Car Price Prediction using Linear Regression

Importing the libraries

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

Importing the dataset

```
df =
pd.read_csv('https://github.com/YBI-Foundation/Dataset/raw/main/Car
%20Price.csv')
```

```
df
```

```
        Brand                                Model  Year  
Selling_Price  \
0      Maruti                        Maruti 800 AC  2007  
60000
1      Maruti             Maruti Wagon R LXI Minor  2007  
135000
2     Hyundai                 Hyundai Verna 1.6 SX  2012  
600000
3      Datsun               Datsun RediGO T Option  2017  
250000
4       Honda                Honda Amaze VX i-DTEC  2014  
450000
...       ...                                  ...   ...            ..
.
4335  Hyundai  Hyundai i20 Magna 1.4 CRDi (Diesel)  2014  
409999
4336  Hyundai           Hyundai i20 Magna 1.4 CRDi  2014  
409999
4337   Maruti                  Maruti 800 AC BSIII  2009  
110000
4338  Hyundai     Hyundai Creta 1.6 CRDi SX Option  2016  
865000
4339  Renault                     Renault KWID RXT  2016  
225000

      KM_Driven    Fuel Seller_Type Transmission         Owner
0         70000  Petrol  Individual       Manual   First Owner
1         50000  Petrol  Individual       Manual   First Owner
2        100000  Diesel  Individual       Manual   First Owner
3         46000  Petrol  Individual       Manual   First Owner
4        141000  Diesel  Individual       Manual  Second Owner
```

```
...         ...     ...          ...          ...          ...
4335      80000  Diesel  Individual       Manual  Second Owner
4336      80000  Diesel  Individual       Manual  Second Owner
4337      83000  Petrol  Individual       Manual  Second Owner
4338      90000  Diesel  Individual       Manual   First Owner
4339      40000  Petrol  Individual       Manual   First Owner

[4340 rows x 9 columns]
```

Get Missing Values Drop

```
df=df.dropna()
```

Get Information of Dataframe

```
df.info()   #gives column name, count,  not null category, D-type(data type)
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 4340 entries, 0 to 4339
Data columns (total 9 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Brand          4340 non-null   object
 1   Model          4340 non-null   object
 2   Year           4340 non-null   int64
 3   Selling_Price  4340 non-null   int64
 4   KM_Driven      4340 non-null   int64
 5   Fuel           4340 non-null   object
 6   Seller_Type    4340 non-null   object
 7   Transmission   4340 non-null   object
 8   Owner          4340 non-null   object
dtypes: int64(3), object(6)
memory usage: 339.1+ KB
```

```
df.describe()   #gives the linear relation of each column with another column
```

```
              Year  Selling_Price      KM_Driven
count  4340.000000   4.340000e+03    4340.000000
mean   2013.090783   5.041273e+05   66215.777419
std       4.215344   5.785487e+05   46644.102194
min    1992.000000   2.000000e+04       1.000000
25%    2011.000000   2.087498e+05   35000.000000
50%    2014.000000   3.500000e+05   60000.000000
75%    2016.000000   6.000000e+05   90000.000000
max    2020.000000   8.900000e+06  806599.000000
```

```
df.head()
```

```
     Brand                     Model  Year  Selling_Price  KM_Driven
Fuel  \
0   Maruti             Maruti 800 AC  2007          60000      70000
Petrol
1   Maruti  Maruti Wagon R LXI Minor  2007         135000      50000
Petrol
2  Hyundai      Hyundai Verna 1.6 SX  2012         600000     100000
Diesel
3   Datsun    Datsun RediGO T Option  2017         250000      46000
Petrol
4    Honda     Honda Amaze VX i-DTEC  2014         450000     141000
Diesel

  Seller_Type Transmission         Owner
0  Individual       Manual   First Owner
1  Individual       Manual   First Owner
2  Individual       Manual   First Owner
3  Individual       Manual   First Owner
4  Individual       Manual  Second Owner
```

```
df.isnull().sum() #(df.isna().sum() gives same result)
#gives the sum of all null values columns-wise
```

```
Brand            0
Model            0
Year             0
Selling_Price    0
KM_Driven        0
Fuel             0
Seller_Type      0
Transmission     0
Owner            0
dtype: int64
```

```
df.nunique()   #gives total no. of unique entries
```

```
Brand              29
Model            1491
Year               27
Selling_Price     445
KM_Driven         770
Fuel                5
Seller_Type         3
Transmission        2
Owner               5
dtype: int64
```

```
df.shape
```

```
(4340, 9)
```

