

# CRYPTOCURRENCIES

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Prediction Analysis & Buying Actions

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# 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?

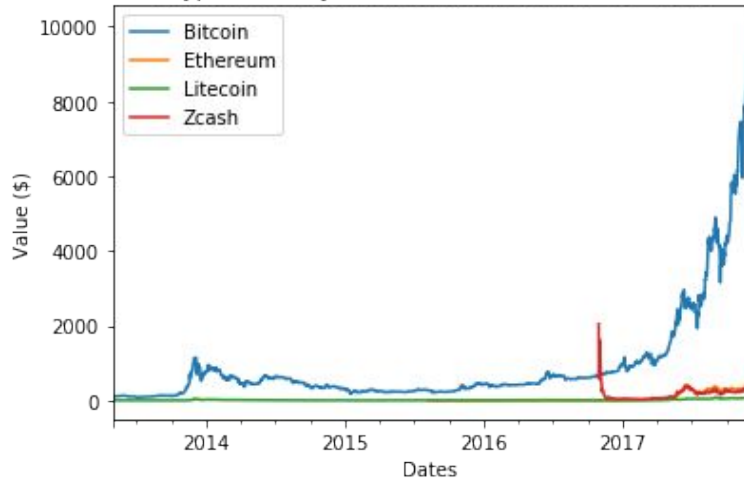
- Analysis will be performed with Python
- Python packages utilized: NumPy, Pandas, Seaborn, Matplotlib, Sklearn

## Where to Retrieve Project Code?

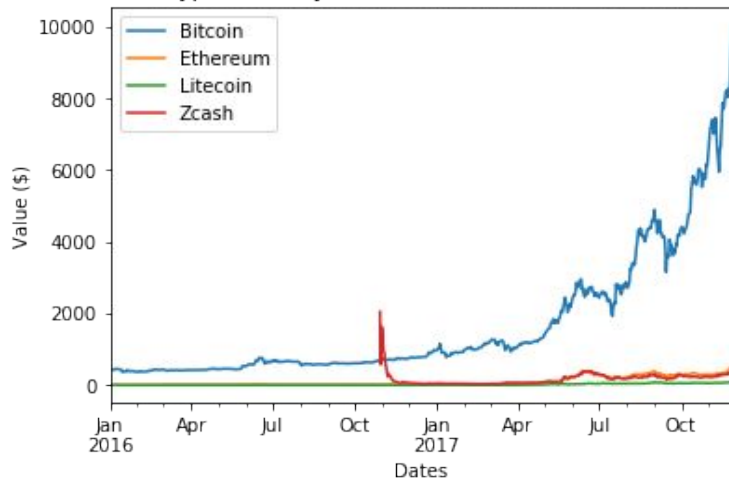
- [GitHub](https://github.com/mlight9/Cryptocurrencies.git) (Link: <https://github.com/mlight9/Cryptocurrencies.git>)

# Exploring Value over Time

Cryptocurrency Value vs. Time (2013 - Present)

