Machine Learning for Cryptocurrencies

SMU-Fintech-Group 1

08/04/22

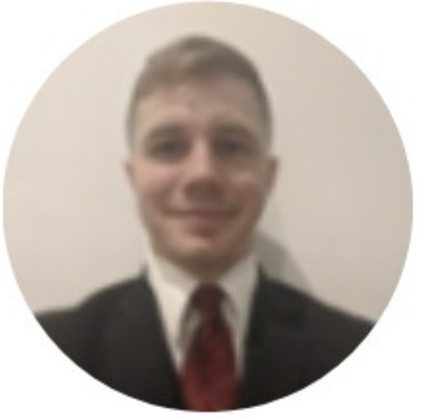
Disclaimer

None of the information or opinions expressed in this presentation constitute financial advice. Please consult a legally certified Financial Advisor before making any permanent financial decisions.

Introductions

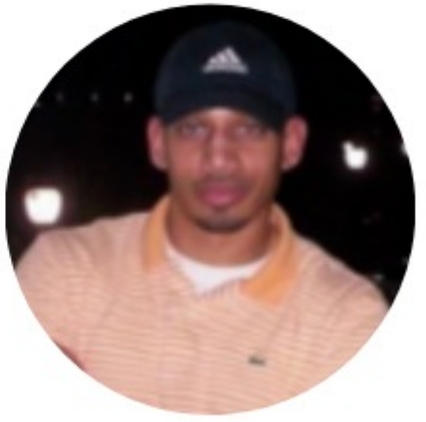
Vicky Lee

Client User Interface Design



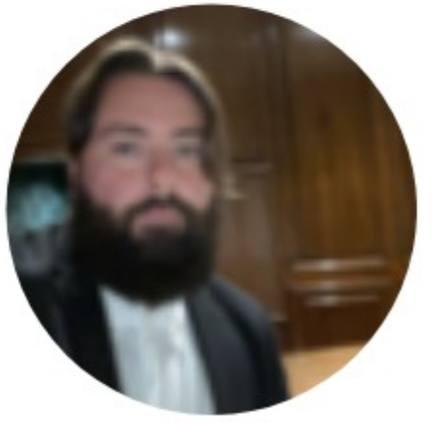
Jeremy Pierce

ML Lead



Michael Morton

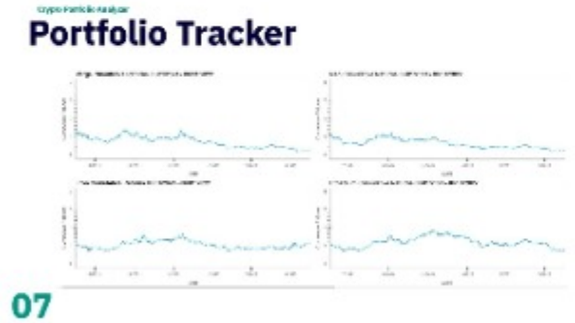
Cluster Analyst



Jay Wiley

ML Development

Context



Why are we here?

After developing a Portfolio Risk Analyzer we decided to incorporate Machine Learning as an offering to clients.

What have we been doing?

Researching and implementing Machine Learning and cloud based Client User Interface functionality for a feature rich utility.

What's the overall strategy?

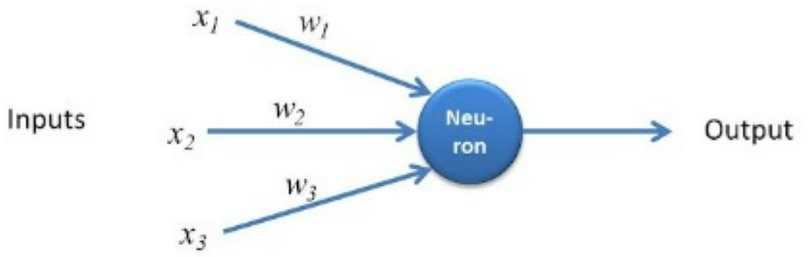
Develop refined Machine Learning functionality for clients to incorporate in their trading strategies.

