

CRYPTOCURRENCIES

Prediction Analysis & Buying Actions

By Michael Cuffaro

Introduction

What Will This Project Deliver?

Insight into the cryptocurrency market by:

- Investigating potential correlations between cryptocurrencies
- Using Machine Learning to make prediction models
- Using models to develop a trading strategy

Introduction (Cont'd)

Which Cryptocurrencies Will Be Included?

- Bitcoin, Ethereum, Litecoin, and Zcash

How Will Analysis Be Performed?

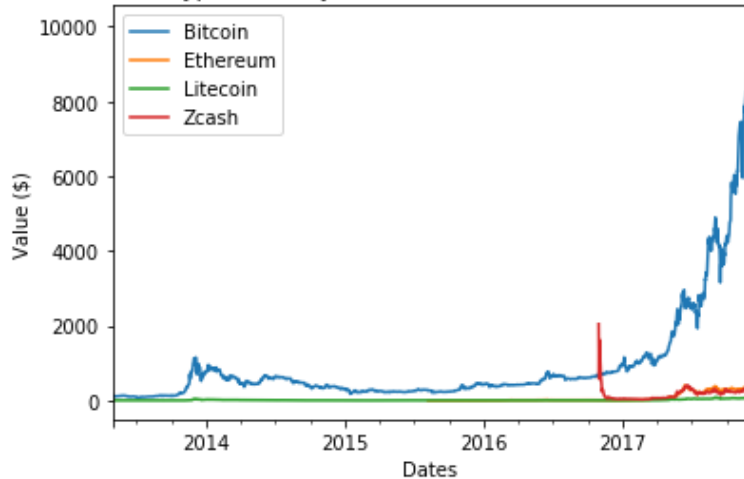
- Analysis will be performed with Python
- Python packages utilized: NumPy, Pandas, Seaborn, Matplotlib, Sklearn

Where to Retrieve Project Code?

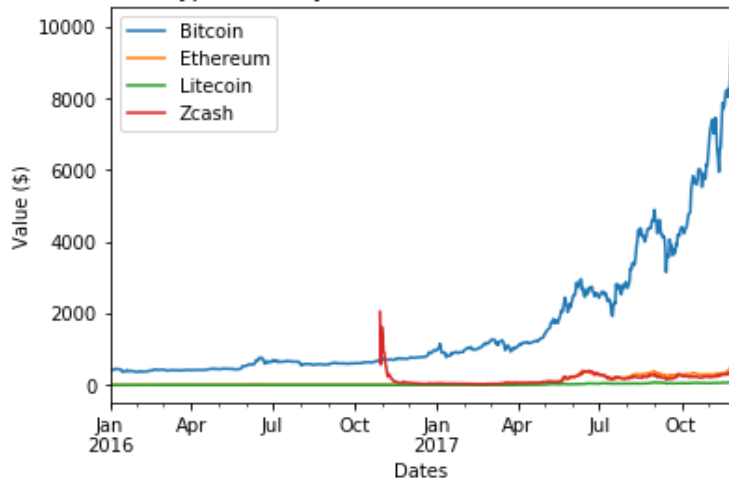
- [GitHub](https://github.com/mlight9/Cryptocurrencies.git) (Link: <https://github.com/mlight9/Cryptocurrencies.git>)

Exploring Value over Time

Cryptocurrency Value vs. Time (2013 - Present)