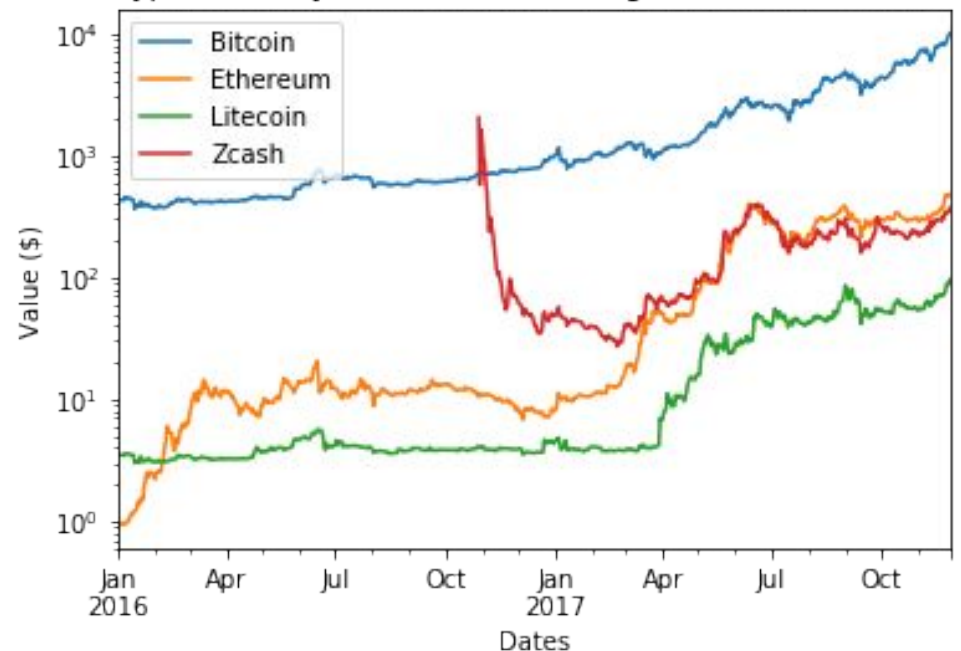


Cryptocurrency Value vs. Time (2016 - Present)



## Same Scale Comparison

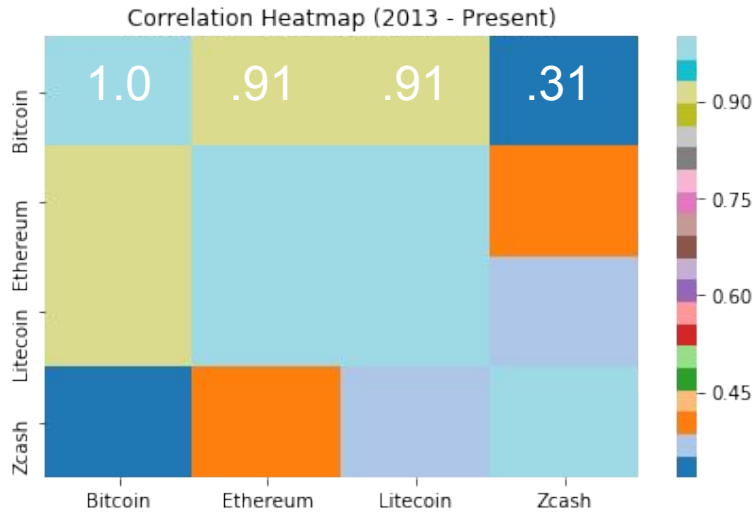
Cryptocurrency Value vs. Time - Logscale (2016 - Present)



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

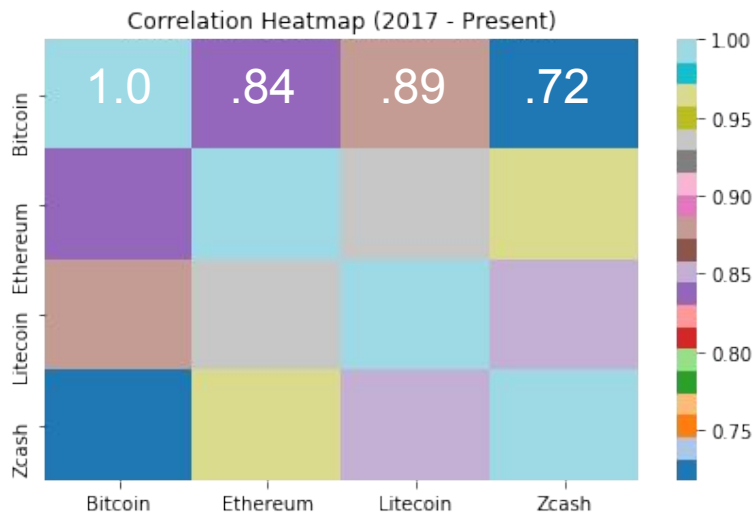
Date Range Analyzed: 4/28/2013 - 11/28/2017

