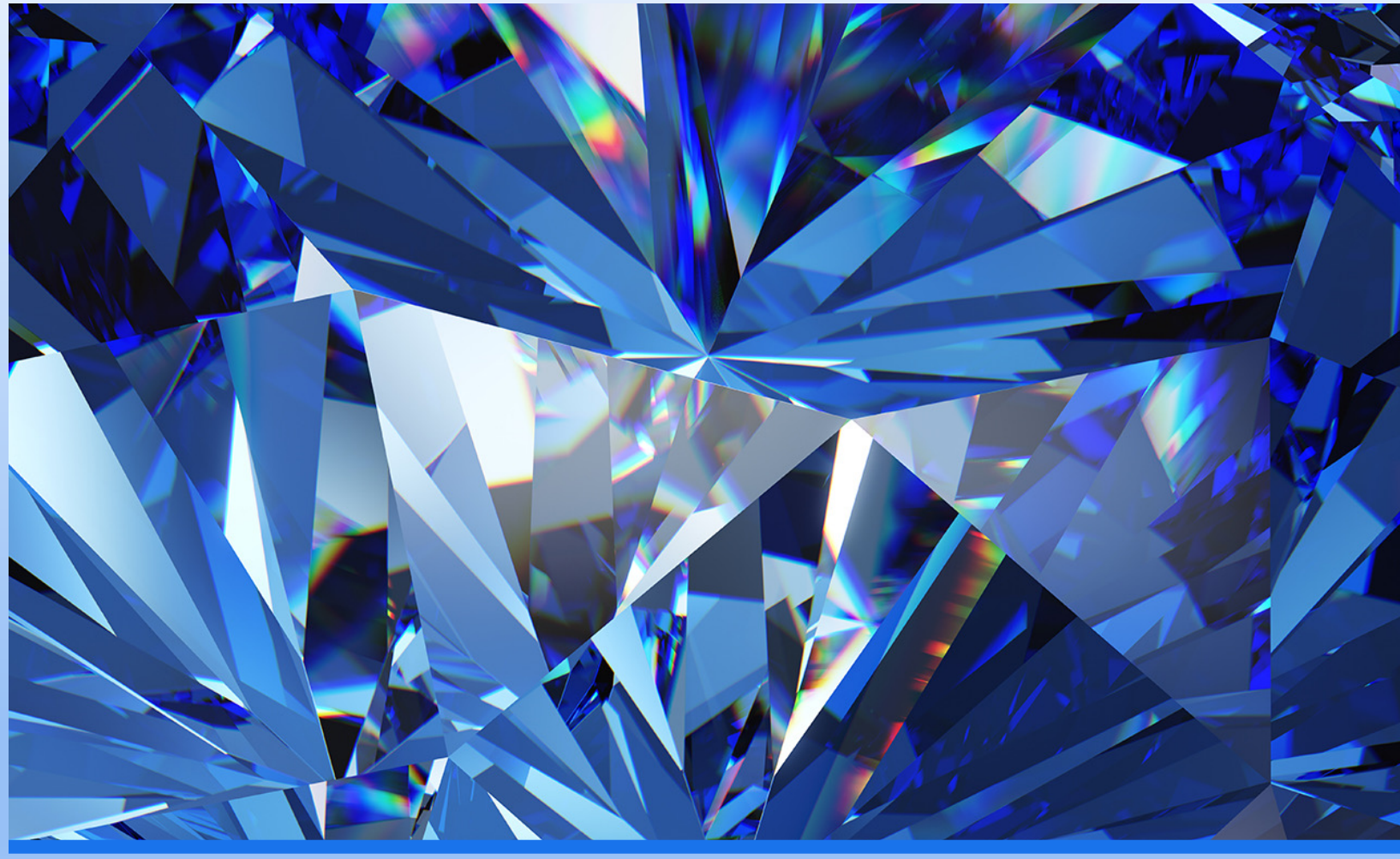
Machine Learning Hands On



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Looking at the Diamonds data

In [1]:
```
import pandas as pd
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
import matplotlib.pyplot as plt
%matplotlib inline
from sklearn import metrics
import numpy as np
```

In [2]:
```
diamonds = pd.read_csv('/Users/christinasimbenga/Desktop/Diamonds.csv')
diamonds.head()
```