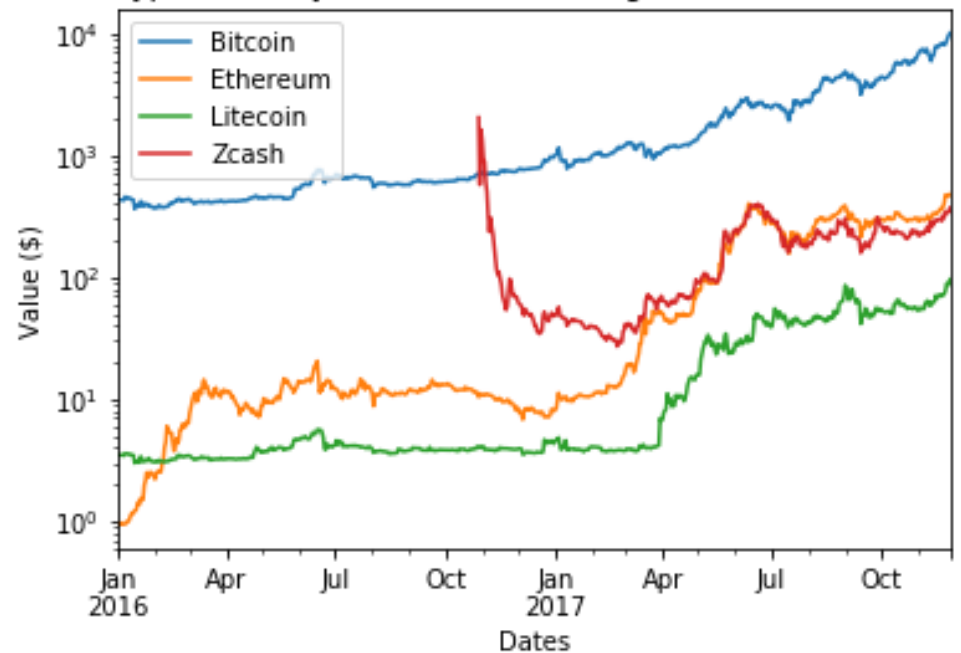


Cryptocurrency Value vs. Time (2016 - Present)



Same Scale Comparison

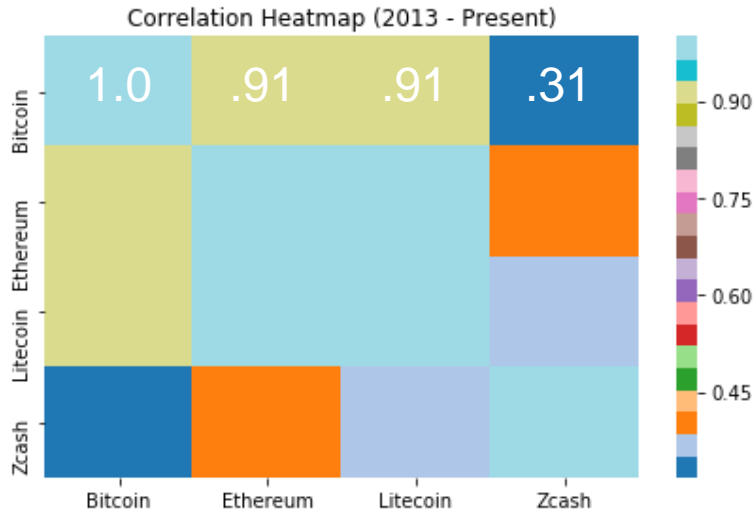
Cryptocurrency Value vs. Time - Logscale (2016 - Present)



Data Source: [CoinMarketCap](https://coinmarketcap.com/)

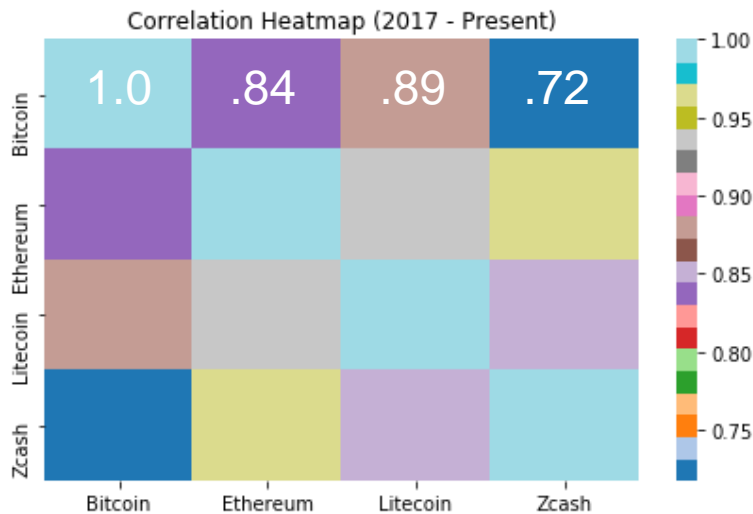
Date Range Analyzed: 4/28/2013 - 11/28/2017

Investigating Correlation



2013 - Present

Average Pearson Correlation is .78



2017 - Present

Average Pearson Correlation is .86

Modelling Background

Best Overall Model

- Determined by Lowest Root Mean Square Error (RMSE)

What is RMSE?