# 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

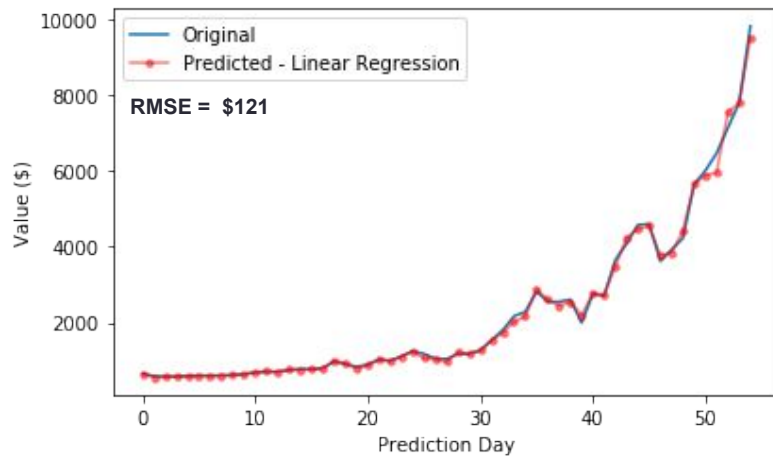
- Linear Regression
- Ridge Regression

# Model Selection – Linear Regression

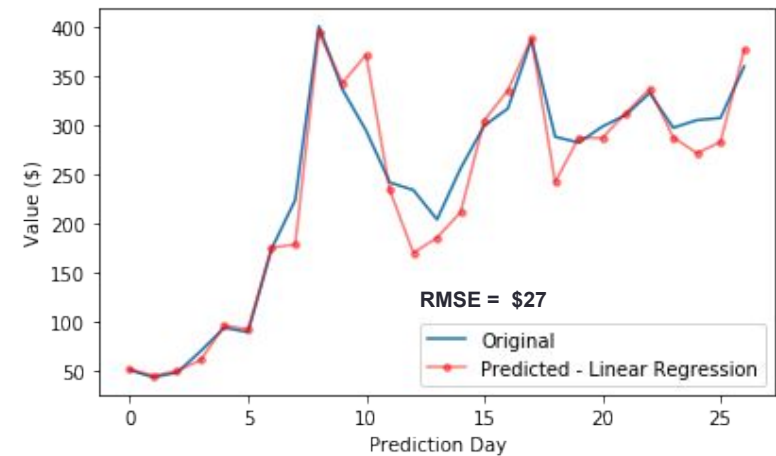
RMSE for Each Cryptocurrency Model					
Look Back Period (Days)	Bitcoin (\$)	Ethereum (\$)	Litecoin (\$)	Zcash (\$)	$\Sigma$ RMSE's (\$)
1	136.6	15.7	2.49	42.3	197.16
2	148.1	17.2	2.8	48.1	216.18
3	137.8	16.8	3.07	17.7	175.33
4	163.6	15	2.96	20.7	202.2
5	152.7	20.6	2.92	19	195.25
6	150.7	16.8	2.86	14.7	185.02
7	143.5	25.3	1.98	24.1	194.78
8	193.5	21.7	4.17	22.4	241.77
<b>9</b>	<b>121.2</b>	<b>26.9</b>	<b>2.97</b>	<b>19.1</b>	<b>170.22</b>
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

