```
import pandas as pd
from google.colab import drive
drive.mount('/content/drive')
df_stocks_crypto = pd.read_csv("/content/drive/MyDrive/stocks_crypto.csv",index_col
    parse_dates=True)
df_stocks_crypto.head()
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
```

Date	Close NASDAQ	% Day Change NASDAQ	Max Difference NASDAQ	Close SP500	% Day Change SP500	Max Difference SP500	% Day Change ETH
2022-11-11	11323.33	0.017850	282.60	3992.93	0.007369	56.66	-0.008978
2022-11-10	11114.15	0.022539	339.16	3956.37	0.024996	98.44	0.181216
2022-11-09	10353.17	-0.016946	220.96	3748.57	-0.016366	73.98	-0.174742
2022-11-08	10616.20	0.000440	272.91	3828.11	0.002905	73.12	-0.150156

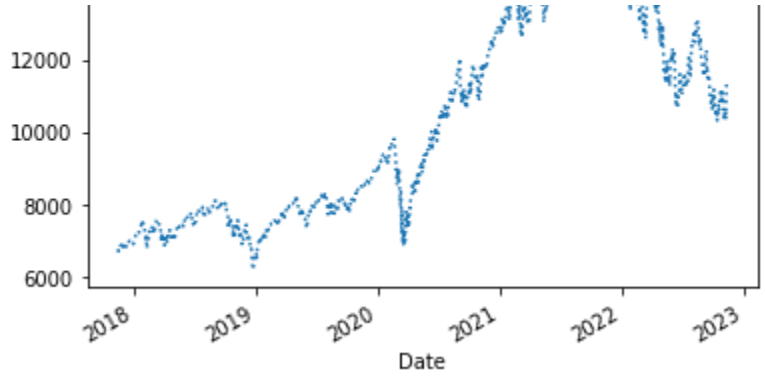
Model Process

```
import matplotlib.pyplot as plt
from sklearn.preprocessing import StandardScaler
from sklearn.neighbors import KNeighborsRegressor
import numpy as np
from datetime import datetime
from sklearn.pipeline import make_pipeline
from sklearn.preprocessing import PolynomialFeatures
from sklearn.linear_model import LinearRegression
```

NASDAQ FORECAST MODEL

```
y_train = df_stocks_crypto["Close NASDAQ"]
y_train.plot.line(style=":")
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f918d3ed7f0>
```




```
date = y_train.index
t = date.year + (30 * (date.month - 1) + date.day) / 365
t
```

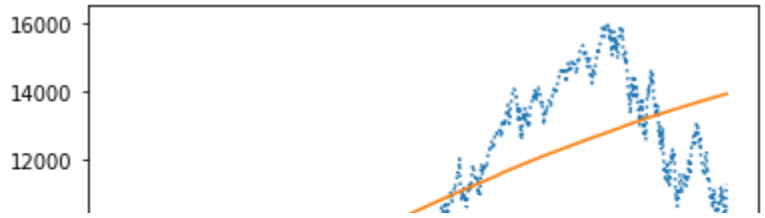
```
Float64Index([2022.8520547945207,  2022.849315068493, 2022.8465753424657,
              2022.8438356164384,  2022.841095890411, 2022.8328767123287,
              2022.8301369863013,  2022.827397260274, 2022.8246575342466,
              2022.8246575342466,
              ...
              2017.8958904109588, 2017.8876712328768, 2017.8821917808218,
              2017.8794520547945,  2017.876712328767,  2017.868493150685,
              2017.8657534246574,   2017.86301369863, 2017.8602739726027,
              2017.8575342465754],
             dtype='float64', name='Date', length=1259)
```

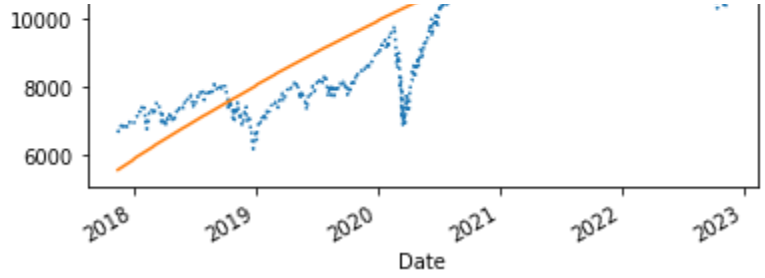
```
pipeline = make_pipeline(
    PolynomialFeatures(degree=2, include_bias=False),
    LinearRegression()
)
pipeline.fit(X=t.to_frame(), y=y_train)

# Store model predictions in a Series for easy plotting
y_train_ = pd.Series(
    pipeline.predict(X=t.to_frame()),
    index=y_train.index
)

# Plot the data and the fitted trend
y_train.plot.line(style=":")
y_train_.plot.line()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f918d35bf40>
```