- RMSE tells us on average how far our predictions are from true cryptocurrency values

Look Back Period

- Number of days used to make a single day prediction

Models Being Investigated

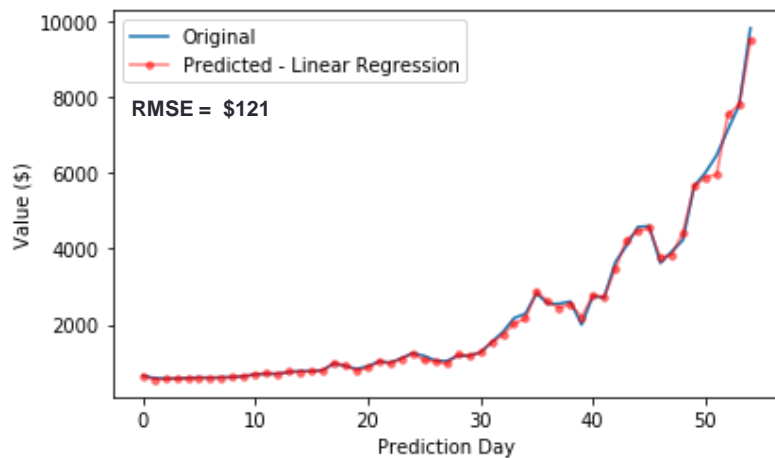
- Linear Regression
- Ridge Regression

Model Selection – Linear Regression

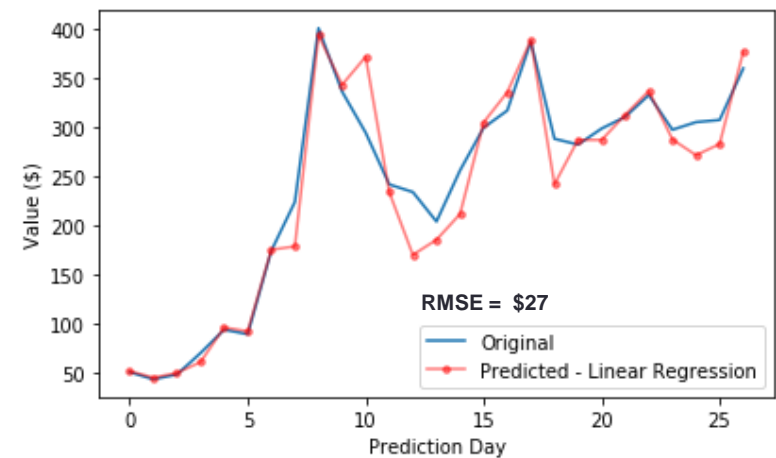
RMSE for Each Cryptocurrency Model					
Look Back Period (Days)	Bitcoin (\$)	Ethereum (\$)	Litecoin (\$)	Zcash (\$)	Σ RMSE's (\$)
1	136.6	15.7	2.49	42.3	197.16
2	148.1	17.2	2.8	48.1	216.18
3	137.8	16.8	3.07	17.7	175.33
4	163.6	15	2.96	20.7	202.2
5	152.7	20.6	2.92	19	195.25
6	150.7	16.8	2.86	14.7	185.02
7	143.5	25.3	1.98	24.1	194.78
8	193.5	21.7	4.17	22.4	241.77
9	121.2	26.9	2.97	19.1	170.22
10	170.7	19.4	3.75	22.9	216.73
20	203.2	40.8	3.78	61.3	309.05
30	186.2	16.6	3.78	61.3	267.84

