Linear Regression

Cellphone Dataset

Importing Libraries and Datasets

In [ ]:

```
import pandas as pd
import numpy as np
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn import metrics
import matplotlib.pyplot as plt
```

In [ ]:

```
data = pd.read_csv('./Dataset/Cellphone.csv')
data.head()
```

Out[ ]:

	Product_id	Price	Sale	weight	resoloution	ppi	cpu core	cpu freq	internal mem	ram	RearCam	Front_Cam
0	203	2357	10	135.0	5.2	424	8	1.35	16.0	3.000	13.00	8.0
1	880	1749	10	125.0	4.0	233	2	1.30	4.0	1.000	3.15	0.0
2	40	1916	10	110.0	4.7	312	4	1.20	8.0	1.500	13.00	5.0
3	99	1315	11	118.5	4.0	233	2	1.30	4.0	0.512	3.15	0.0
4	880	1749	11	125.0	4.0	233	2	1.30	4.0	1.000	3.15	0.0

EDA

In [ ]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 161 entries, 0 to 160
Data columns (total 14 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Product_id    161 non-null    int64  
 1   Price         161 non-null    int64  
 2   Sale          161 non-null    int64  
 3   weight        161 non-null    float64
 4   resoloution   161 non-null    float64
 5   ppi           161 non-null    int64  
 6   cpu core      161 non-null    int64  
 7   cpu freq      161 non-null    float64
 8   internal mem  161 non-null    float64
 9   ram           161 non-null    float64
 10  RearCam       161 non-null    float64
 11  Front_Cam     161 non-null    float64
 12  battery       161 non-null    int64  
 13  thickness     161 non-null    float64
dtypes: float64(8), int64(6)
memory usage: 17.7 KB
```

In [ ]:

```
data.isna().sum()
```

Out[ ]:

```
Product_id      0
Price           0
Sale            0
weight          0
resoloution     0
ppi             0
cpu core        0
cpu freq        0
internal mem    0
ram             0
RearCam         0
Front_Cam       0
battery         0
thickness       0
dtype: int64
```

---

1. Dataset is clean
2. We can perform Linear Regression directly

In [ ]:

```
data1 = data.iloc[:,[0,2,3,4,5,6,7,8,9,10,11,12,13]]
data1
```

Out[ ]:

	Product_id	Sale	weight	resoloution	ppi	cpu core	cpu freq	internal mem	ram	RearCam	Front_Cam	b
0	203	10	135.0	5.20	424	8	1.350	16.0	3.000	13.00	8.0	
1	880	10	125.0	4.00	233	2	1.300	4.0	1.000	3.15	0.0	
2	40	10	110.0	4.70	312	4	1.200	8.0	1.500	13.00	5.0	
3	99	11	118.5	4.00	233	2	1.300	4.0	0.512	3.15	0.0	
4	880	11	125.0	4.00	233	2	1.300	4.0	1.000	3.15	0.0	
...	...	...	...	...	...	...	...	...	...	...	...	
156	1206	4638	178.0	5.46	538	4	1.875	128.0	6.000	12.00	16.0	
157	1296	8016	170.0	5.50	534	4	1.975	128.0	6.000	20.00	8.0	
158	856	8809	150.0	5.50	401	8	2.200	64.0	4.000	20.00	20.0	
159	1296	8946	170.0	5.50	534	4	1.975	128.0	6.000	20.00	8.0	
160	1131	9807	202.0	6.00	367	8	1.500	16.0	3.000	21.50	16.0	

161 rows × 13 columns

In [ ]:

```
X = data1[['resoloution','ppi','cpu core','cpu freq','internal mem','ram','battery']]
```

In [ ]:

```
y = data.iloc[:,[1]]
y
```

Out[ ]:

	Price
0	2357
1	1749
2	1916
3	1315
4	1749
...	...
156	3551
157	3211
158	3260
159	3211
160	2536

161 rows × 1 columns

In [ ]:

```
X_train, X_test, y_train, y_test = train_test_split(X,y , random_state=00,  test_size=0.30)
```

In [ ]:

```
print(X_train.shape)
print(y_train.shape)
print(X_test.shape)
print(y_test.shape)
```

```
(112, 7)
(112, 1)
(49, 7)
(49, 1)
```

Linear Regression Modelling

> Modelling on just X , y

In [ ]:

```
model = LinearRegression()
model.fit(X,y)
```

Out[ ]:

```
▾ LinearRegression
LinearRegression()
```

In [ ]:

```
model.coef_
```

Out[ ]:

```
array([[-2.80094250e+01,  1.08273650e+00,  9.86514030e+01,
         1.93637238e+02,  6.62110199e+00,  1.27977052e+02,
         4.12470925e-02]])
```

In [ ]:

```
model.intercept_
```

Out[ ]:

```
array([666.93232853])
```

In [ ]:

```
model.predict([[5.20,400,5,1.350,16.0,3.000,2310]])
```

```
c:\Users\Prasanna Pandhare\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\b
ase.py:464: UserWarning: X does not have valid feature names, but LinearRegression was fitted
with feature names
  warnings.warn(
```

Out[ ]:
```
array([[2294.19477765]])
```

In [ ]:
```python
model.score(X,y)
```

Out[ ]:
```
0.9331544279402171
```

> Performing Modelling on Train-Test data

In [ ]:
```python
modelFinal = LinearRegression()
```

In [ ]:
```python
modelFinal.fit(X_train,y_train)
```

Out[ ]:
```
▾ LinearRegression
LinearRegression()
```

In [ ]:
```python
y_pred = modelFinal.predict(X_test)
```

In [ ]:
```python
r2_score = metrics.r2_score(y_pred,y_test)
mean_squared_error = metrics.mean_squared_error(y_pred,y_test)
print("R^2 Score: ", r2_score)
print("Mean Squared Error: ", mean_squared_error)
```

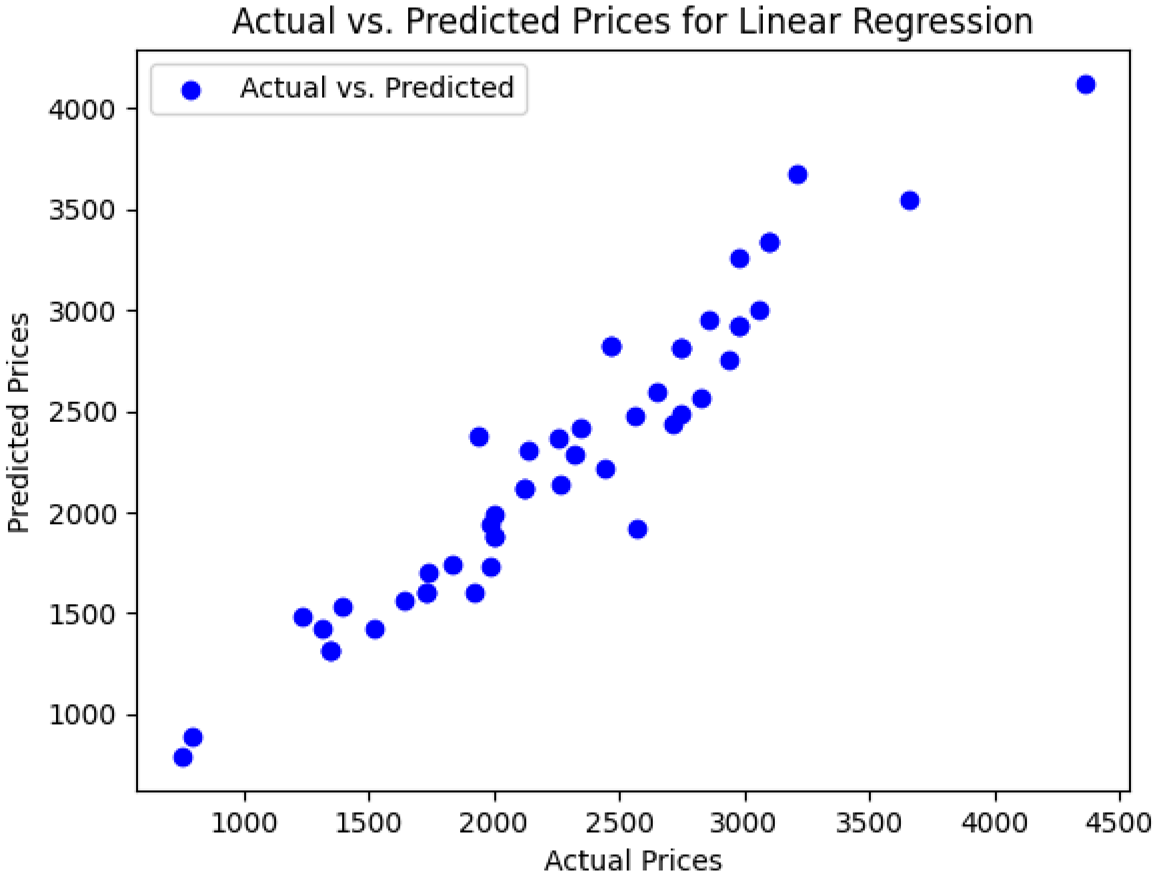
```
R^2 Score:  0.9188489800998326
Mean Squared Error:  42911.30679764876
```

In [ ]:
```python
modelFinal.score(X_test,y_test)
```

Out[ ]:
```
0.9147802517033088
```

Visulization - Graphing

In [ ]:
```python
plt.scatter(y_test, y_pred, color='blue', label='Actual vs. Predicted')
# plt.plot([min(y_test), max(y_test)], [min(y_test), max(y_test)], color='red', label='Line o
plt.xlabel('Actual Prices')
plt.ylabel('Predicted Prices')
plt.title('Actual vs. Predicted Prices for Linear Regression')
plt.legend()
plt.show()
```


Actual vs. Predicted Prices for Linear Regression
Actual vs. Predicted
Predicted Prices
4000
3500
3000
2500
2000
1500
1000
1000
1500
2000
2500
3000
3500
4000
4500
Actual Prices