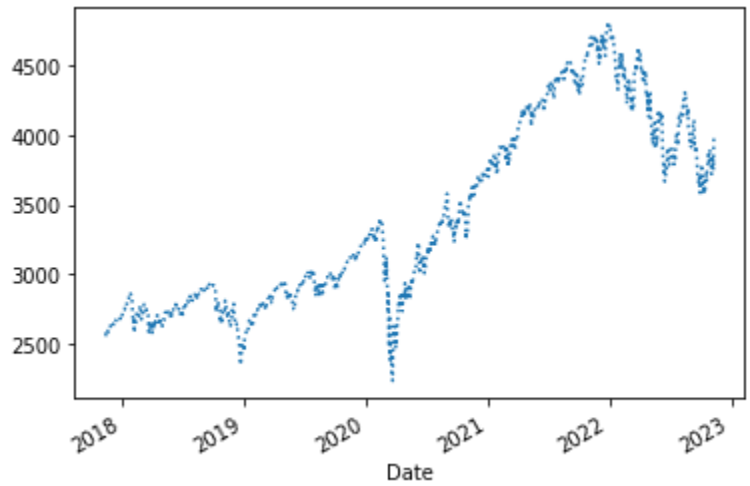

```
pipeline.predict(
    np.array([
        [2023.0],
        [2024.0],
        [2025.0],
        [2028.0],
        [2030.0]
    ])
)
```

```
/usr/local/lib/python3.8/dist-packages/sklearn/base.py:450: UserWarning: X do
  warnings.warn(
array([14099.88051653, 14960.29606372, 15561.73919439, 15812.23408836,
       14684.36860251])
```

SP500 FORECAST MODEL

```
y_train = df_stocks_crypto["Close SP500"]
y_train.plot.line(style=":")
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f918d2e3550>
```



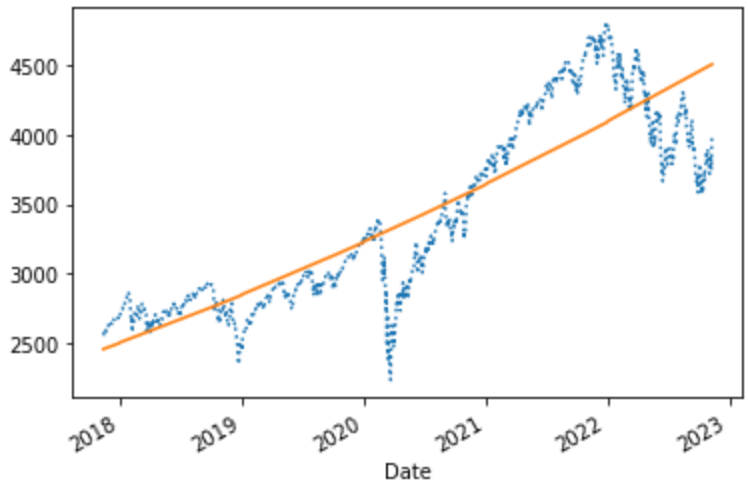

```
pipeline = make_pipeline(
    PolynomialFeatures(degree=2, include_bias=False),
    LinearRegression()
)
```

```
)
pipeline.fit(X=t.to_frame(), y=y_train)

# Store model predictions in a Series for easy plotting
y_train_ = pd.Series(
    pipeline.predict(X=t.to_frame()),
    index=y_train.index
)

# Plot the data and the fitted trend
y_train.plot.line(style=":")
y_train_.plot.line()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f918d3ceac0>
```




```
pipeline.predict(
    np.array([
        [2023.0],
        [2024.0],
        [2025.0],
        [2028.0],
        [2030.0]
    ])
)
```