Out[2]:

	Unnamed: 0	carat	cut	color	clarity	depth	table	price	x	y	z
0	0	0.23	Ideal	E	SI2	61.5	55.0	326	3.95	3.98	2.43
1	1	0.21	Premium	E	SI1	59.8	61.0	326	3.89	3.84	2.31
2	2	0.23	Good	E	VS1	56.9	65.0	327	4.05	4.07	2.31
3	3	0.29	Premium	I	VS2	62.4	58.0	334	4.20	4.23	2.63
4	4	0.31	Good	J	SI2	63.3	58.0	335	4.34	4.35	2.75

Data Wrangling

In [10]:
```
diamonds.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 53940 entries, 0 to 53939
```

Lots of data wrangling

- I went through the data and looked at the columns I needed to use and recode so that they have number instead of strings.

Data Wrangling

In [10]:
```
diamonds.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 53940 entries, 0 to 53939
Data columns (total 11 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   Unnamed: 0  53940 non-null  int64
 1   carat       53940 non-null  float64
 2   cut         53940 non-null  object
 3   color       53940 non-null  object
 4   clarity     53940 non-null  object
 5   depth       53940 non-null  float64
 6   table       53940 non-null  float64
 7   price       53940 non-null  int64
 8   x           53940 non-null  float64
 9   y           53940 non-null  float64
 10  z           53940 non-null  float64
dtypes: float64(6), int64(2), object(3)
memory usage: 4.5+ MB
```

In [12]:
```
diamonds.cut.value_counts()
```

Out[12]:
```
Ideal        21551
Premium      13791
Very Good    12082
Good          4906
Fair          1610
```

Drop missing data

```
diamonds.dropna(inplace=True)
```

```
diamonds.head()
```

	Unnamed: 0	carat	cut	color	clarity	depth	table	price	x	y	
1	1	0.21	Premium	E	SI1	59.8	61.0	326	3.89	3.84	2.3
2	2	0.23	Good	E	VS1	56.9	65.0	327	4.05	4.07	2.3
3	3	0.29	Premium	I	VS2	62.4	58.0	334	4.20	4.23	2.6
5	5	0.24	Very Good	J	VVS2	62.8	57.0	336	3.94	3.96	2.4
6	6	0.24	Very Good	I	VVS1	62.3	57.0	336	3.95	3.98	2.4