#Get Categories and Counts of Categorical Variables

```
df[['Brand']].value_counts()
```

```
Brand
Maruti           1280
Hyundai           821
Mahindra          365
Tata              361
Honda             252
Ford              238
Toyota            206
Chevrolet         188
Renault           146
Volkswagen        107
Skoda              68
Nissan             64
Audi               60
BMW                39
Fiat               37
Datsun             37
Mercedes-Benz      35
Mitsubishi          6
Jaguar              6
Land                5
Ambassador          4
Volvo               4
Jeep                3
OpelCorsa           2
MG                  2
Isuzu               1
Force               1
Daewoo              1
Kia                 1
dtype: int64
```

```
df[['Transmission']].value_counts()
```

```
Transmission
Manual          3892
Automatic        448
dtype: int64
```

```
df[['Model']].value_counts()
```

```
Model
Maruti Swift Dzire VDI                  69
Maruti Alto 800 LXI                     59
Maruti Alto LXi                         47
Hyundai EON Era Plus                    35
Maruti Alto LX                          35
```

```
                                        ..
Mahindra KUV 100 G80 K4 Plus             1
Mahindra KUV 100 mFALCON D75 K8          1
Mahindra KUV 100 mFALCON D75 K8 AW       1
Mahindra KUV 100 mFALCON G80 K2 Plus     1
Volvo XC60 D5 Inscription                1
Length: 1491, dtype: int64
```

```
df[['Seller_Type']].value_counts()
```

```
Seller_Type
Individual          3244
Dealer               994
Trustmark Dealer     102
dtype: int64
```

```
df[['Owner']].value_counts()
```

```
Owner
First Owner             2832
Second Owner            1106
Third Owner              304
Fourth & Above Owner      81
Test Drive Car            17
dtype: int64
```

```
df[['Fuel']].value_counts()
```

```
Fuel
Diesel      2153
Petrol      2123
CNG           40
LPG           23
Electric       1
dtype: int64
```

Get Column Names

```
df.columns
```

```
Index(['Brand', 'Model', 'Year', 'Selling_Price', 'KM_Driven', 'Fuel',
       'Seller_Type', 'Transmission', 'Owner'],
      dtype='object')
```

Get Encoding of Categorical Features

```
df.replace({'Seller_Type':{'Individual':0,'Dealer':1,'Trustmark Dealer':2}},inplace=True)
```

```
df.replace({'Owner':{'First Owner':0,'Second Owner':1,'Third Owner':2,'Fourth & Above Owner':3,'Test Drive Car':4}},inplace=True)
df.replace({'Fuel':
{'Diesel':0,'Petrol':1,'CNG':2,'LPG':3,'Electric':4}},inplace=True)

df.replace({'Transmission':{'Automatic':0,'Manual':1}},inplace=True)

#df=pd.get_dummies(df,columns=['Fuel','Transmission'])

df
```

```
        Brand                                Model  Year  
Selling_Price  \
0      Maruti                        Maruti 800 AC  2007  
60000  
1      Maruti             Maruti Wagon R LXI Minor  2007  
135000  
2     Hyundai                 Hyundai Verna 1.6 SX  2012  
600000  
3      Datsun               Datsun RediGO T Option  2017  
250000  
4       Honda                Honda Amaze VX i-DTEC  2014  
450000  
...       ...                                  ...   ...            ..
.  
4335  Hyundai  Hyundai i20 Magna 1.4 CRDi (Diesel)  2014  
409999  
4336  Hyundai           Hyundai i20 Magna 1.4 CRDi  2014  
409999  
4337   Maruti                  Maruti 800 AC BSIII  2009  
110000  
4338  Hyundai     Hyundai Creta 1.6 CRDi SX Option  2016  
865000  
4339  Renault                     Renault KWID RXT  2016  
225000  

      KM_Driven  Fuel  Seller_Type  Transmission  Owner  
0         70000     1            0             1      0  
1         50000     1            0             1      0  
2        100000     0            0             1      0  
3         46000     1            0             1      0  
4        141000     0            0             1      1  
...         ...   ...          ...           ...    ...  
4335      80000     0            0             1      1  
4336      80000     0            0             1      1  
4337      83000     1            0             1      1  
4338      90000     0            0             1      0  
4339      40000     1            0             1      0  

[4340 rows x 9 columns]
```