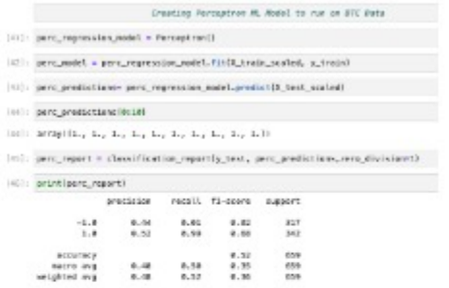
Machine Learning

A branch of computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

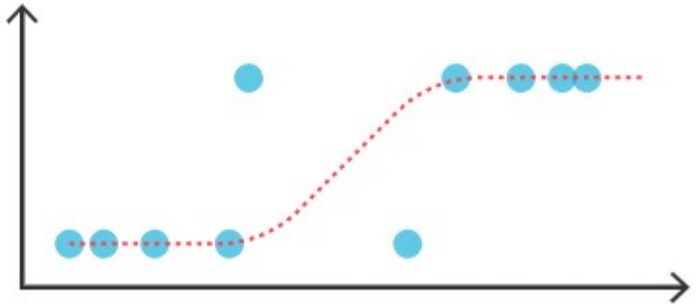
We investigated three ML models for use with cryptocurrencies BTC, ETH, and BNB:

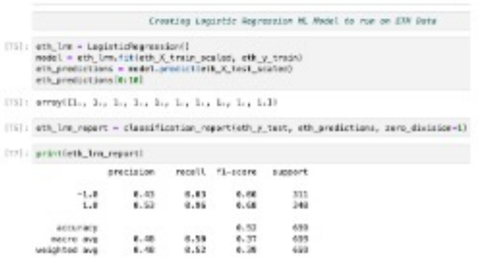
1. Perceptron
2. Logistic Regression
3. Decision Tree Classifier



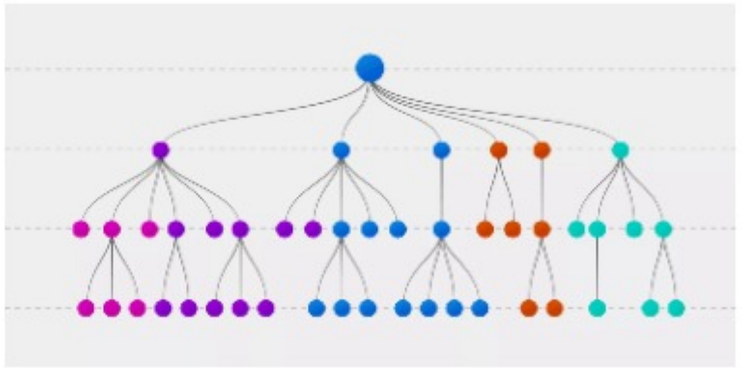


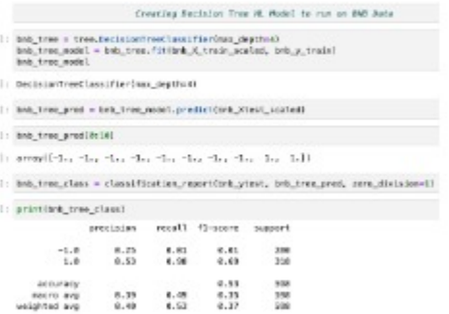
Perceptron Model





Logistic Regression Model





Decision Tree Classifier

Proof of Concept & Initial Results

Finding 1

Perceptron algorithm is a two-class (binary) classification machine learning algorithm. We applied it to BTC simple moving averages (SMA) to make buy/sell predictions.

Finding 2

Logistic regression is a statistical analysis method to predict a binary outcome. Based on the historical SMA data for ETH we used the model to predict buy/sell.

Finding 3

Decision Tree is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome. In this case whether to buy or sell BNB.