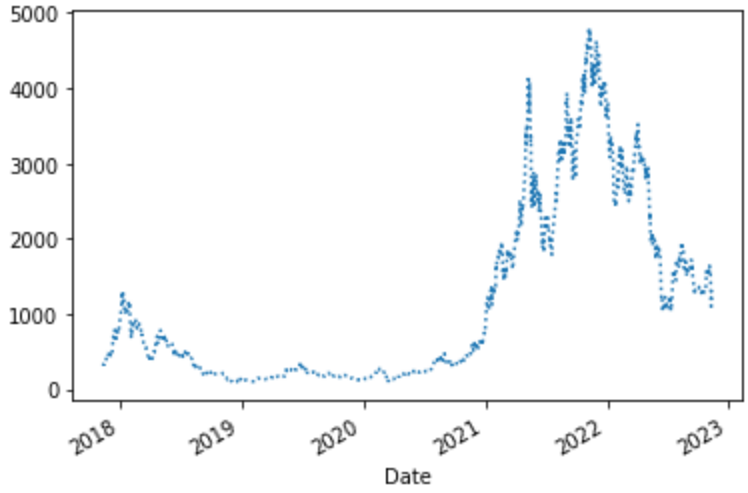
```
/usr/local/lib/python3.8/dist-packages/sklearn/base.py:450: UserWarning: X doe
  warnings.warn(
array([4581.28354558, 5102.21247014, 5658.45548601, 7539.06908163,
       8969.38193536])
```

ETHEREUM FORECAST MODEL (WRONG WAY TO DO IT)

This is why you cannot forecast on Purely Ethereum because it is too volatile talk about this in our presentation, so instead what we decided to do is use NASDAQ and SP500 Forecasting and then using that as our X_Train to predict Ethereum's Future Price

```
y_train = df_stocks_crypto["Close ETH"]
y_train.plot.line(style=":")
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f918d205c70>
```




```
date = y_train.index
t = date.year + (30 * (date.month - 1) + date.day) / 365
t
```

```
Float64Index([2022.8520547945207,  2022.849315068493, 2022.8465753424657,
              2022.8438356164384,  2022.841095890411, 2022.8328767123287,
              2022.8301369863013,  2022.827397260274, 2022.8246575342466,
              2022.8246575342466,
              ...
              2017.8958904109588, 2017.8876712328768, 2017.8821917808218,
              2017.8794520547945,  2017.876712328767,  2017.868493150685,
              2017.8657534246574,   2017.86301369863, 2017.8602739726027,
              2017.8575342465754],
             dtype='float64', name='Date', length=1259)
```

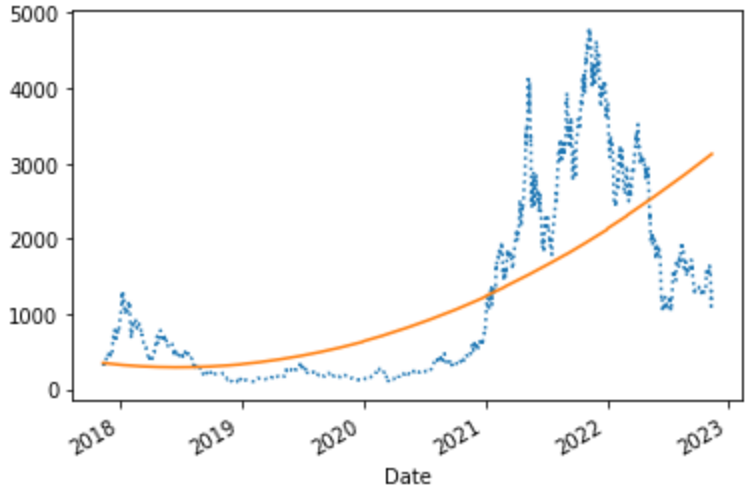
```
pipeline = make_pipeline(
    PolynomialFeatures(degree=2, include_bias=False),
    LinearRegression()
)
pipeline.fit(X=t.to_frame(), y=y_train)

# Store model predictions in a Series for easy plotting
y_train_ = pd.Series(
    pipeline.predict(X=t.to_frame()),
    index=y_train.index
)

# Plot the data and the fitted trend
```

```
y_train.plot.line(style=":")
y_train_.plot.line()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f918d1726a0>
```




```
pipeline.predict(
    np.array([
        [2025.0],
        [2025 + 0.5 / 365]
    ])
)
```

```
/usr/local/lib/python3.8/dist-packages/sklearn/base.py:450: UserWarning: X do
  warnings.warn(
array([6589.33046114, 6591.9745388 ])
```