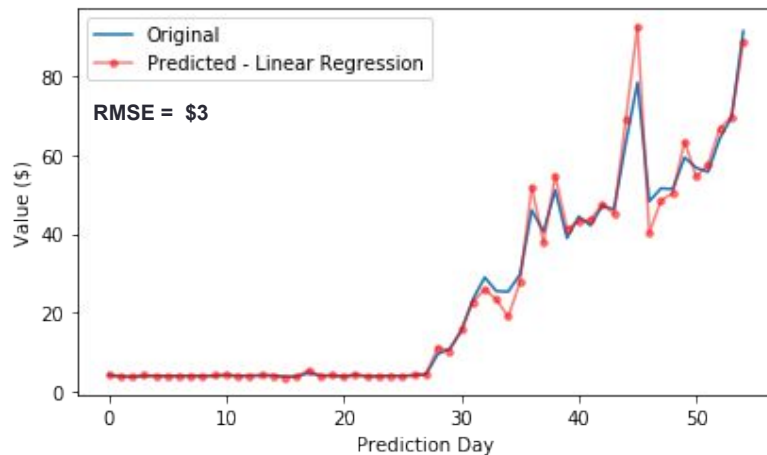
Bitcoin 1 Day Predictions Using 9 Days of Historical Data



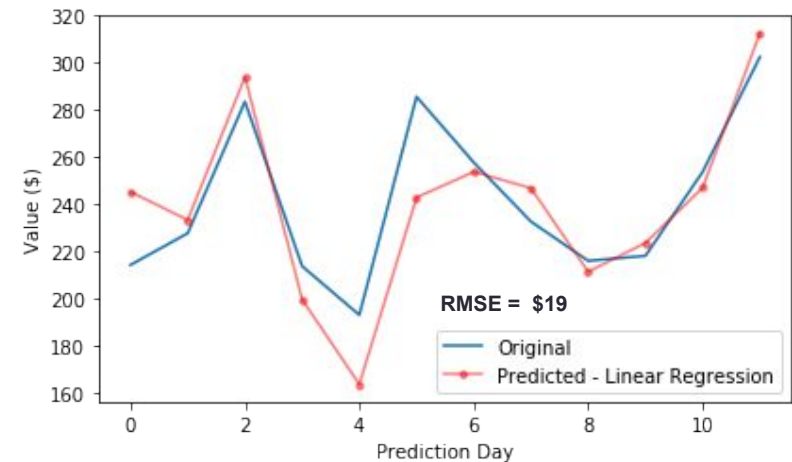
Ethereum 1 Day Predictions Using 9 Days of Historical Data