Finding the best gains

Finding the Optimal Parameters


```python
def find_optimal_parameter(df):
    # predefine several parameter sets
    atr_period = [6, 7, 8, 9, 10]
    atr_multiplier = [1.0, 1.5, 2.0, 2.5, 3.0]
    roi_list = []

    # for each period and multiplier, perform backtest
    for period, multiplier in [(x,y) for x in atr_period for y in atr_multiplier]:
        new_df = df
        supertrend = Supertrend(df, period, multiplier)
        new_df = df.join(supertrend)
        new_df = new_df[period:]
        entry, exit, roi = backtest_supertrend(new_df, 100000)
        roi_list.append((period, multiplier, roi))

    print(pd.DataFrame(roi_list, columns=['ATR_period','Multiplier','ROI']))

    # return the best parameter set
    return max(roi_list, key=lambda x:x[2])
df = yf.download('BTC-USD', start='2020-01-01')
optimal_param = find_optimal_parameter(df)
print(f'Best parameter set for BTC: ATR Period={optimal_param[0]}, Multiplier={optimal_param[1]}, ROI={optimal_param[2]}')
```

Fine-tuning each crypto

Earning from investing $100k in Ethereum $2356160.27 (ROI = 2356.16%)

	ATR_period	Multiplier	ROI
0	7	1.0	7.876950e+05
1	7	1.5	1.123204e+06
2	7	2.0	1.163427e+06
3	7	2.5	1.447308e+06
4	7	3.0	2.194360e+06
5	8	1.0	1.060796e+06
6	8	1.5	9.557627e+05
7	8	2.0	1.133637e+06
8	8	2.5	1.448994e+06
9	8	3.0	2.494504e+06
10	9	1.0	7.974494e+05
11	9	1.5	9.566969e+05
12	9	2.0	1.187976e+06
13	9	2.5	1.790718e+06
14	9	3.0	2.455172e+06
15	10	1.0	7.943420e+05
16	10	1.5	5.800104e+05
17	10	2.0	8.485830e+05
18	10	2.5	1.924554e+06
19	10	3.0	2.456160e+06

Best parameter set for ETH: ATR Period=8, Multiplier=3.0, ROI=2494504.221801758

Earning from investing $100k into Binance is $2547337.02 (ROI = 2547.34%)

	ATR_period	Multiplier	ROI
0	7	1.0	1.286478e+06
1	7	1.5	5.795876e+05
2	7	2.0	3.820767e+06
3	7	2.5	2.605527e+06
4	7	3.0	2.631505e+06
5	8	1.0	1.395152e+06
6	8	1.5	6.840009e+05
7	8	2.0	2.846277e+06
8	8	2.5	2.640480e+06
9	8	3.0	2.320538e+06
10	9	1.0	1.736045e+06
11	9	1.5	5.743521e+05
12	9	2.0	3.138433e+06
13	9	2.5	2.452235e+06
14	9	3.0	2.305897e+06
15	10	1.0	1.742486e+06
16	10	1.5	6.293468e+05
17	10	2.0	2.759568e+06
18	10	2.5	2.019024e+06
19	10	3.0	2.647337e+06

Best parameter set for BNB: ATR Period=7, Multiplier=2.0, ROI=3820767.4514198303

Earning from investing $100k in Bitcoin is $-60.0 (ROI = -0.06%)

	ATR_period	Multiplier	ROI
0	6	1.0	99715.0
1	6	1.5	99840.0
2	6	2.0	99890.0
3	6	2.5	99915.0
4	6	3.0	99945.0
5	7	1.0	99725.0
6	7	1.5	99845.0
7	7	2.0	99895.0
8	7	2.5	99920.0
9	7	3.0	99945.0
10	8	1.0	99725.0
11	8	1.5	99845.0
12	8	2.0	99890.0
13	8	2.5	99925.0
14	8	3.0	99945.0
15	9	1.0	99725.0
16	9	1.5	99850.0
17	9	2.0	99885.0
18	9	2.5	99925.0
19	9	3.0	99945.0
20	10	1.0	99725.0
21	10	1.5	99850.0
22	10	2.0	99885.0
23	10	2.5	99925.0
24	10	3.0	99940.0