dropping unwanted columns

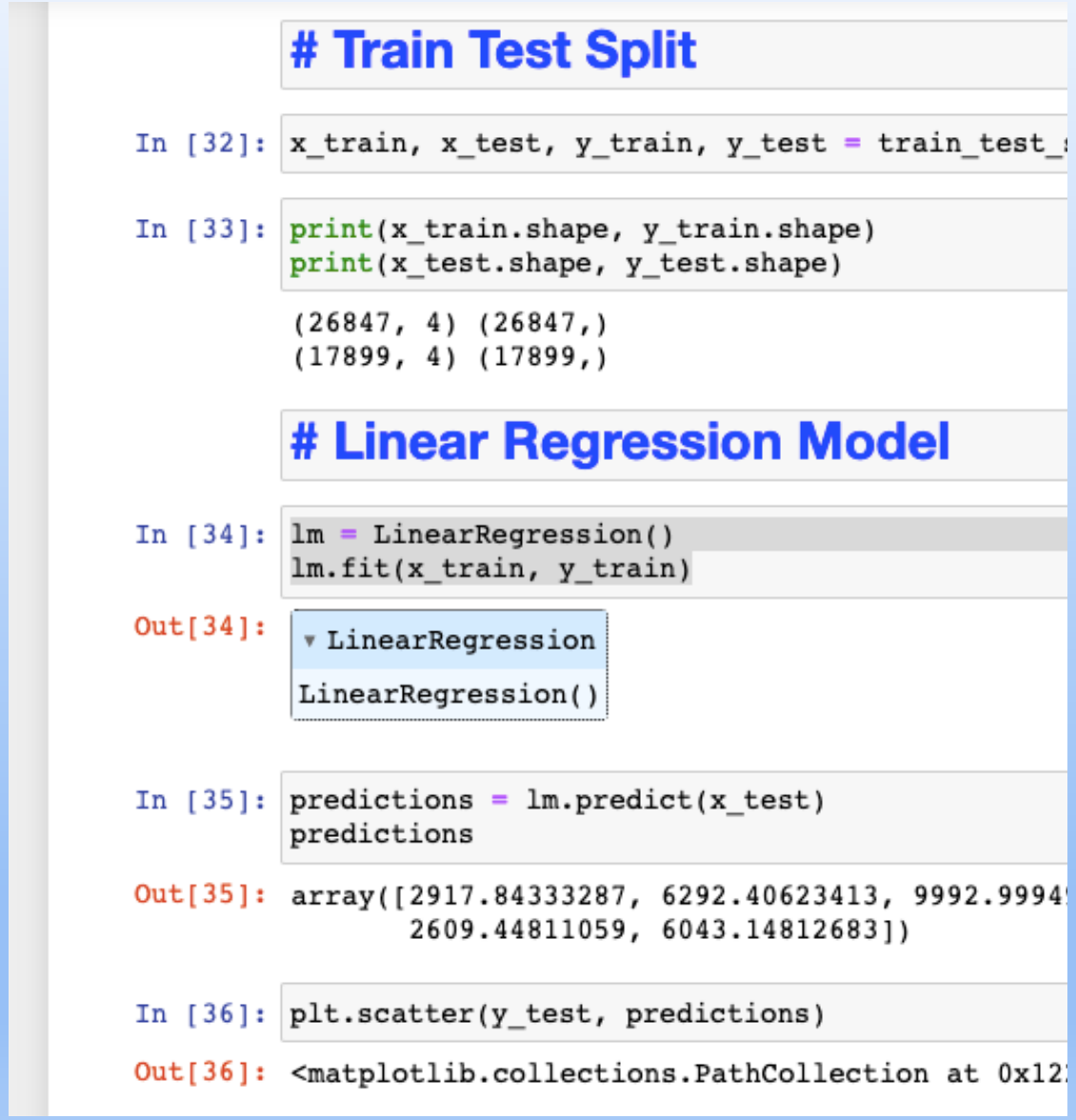
```
diamonds.drop(['cut', 'color', 'clarity'], axis=1, inplace=Tr
```

```
diamonds.head ()
```

	Unnamed: 0	carat	depth	table	price	x	y	z	cut1	color1	clarity1
1	1	0.21	59.8	61.0	326	3.89	3.84	2.31	1	1	0
2	2	0.23	56.9	65.0	327	4.05	4.07	2.31	3	1	2
3	3	0.29	62.4	58.0	334	4.20	4.23	2.63	1	5	1

Dropping columns and missing data

- I had to drop some missing data so they won't affect the overall test. Also, I got ride of the old columns with strings so the data can look prettier



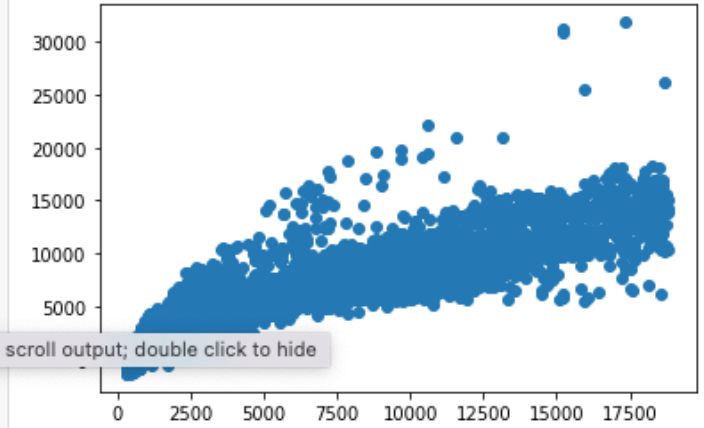
```
# Train Test Split

In [32]: x_train, x_test, y_train, y_test = train_test_

In [33]: print(x_train.shape, y_train.shape)
         print(x_test.shape, y_test.shape)

         (26847, 4) (26847,)
         (17899, 4) (17899,)

# Linear Regression Model

In [34]: lm = LinearRegression()
         lm.fit(x_train, y_train)

Out[34]: ▾ LinearRegression
         LinearRegression()

In [35]: predictions = lm.predict(x_test)
         predictions

Out[35]: array([2917.84333287, 6292.40623413, 9992.9994
                2609.44811059, 6043.14812683])

In [36]: plt.scatter(y_test, predictions)

Out[36]: <matplotlib.collections.PathCollection at 0x12
```

Train test and Linear Regression

- After Wrangling the data I completed the train test and checked for linear regression by completing the scatterplot.