Litecoin 1 Day Predictions Using 9 Days of Historical Data



Zcash 1 Day Predictions Using 9 Days of Historical Data





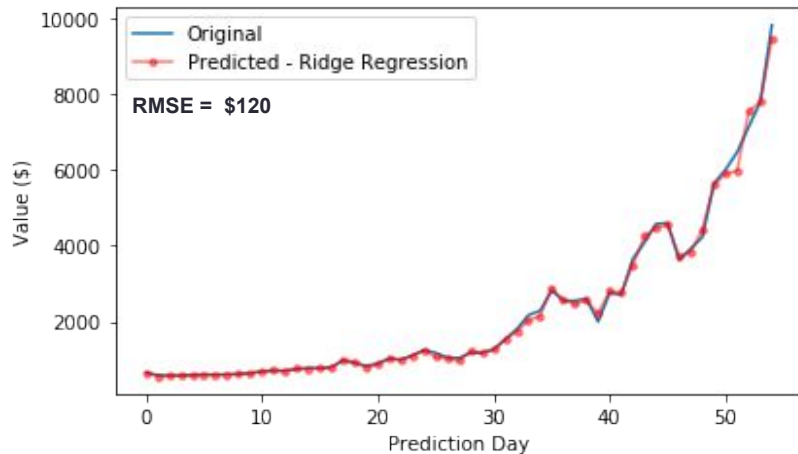
# Model Selection – Ridge Regression

## RMSE for Each Cryptocurrency Model

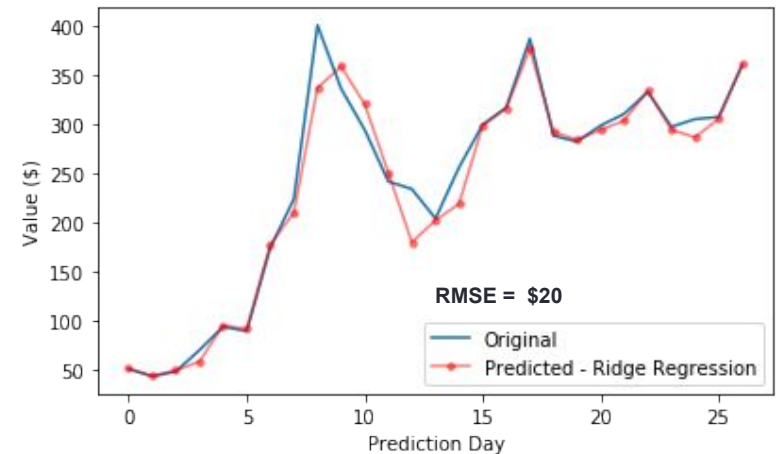
Look Back Period (Days)	Bitcoin (\$)	Ethereum (\$)	Litecoin (\$)	Zcash (\$)	$\Sigma$ RMSE's (\$)
1	136.69	15.69	2.49	42.34	197.21
2	148.08	15.19	2.8	47.94	214.01
3	137.82	16.75	2.11	17.72	174.4
4	163.5	14.69	2.96	20.7	201.85
5	153.61	24.9	2.92	18.14	199.57
6	152.48	16.6	2.31	14.62	186.01
7	146.59	25.74	2.08	23.5	197.91
8	197.53	30.3	4.33	22.41	254.57
<b>9</b>	<b>120.29</b>	<b>19.84</b>	<b>2.07</b>	<b>18.11</b>	<b>160.31</b>
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

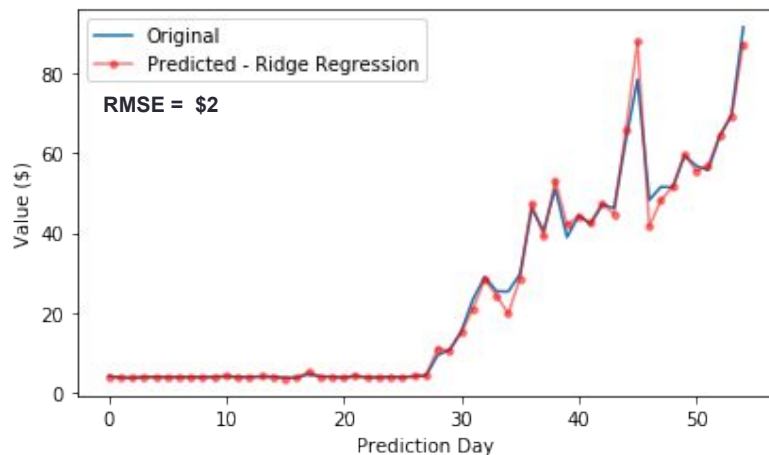
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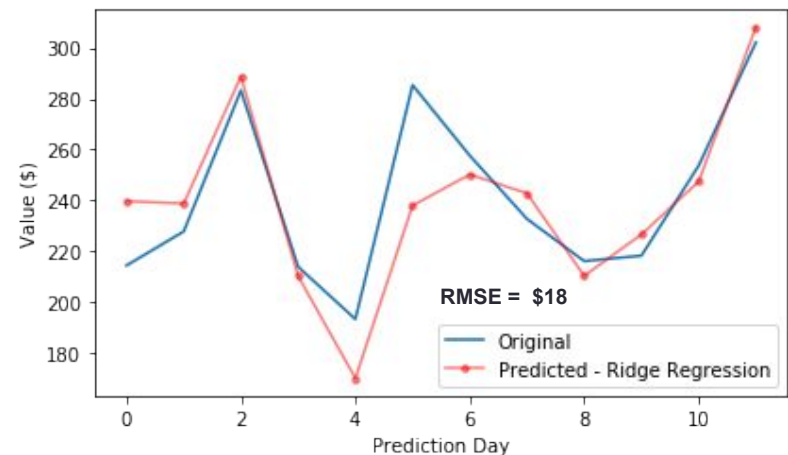
Ethereum 1 Day Predictions Using 9 Days of Historical Data