Best parameter set for BTC: ATR Period=6, Multiplier=3.0, ROI=99945.0

Buy & Sell Signals

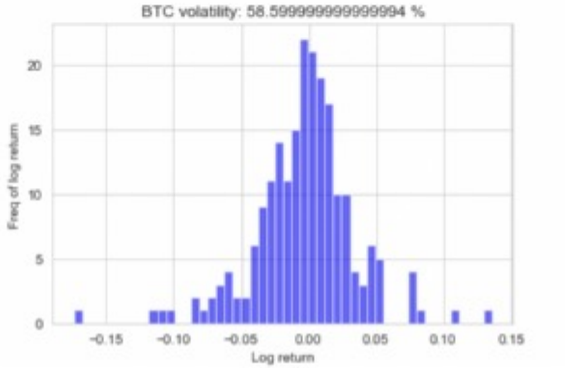
What is Volatility?

Standard deviation

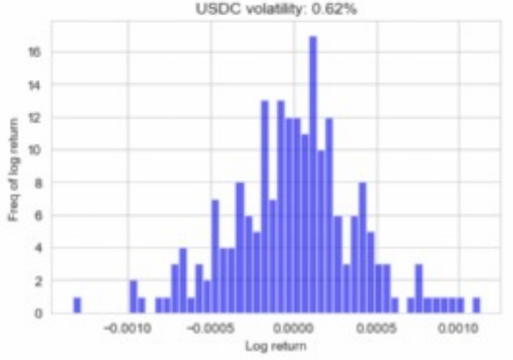
- $\sigma_p = \sigma_{daily} \times \sqrt{p}$
- $\sigma_{annually} = \sigma_{daily} \times \sqrt{252}$

(252 trading days per year)

Text(0.5, 1.0, 'BTC volatility: 58.599999999999994 %')



Text(0.5, 1.0, 'USDC volatility: 0.62%')



Standard Deviation

Is on average, how far each score lies from the mean. In normal distributions, a high standard deviation means that values are generally far from the mean, while a low standard deviation indicates that values are clustered close to the mean.

BTC Volatility

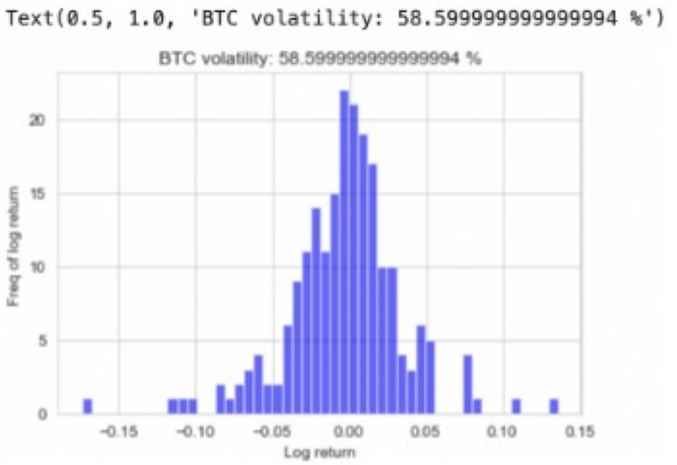
High volatility means that experienced traders can make a nice profit from trading Bitcoin. As Bitcoin matures and becomes more mainstream, its price will rise and its volatility will decrease accordingly.