Model Predictions – Linear Regression

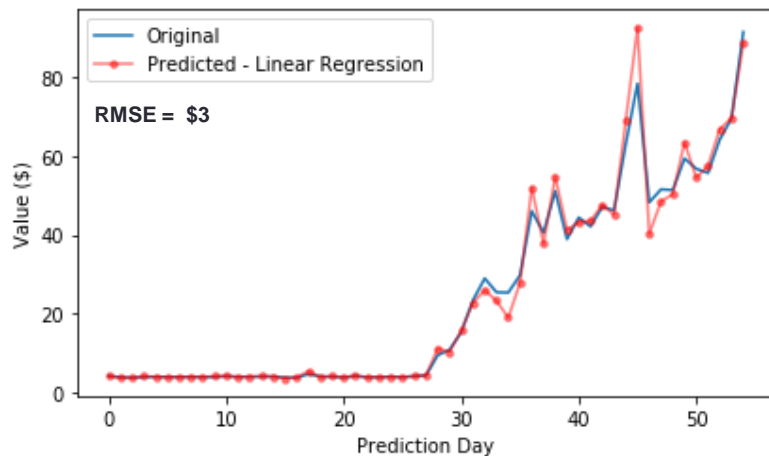
Bitcoin 1 Day Predictions Using 9 Days of Historical Data



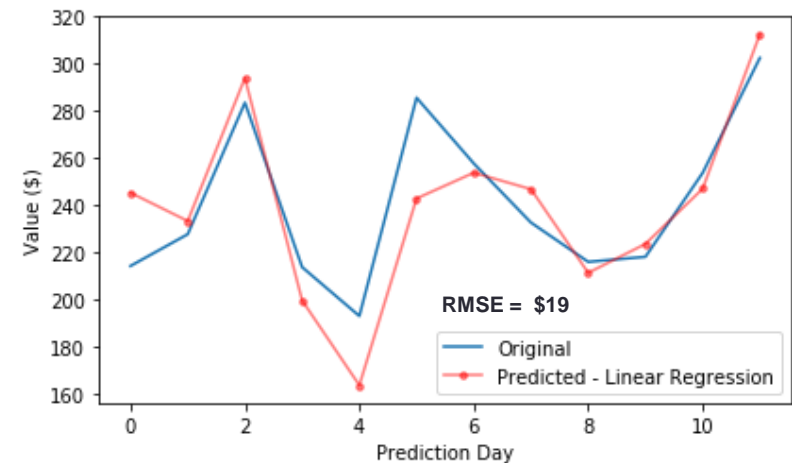
Ethereum 1 Day Predictions Using 9 Days of Historical Data