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

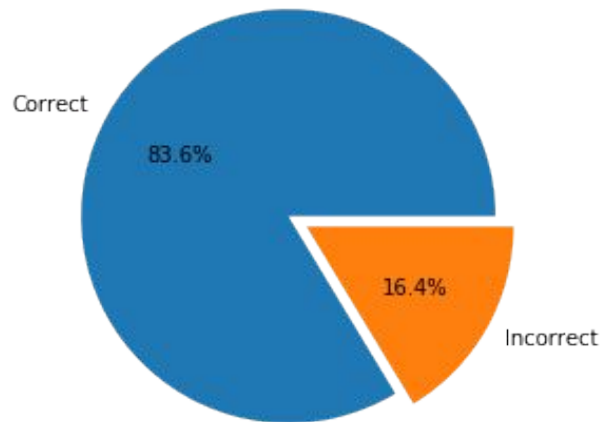
## Trading Strategy Assumptions

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

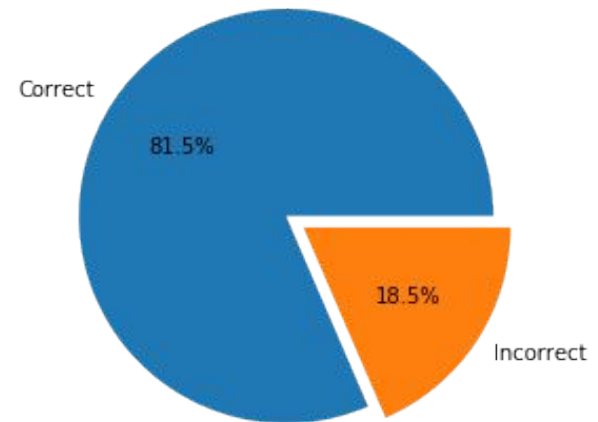
Trading Action Summary	
Comparison of Consecutive Days	Action
Negative (Price Decreasing)	Buy
Positive (Price Increasing)	Hold

# Trading Strategy Outcomes – Linear Regression

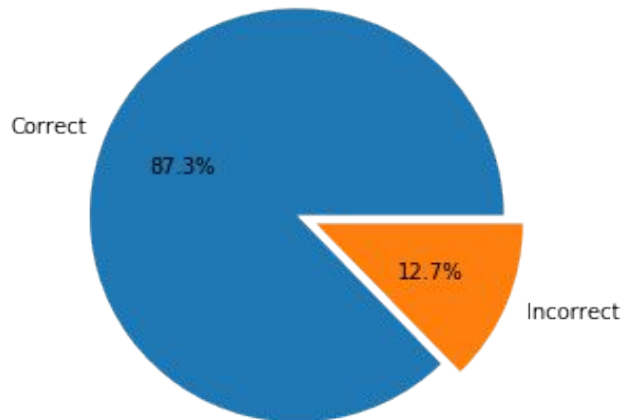
Bitcoin Prediction Outcome with Linear Regression



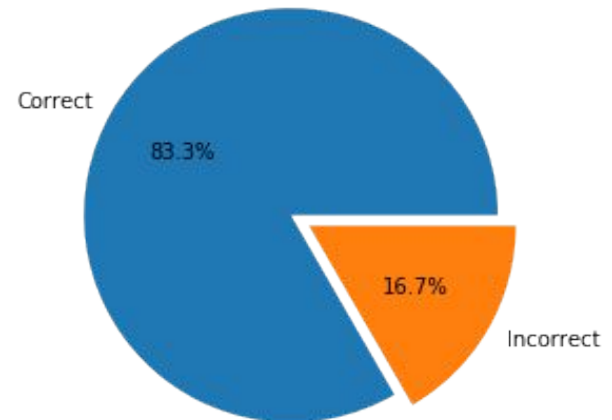
Ethereum Prediction Outcome with Linear Regression