USDC Volatility

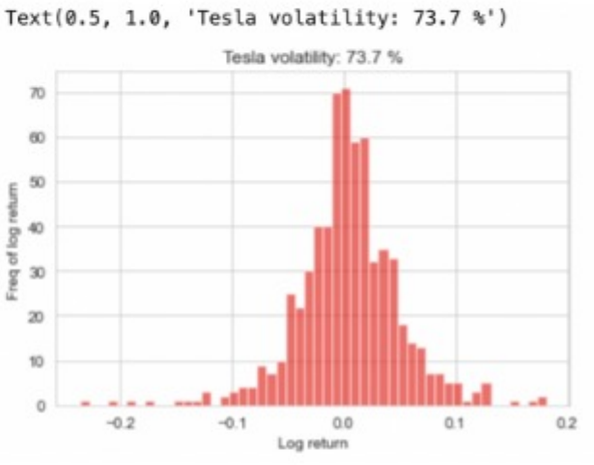
One potential winner of the current turmoil is USD Coin, backed by reserves of cash and U.S. Treasury notes, which has seen its market cap steadily climb to more than $54 billion from $52 billion over the past month even as other stablecoins struggled.

Crypto coins are less volatile

“If you look at the last two years, if you look at the tech stock price versus the bitcoin price, many of the tech stocks are more volatile than bitcoin. If you look at the data, bitcoin’s is more stable than Tesla ."



BTC Volatility

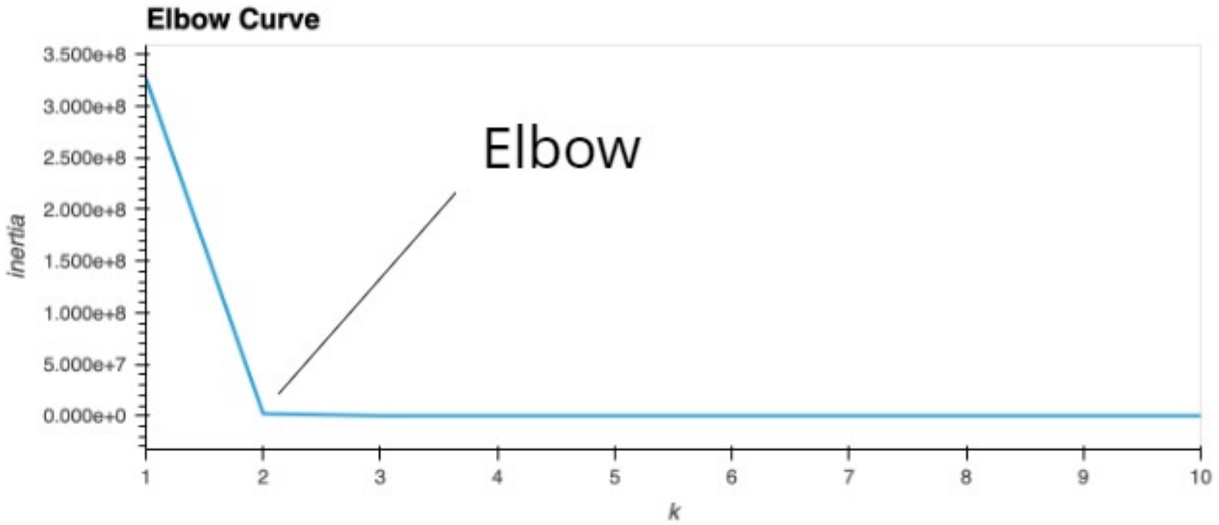


TSLA Volatility

Finding the Elbow

We group these coins as a first step to understand the coins in a machine learning system.

This is helpful to determine how many coins we need to capture on the majority of the variation in the data. The elbow plot visualizes the standard deviation of each coin Where the elbow appears is usually the threshold for identifying the majority of the variation.



2021 - 2022

What is movement?

‘Movement’ is defined as difference of opening and closing prices of a particular day. Positive movement suggests to go long on stock(buy) and negative movement suggests to short the stock(sell). We calculated the movement over the year.