Litecoin 1 Day Predictions Using 9 Days of Historical Data



Zcash 1 Day Predictions Using 9 Days of Historical Data

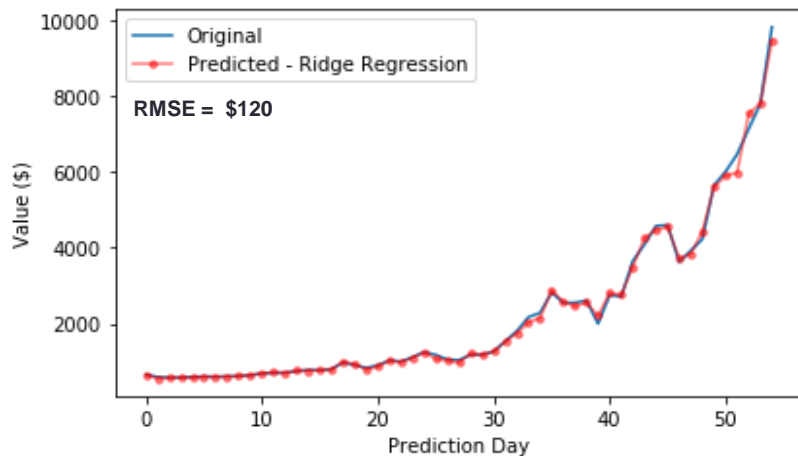


Model Selection – Ridge Regression

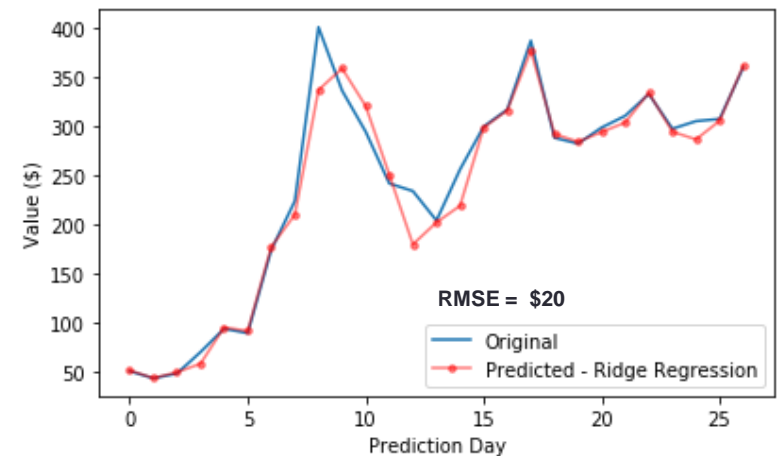
RMSE for Each Cryptocurrency Model					
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1	136.69	15.69	2.49	42.34	197.21
2	148.08	15.19	2.8	47.94	214.01
3	137.82	16.75	2.11	17.72	174.4
4	163.5	14.69	2.96	20.7	201.85
5	153.61	24.9	2.92	18.14	199.57
6	152.48	16.6	2.31	14.62	186.01
7	146.59	25.74	2.08	23.5	197.91
8	197.53	30.3	4.33	22.41	254.57
9	120.29	19.84	2.07	18.11	160.31
10	172.08	19.84	3.74	19.66	215.32
20	225.04	30.59	4.08	25.95	285.65
30	150.16	19.49	2.73	31.87	204.25

Model Predictions – Ridge Regression

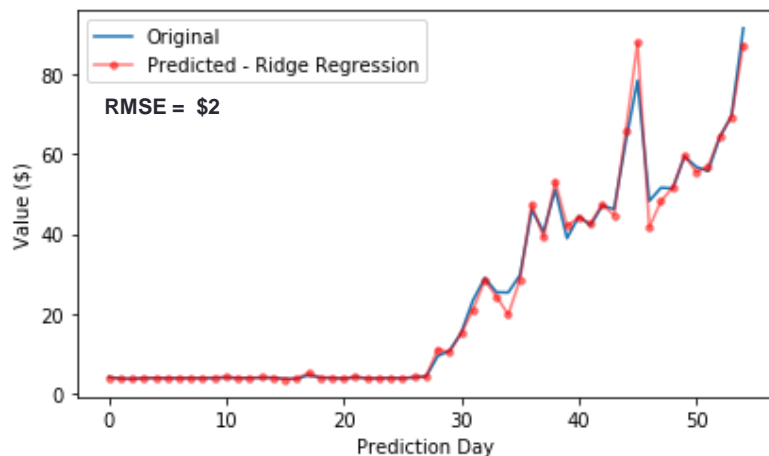
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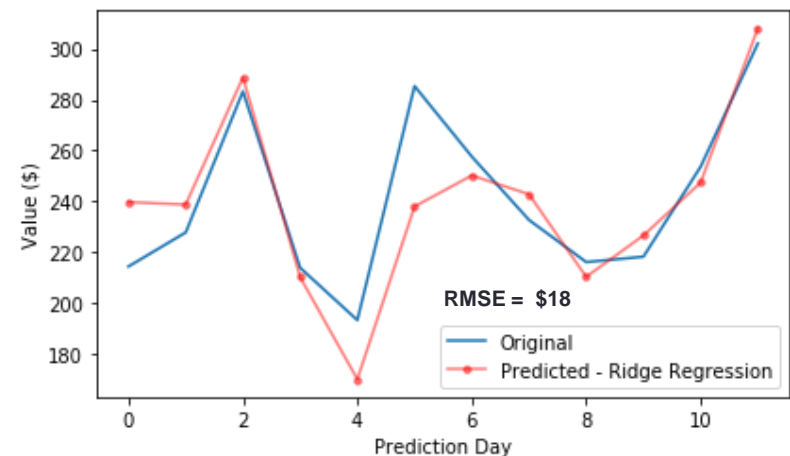
Ethereum 1 Day Predictions Using 9 Days of Historical Data