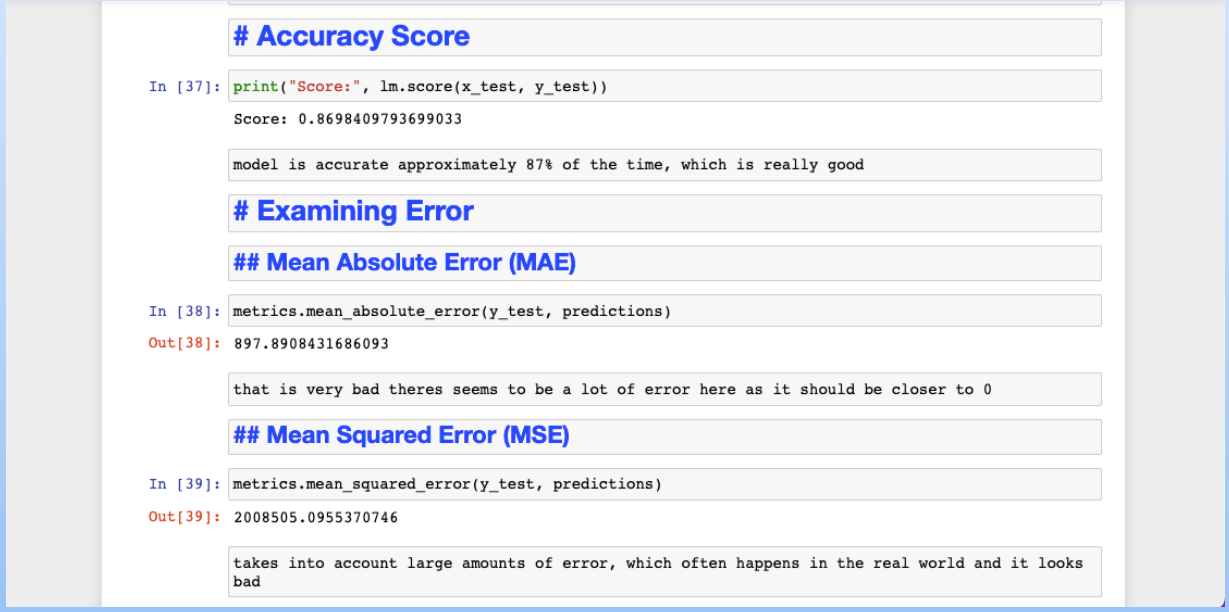
Scatter plot

```
In [35]: predictions = lm.predict(x_test)
         predictions

Out[35]: array([2917.84333287, 6292.40623413, 9992.99949562, ..., 6909.74568676,
                2609.44811059, 6043.14812683])

In [36]: plt.scatter(y_test, predictions)

Out[36]: <matplotlib.collections.PathCollection at 0x12203b760>
```




```
Looking at it looks as if most data points are gathered in a very dense line with so
outliers hanging out somewhere
```

 # Accuracy Score



Accuracy Score

In [37]:
```
print("Score:", lm.score(x_test, y_test))
```

```
Score: 0.8698409793699033
```

```
model is accurate approximately 87% of the time, which is really good
```

Examining Error

Mean Absolute Error (MAE)

In [38]:
```
metrics.mean_absolute_error(y_test, predictions)
```

Out[38]:
```
897.8908431686093
```

```
that is very bad theres seems to be a lot of error here as it should be closer to 0
```

Mean Squared Error (MSE)