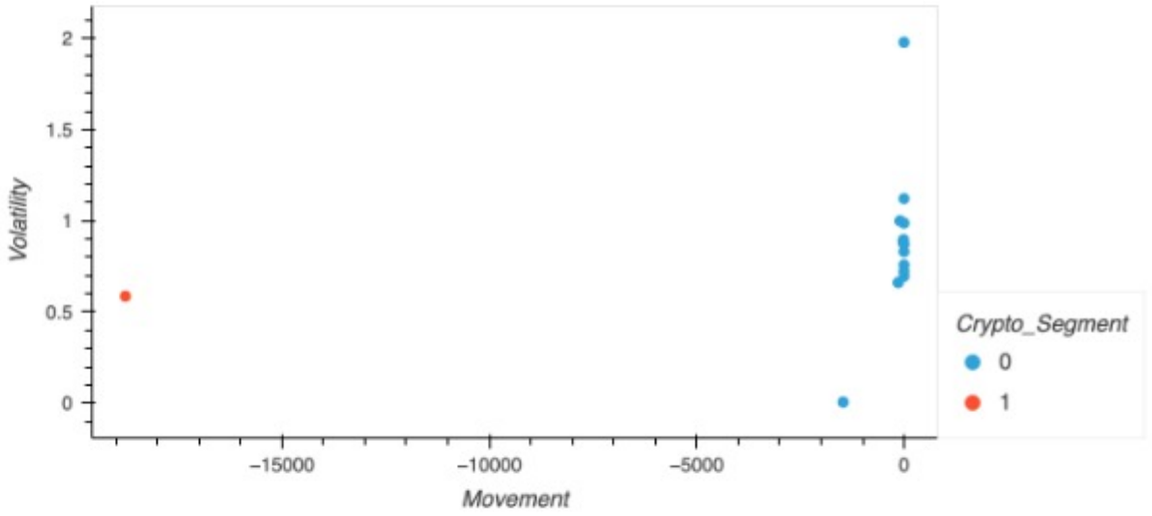
```
Crypto Coin:BTC-USD, Change:-18774.576171875
Crypto Coin:ETH-USD, Change:-1469.1765747070312
Crypto Coin:USDC-USD, Change:-0.0007677674293518066
Crypto Coin:BNB-USD, Change:-140.7424774169922
Crypto Coin:ADA-USD, Change:-0.6341279149055481
Crypto Coin:XRP-USD, Change:-0.3683289885520935
Crypto Coin:SOL-USD, Change:-96.8180046081543
Crypto Coin:DOGE-USD, Change:-0.07655707374215126
Crypto Coin:DOT-USD, Change:-15.924806594848633
Crypto Coin:UNI-USD, Change:-0.0001579999880050309
Crypto Coin:BTT2-USD, Change:-2.000000108637323e-06
Crypto Coin:TRX-USD, Change:0.005309991538524628
Crypto Coin:NEO-USD, Change:-11.792947769165039
Crypto Coin:XVG-USD, Change:-0.009336998453363776
Crypto Coin:XMR-USD, Change:-25.721336364746094
```

2021 - 2022

Displaying the Cluster

We want to identify the natural groupings of coins that have similar volatility and movements.

The data we use to crypto segmentation include the volatility, how much movement and so on. We created a model to try to understand what these groups of coins are like so that you can design a portfolio that appeal to group members.