Ethereum Predicting Model Based on NASDAQ and SP500

```
X_train = df_stocks_crypto[["Close NASDAQ", "Close SP500"]]
y_train = df_stocks_crypto["Close ETH"]
```

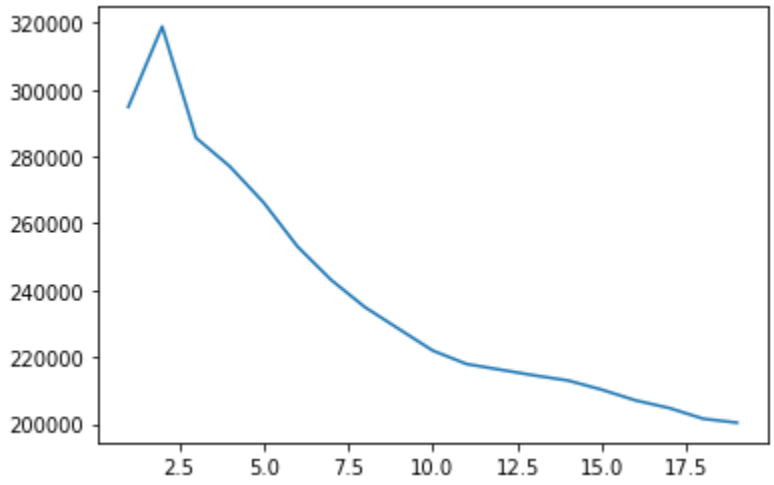
Find the Best K Nearest Neighbors Value

```
def get_cv_error(k):
  # define pipeline
  pipeline = make_pipeline(
      StandardScaler(),
      KNeighborsRegressor(n_neighbors=k)
  )
  # calculate errors from cross-validation
  cv_errs = -cross_val_score(pipeline, X=pd.get_dummies(X_train), y=y_train,
                             scoring="neg_mean_squared_error", cv=10)
```

```
  # calculate average of the cross-validation errors
  return cv_errs.mean()

ks = pd.Series(range(1, 20))
ks.index = range(1, 20)
test_errs = ks.apply(get_cv_error)
test_errs.plot.line()
test_errs.sort_values()
```

```
19    200357.277047
18    201535.658603
17    204720.948552
16    207021.909496
15    210225.619343
14    212974.728944
13    214508.603539
12    216204.916677
11    217906.462439
10    221925.888750
9     228393.881046
8     234881.254071
7     243027.220610
6     253073.104406
5     266215.110188
4     277016.167890
3     285564.823165
1     294782.130903
2     318833.178078
dtype: float64
```



LINEAR AND K-NEAREST MODELS

```
from sklearn.linear_model import LinearRegression
from sklearn.neighbors import KNeighborsRegressor
from sklearn.preprocessing import StandardScaler
from sklearn.pipeline import make_pipeline
```

```
# Train linear regression model
linear_model = LinearRegression()
linear_model.fit(X=X_train, y=y_train)

# Train 10-nearest neighbors model
knn_model = make_pipeline(
    StandardScaler(),
    KNeighborsRegressor(n_neighbors=19)
)
knn_model.fit(X=X_train, y=y_train)

prediction_2024 = [[14960, 5102]]
linear_model.predict(prediction_2024), knn_model.predict(prediction_2024)
```

```
/usr/local/lib/python3.8/dist-packages/sklearn/base.py:450: UserWarning: X doe
  warnings.warn(
/usr/local/lib/python3.8/dist-packages/sklearn/base.py:450: UserWarning: X doe
  warnings.warn(
(array([4088.18533301]), array([3661.25467721]))
```