Litecoin 1 Day Predictions Using 9 Days of Historical Data



Zcash 1 Day Predictions Using 9 Days of Historical Data



Trading Strategy Based on Models

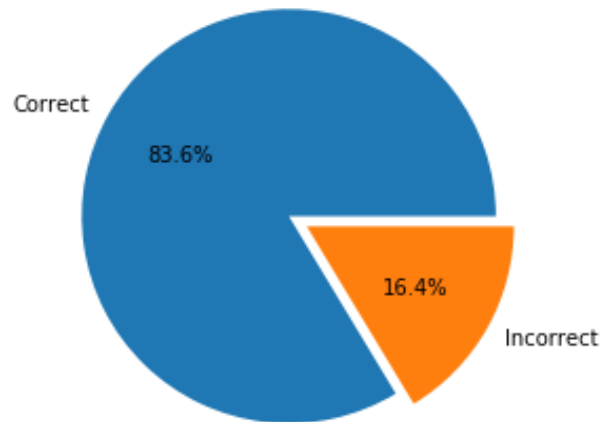
Trading Strategy Assumptions

- Long-term investing
- Actions will encompass a “Buy” or “Hold”
- The difference in price over consecutive days will be used to determine trading action

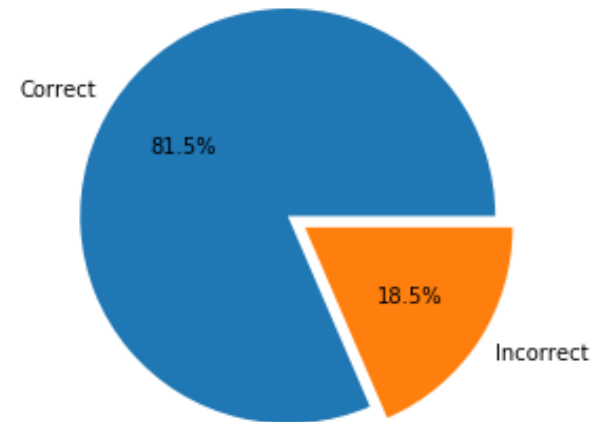
Trading Action Summary	
Comparison of Consecutive Days	Action
Negative (Price Decreasing)	Buy
Positive (Price Increasing)	Hold

Trading Strategy Outcomes – Linear Regression

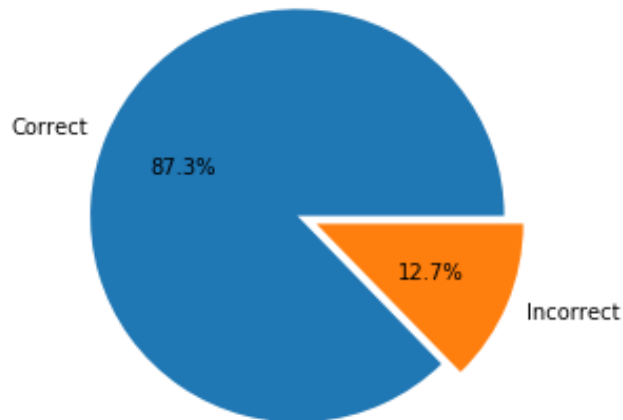
Bitcoin Prediction Outcome with Linear Regression



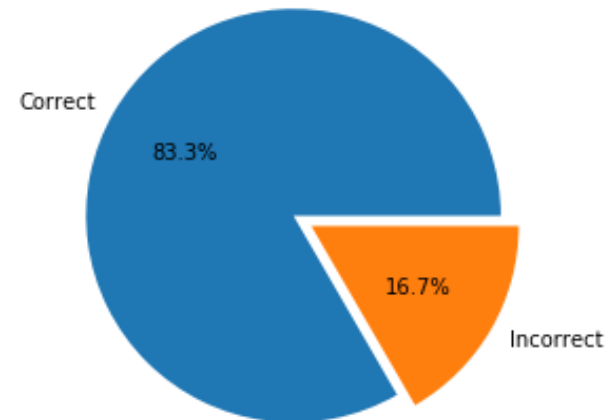
Ethereum Prediction Outcome with Linear Regression