2021 - 2022

Roadmap

APR-22

Starting SMU FinTech Classes

JUN-22

Product ONE
Crypto Portfolio Analyzer
Created with CLI

AUG-22

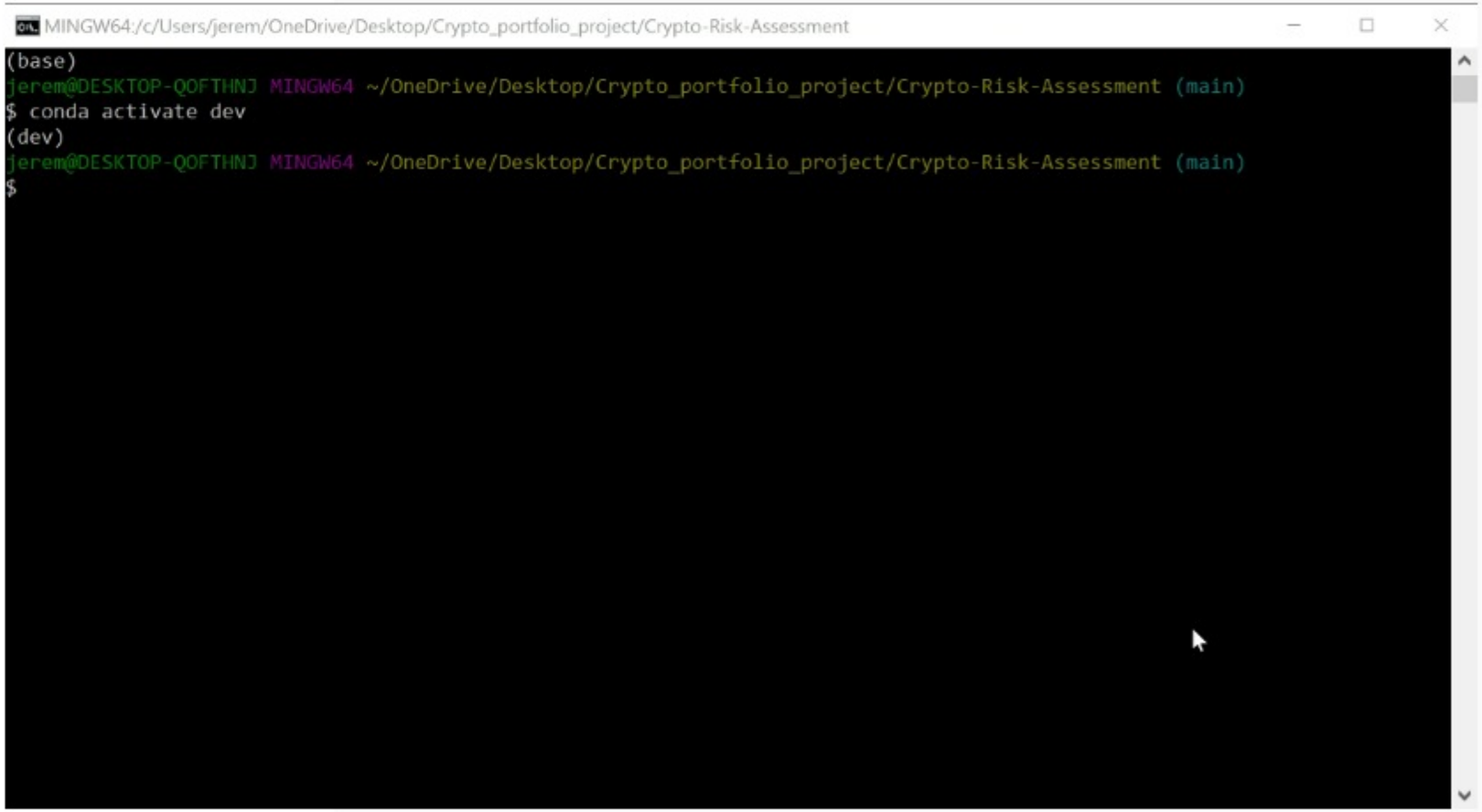
Product TWO
Machine Learning for
Cryptocurrencies Created
with CUI

OCT-22

Product THREE
Further refine Crypto
Portfolio Analyzer with
Blockchain technologies