STACKING AND ENSEMBLE MODELS

```
preds = np.stack([
    linear_model.predict(X_train), knn_model.predict(X_train)
], axis=1)
preds
```

```
array([[2214.38381052, 1791.82896668],
       [2163.31370349, 1674.85149189],
       [1821.76710824, 1328.31296905],
       ...,
       [-206.73067893,  308.17402932],
       [-180.84986765,  304.45090363],
       [-170.78187936,  315.80369647]])
```

```
stacker = LinearRegression()
stacker.fit(X=preds, y=y_train)
```

```
LinearRegression()
```

```
from sklearn.ensemble import StackingRegressor

stacking_model = StackingRegressor([
    ("linear", linear_model),
    ("knn", knn_model)],
```

```
    final_estimator=LinearRegression()
)
stacking_model.fit(X=X_train, y=y_train)

stacker = stacking_model.final_estimator_
stacker.intercept_, stacker.coef_
```

```
(86.7448769180196, array([0.13299527, 0.76387379]))
```

```
from sklearn.ensemble import VotingRegressor

ensemble_model = VotingRegressor([
    ("linear", linear_model),
    ("knn", knn_model)
])
ensemble_model.fit(X=X_train, y=y_train)
```

```
VotingRegressor(estimators=[('linear', LinearRegression()),
                            ('knn',
                             Pipeline(steps=[('standardscaler',
                                              StandardScaler()),
                                             ('kneighborsregressor',

KNeighborsRegressor(n_neighbors=19))]))])
```

SELECTING THE BEST MODEL TO USE FOR PREDICTIONS

```
from sklearn.model_selection import cross_val_score

for model in [linear_model, knn_model, ensemble_model, stacking_model]:
    print(-cross_val_score(model, X=X_train, y=y_train, cv=5,
                           scoring="neg_mean_squared_error").mean())
```

```
454085.73614020896
237952.18454781393
245614.86466934966
556835.9013569362
```

We see that our K Nearest Neighbors model however, after trying various predictions we decided that our Ensemble Model would be best based on other expert predictors and our beliefs

Final Model Predictions and Final Model Plotted

```
prediction_nasdaq_sp500 = [[14684, 8969]]
```

```
ensemble_model.predict(prediction_nasdaq_sp500)
```

```
/usr/local/lib/python3.8/dist-packages/sklearn/base.py:450: UserWarning: X do
  warnings.warn(
/usr/local/lib/python3.8/dist-packages/sklearn/base.py:450: UserWarning: X do
  warnings.warn(
array([4661.08071261])
```

```
t_val =  df_stocks_crypto.index
```

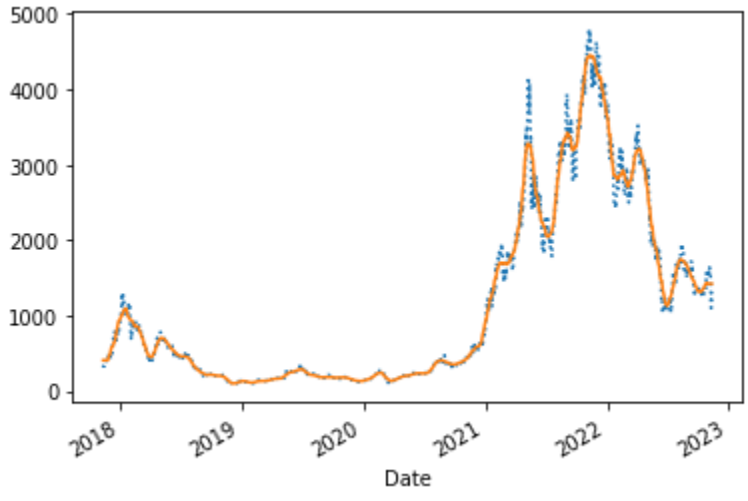
```
from sklearn.pipeline import make_pipeline

# Fit linear regression of y on t and t^2
pipeline = make_pipeline(
    PolynomialFeatures(degree=2, include_bias=False),
    ensemble_model
)
pipeline.fit(X=t_val.to_frame(), y=y_train)

# Store model predictions in a Series for easy plotting
y_train_ = pd.Series(
    pipeline.predict(X=t_val.to_frame()),
    index=y_train.index
)

# Plot the data and the fitted trend
y_train.plot.line(style=":")
y_train_.plot.line()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f918d2cadf0>
```



Colab paid products - Cancel contracts here