Litecoin Prediction Outcome with Linear Regression

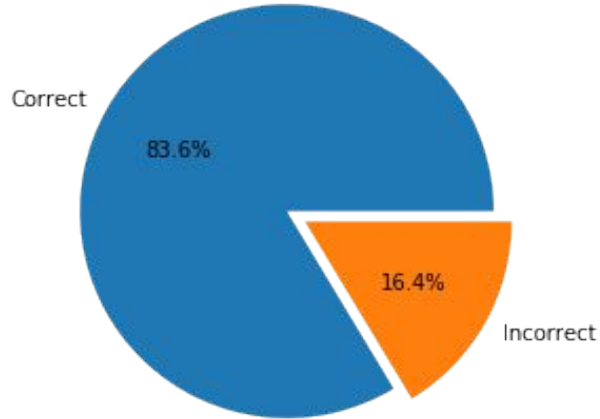


Zcash Prediction Outcome with Linear Regression

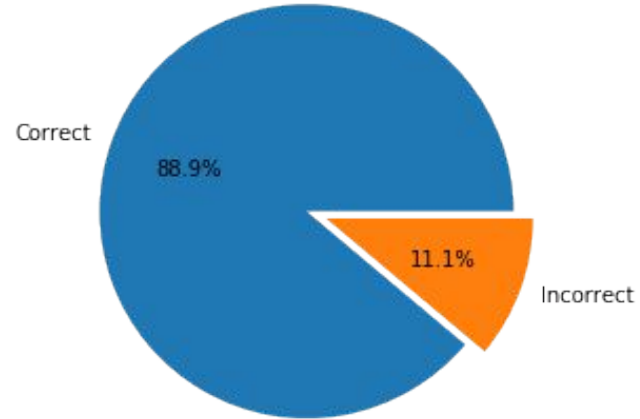


# Trading Strategy Outcomes – Ridge Regression

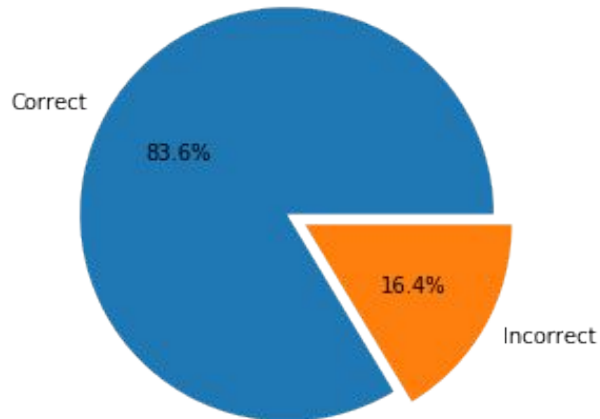
Bitcoin Prediction Outcome with Ridge Regression



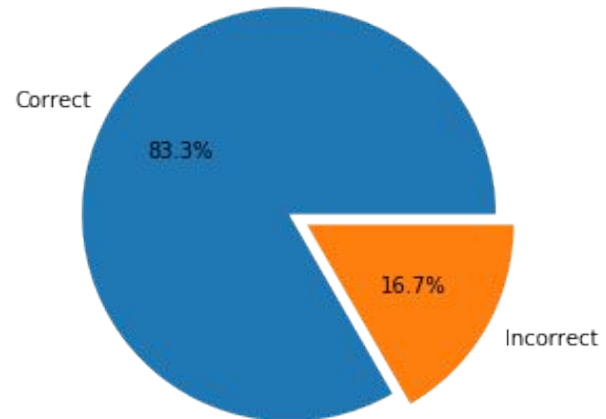
Ethereum Prediction Outcome with Ridge Regression



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