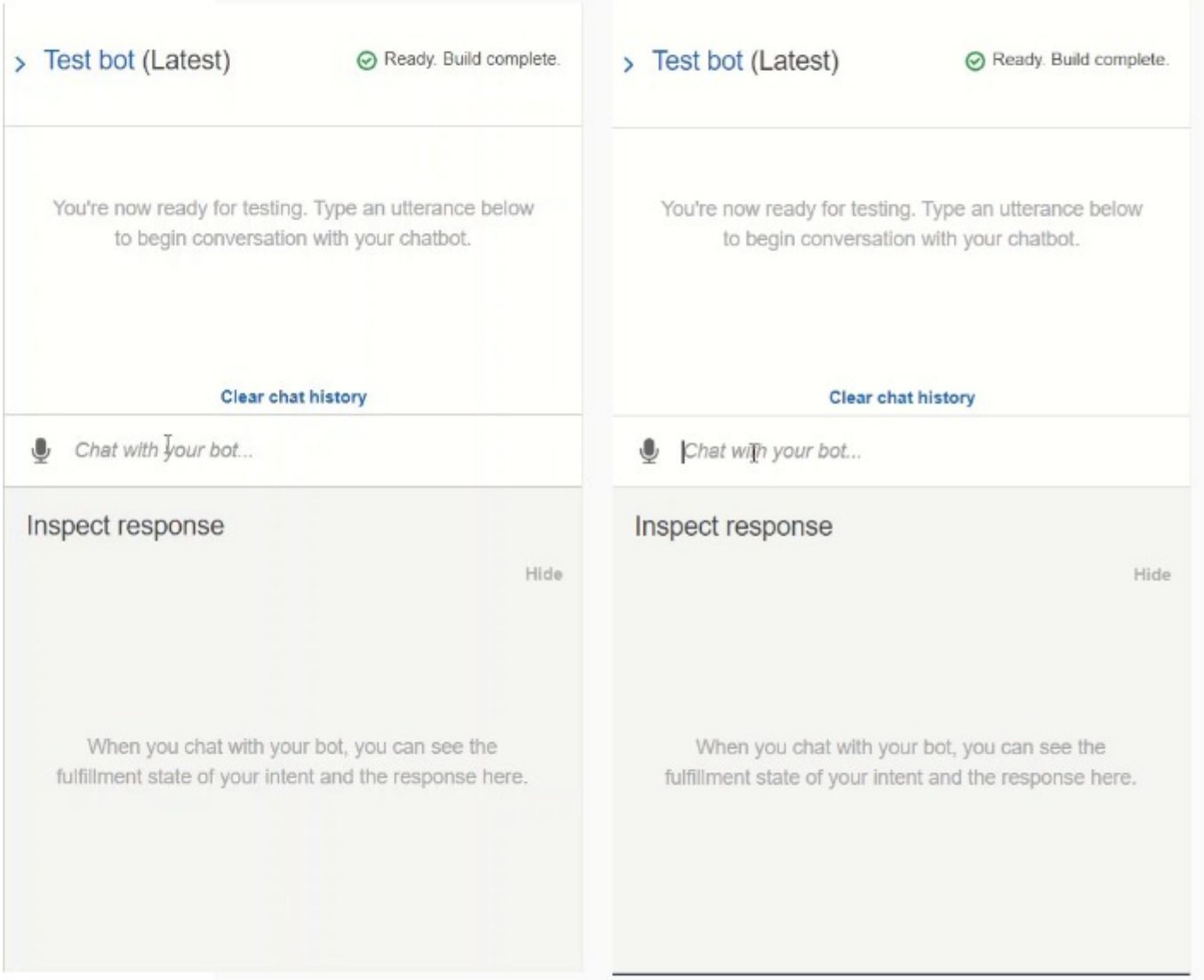
Demo

Product ONE - CLI

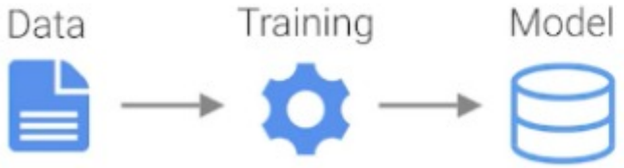


Demo

Product TWO - CUI



Strategic Value



Data Utilization

Help build confidence by providing faster and more accurate recommendations than human brain alone

Customer Engagement

The power of predictive model helps to improve reliability. Gain experience to define and reflect customers' requirements in a decision strategy.

Competitive Edge

You need the right partner to help you with your investment recommendations. Our machine learning methodology ensures greater opportunities.

Questions?