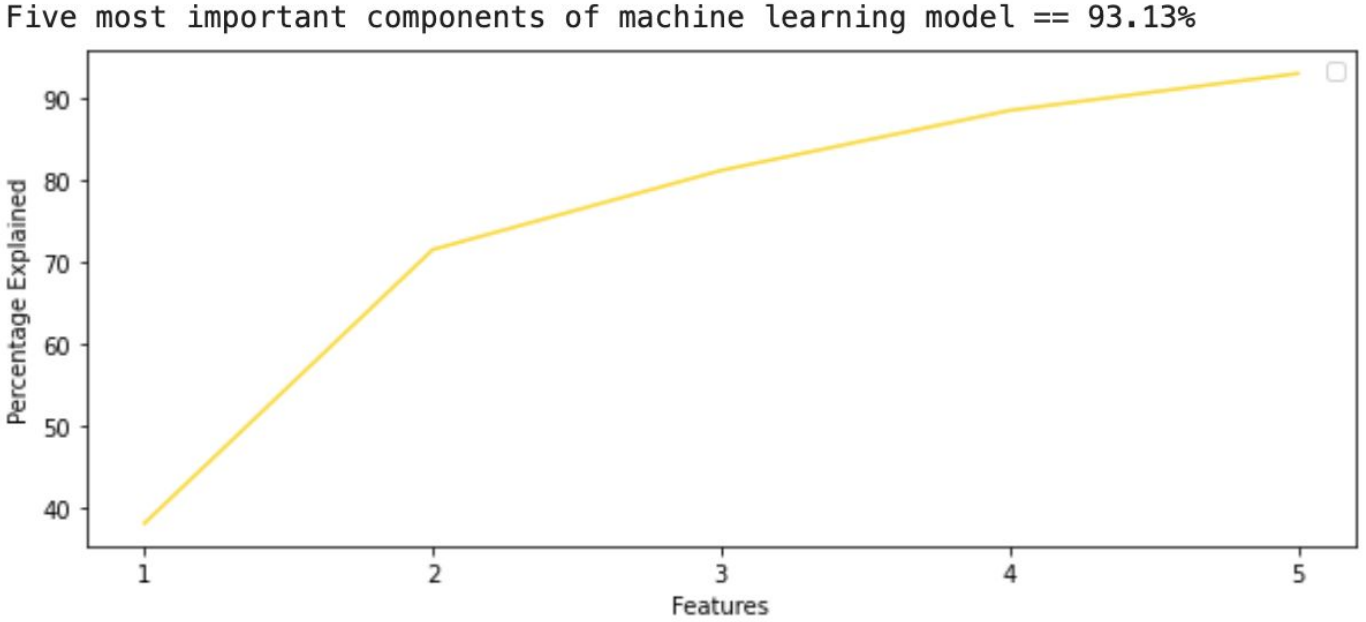
timestamp	signal
2022-11-03 22:00:00+00:00	0.0
2022-11-03 23:00:00+00:00	0.0
2022-11-04 00:00:00+00:00	0.0
2022-11-04 01:00:00+00:00	0.0
2022-11-04 02:00:00+00:00	0.0
2022-11-04 03:00:00+00:00	0.0
2022-11-04 04:00:00+00:00	0.0
2022-11-04 05:00:00+00:00	0.0
2022-11-04 06:00:00+00:00	0.0
2022-11-04 07:00:00+00:00	1.0
2022-11-04 08:00:00+00:00	1.0
2022-11-04 09:00:00+00:00	1.0
2022-11-04 10:00:00+00:00	1.0
2022-11-04 11:00:00+00:00	1.0
2022-11-04 12:00:00+00:00	1.0
2022-11-04 13:00:00+00:00	1.0
2022-11-04 14:00:00+00:00	1.0
2022-11-04 15:00:00+00:00	1.0
2022-11-04 16:00:00+00:00	1.0
2022-11-04 17:00:00+00:00	1.0
2022-11-04 18:00:00+00:00	1.0
2022-11-04 19:00:00+00:00	1.0
2022-11-04 20:00:00+00:00	1.0
2022-11-04 21:00:00+00:00	1.0

Dimensionality Reduction

- Dimensionality Reduction converts higher dimension datasets into lower dimension datasets while ensuring it provides similar information.
- Reduces dimensions by reducing the number of features or observations in a dataset.
- Helps reduce model complexity and noise in data while mitigating overfitting.

Principal Component Analysis and Singular Value Decomposition

- Linear based reduction method that with SVD reduces the amount of features in a dataframe to a defined variable.



Conclusions

- We were able to clearly define our problem, pull relevate, accurate and up to date data, use that data to determine the most effective machine learning model, backtest our model and finally enhance our model through dimensionality reduction.
- Our next steps to testing our algorithm would be to put it to a real world test and start using the buy/sell signals to trade hourly.

Future Enhancements

- The next step after we confirm that our model will likely be profitable would be to build a trading bot that would automatically execute trades on our behalf.
- We were limited in the amount of data we could pull and the rate of our updates could only be reduced to hourly. Ideally we would have pulled data by the minute to ensure that we always had the most relevant information to base our predictions.

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