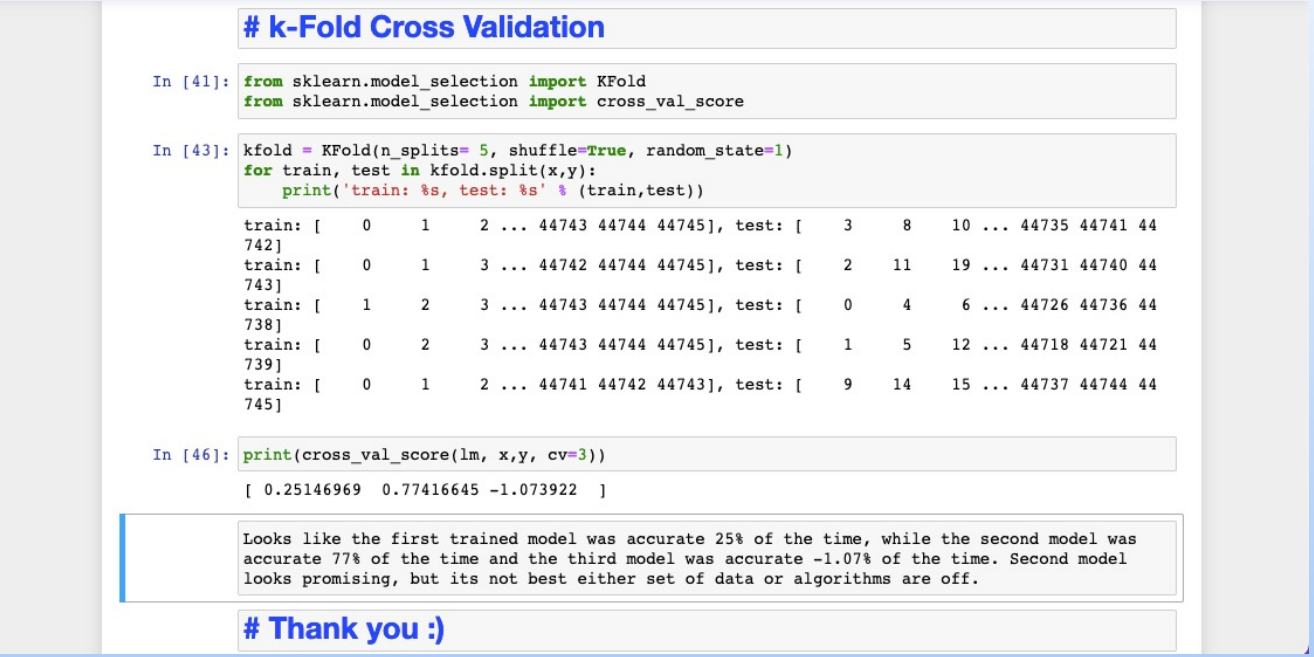
In [39]:
```
metrics.mean_squared_error(y_test, predictions)
```

Out[39]:
```
2008505.0955370746
```

```
takes into account large amounts of error, which often happens in the real world and it looks bad
```

Accuracy and Error test

- I looked at the accuracy score and it showed 87% of the time model is accurate
- I looked at the errors and they were very large numbers when it should have been towards "0". There are a lot of errors in the model



```
# k-Fold Cross Validation

In [41]: from sklearn.model_selection import KFold
         from sklearn.model_selection import cross_val_score

In [43]: kfold = KFold(n_splits= 5, shuffle=True, random_state=1)
         for train, test in kfold.split(x,y):
             print('train: %s, test: %s' % (train,test))

         train: [    0     1     2 ... 44743 44744 44745], test: [    3     8    10 ... 44735 44741 44
         742]
         train: [    0     1     3 ... 44742 44744 44745], test: [    2    11    19 ... 44731 44740 44
         743]
         train: [    1     2     3 ... 44743 44744 44745], test: [    0     4     6 ... 44726 44736 44
         738]
         train: [    0     2     3 ... 44743 44744 44745], test: [    1     5    12 ... 44718 44721 44
         739]
         train: [    0     1     2 ... 44741 44742 44743], test: [    9    14    15 ... 44737 44744 44
         745]

In [46]: print(cross_val_score(lm, x,y, cv=3))

         [ 0.25146969  0.77416645 -1.073922  ]

         Looks like the first trained model was accurate 25% of the time, while the second model was
         accurate 77% of the time and the third model was accurate -1.07% of the time. Second model
         looks promising, but its not best either set of data or algorithms are off.

         # Thank you :)
```

K fold cross validation

- Looks like the first trained model was accurate 25% of the time, while the second model was accurate 77% of the time and the third model was accurate -1.07% of the time. Second model looks promising, but its not best either set of data or algorithms are off.

Thank you