Litecoin Prediction Outcome with Linear Regression

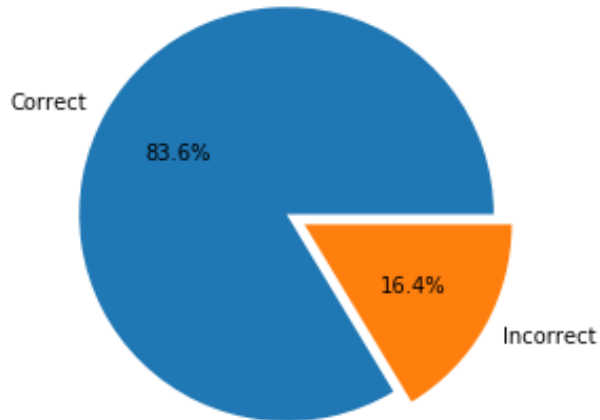


Zcash Prediction Outcome with Linear Regression

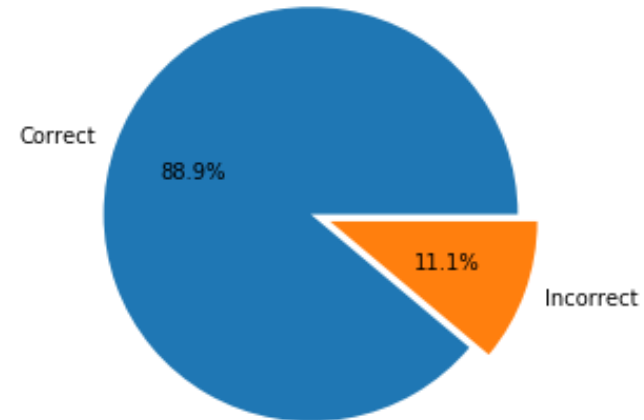


Trading Strategy Outcomes – Ridge Regression

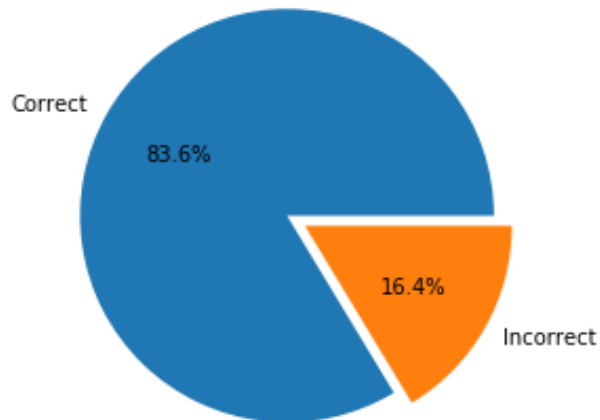
Bitcoin Prediction Outcome with Ridge Regression



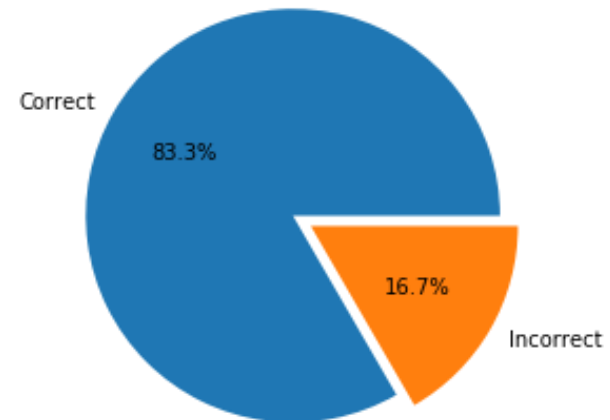
Ethereum Prediction Outcome with Ridge Regression



Litecoin Prediction Outcome with Ridge Regression



Zcash Prediction Outcome with Ridge Regression



Summary

- Strong positive correlation (.86) is present between Bitcoin, Litecoin, Ethereum, and Zcash
- Optimal model produced with Ridge Regression using 9 days of Historical data

Optimal Prediction Model Summary	
Cryptocurrency	Avg. Price Variance
Bitcoin	\$120
Ethereum	\$20
Litecoin	\$2
Zcash	\$18

- Trading strategy offers at least 80% accuracy across all four cryptocurrencies