Define y

```
y=df['Selling_Price']
```

```
y.shape
```

```
(4340,)
```

```
y
```

```
0        60000
1       135000
2       600000
3       250000
4       450000
         ...  
4335    409999
4336    409999
4337    110000
4338    865000
4339    225000
Name: Selling_Price, Length: 4340, dtype: int64
```

```
df.columns
```

```
Index(['Brand', 'Model', 'Year', 'Selling_Price', 'KM_Driven', 'Fuel',
       'Seller_Type', 'Transmission', 'Owner'],
      dtype='object')
```

```
X=df[['Year','KM_Driven','Fuel','Seller_Type','Transmission','Owner']]
```

```
X.shape
```

```
(4340, 6)
```

```
X
```

```
      Year  KM_Driven  Fuel  Seller_Type  Transmission  Owner
0     2007      70000     1            0             1      0
1     2007      50000     1            0             1      0
2     2012     100000     0            0             1      0
3     2017      46000     1            0             1      0
4     2014     141000     0            0             1      1
...    ...        ...   ...          ...           ...    ...
4335  2014      80000     0            0             1      1
4336  2014      80000     0            0             1      1
4337  2009      83000     1            0             1      1
4338  2016      90000     0            0             1      0
4339  2016      40000     1            0             1      0

[4340 rows x 6 columns]
```

Train Test Split

```
from sklearn.model_selection import train_test_split
```

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=
train_test_split(X,y,test_size=0.3,random_state=2323)
```

```
X_train.shape, X_test.shape, y_train.shape, y_test.shape
```

```
((3038, 6), (1302, 6), (3038,), (1302,))
```

Get Model Test

```
from sklearn.linear_model import LinearRegression
```

```
lr= LinearRegression()
```

```
y_train
```

```
385     600000
1440    200000
2265    239000
338     490000
4290     37500
         ...
2004    458000
2868    260000
3503     80000
2280    300000
2120    220000
Name: Selling_Price, Length: 3038, dtype: int64
```

```
X_train
```

```
      Year  KM_Driven  Fuel  Seller_Type  Transmission  Owner
385   2019      10000     1            0             1      0
1440  2006      73756     0            0             1      0
2265  2016      41000     1            1             1      0
338   2015      60000     0            0             1      1
4290  2004      90000     1            0             1      1
...    ...        ...   ...          ...           ...    ...
2004  2014      80000     0            0             1      0
2868  2010      50000     1            0             1      0
3503  2002      40000     1            0             1      3
2280  2016      30000     1            0             1      0
2120  2011      58000     1            1             1      1

[3038 rows x 6 columns]
```

```
lr.fit(X_train, y_train)
```

```
LinearRegression()
```

Get Model Prediction

```
y_pred= lr.predict(X_test)
```

```
y_pred.shape
```

```
(1302,)
```

```
y_pred
```

```
array([ 429912.75948648,  532127.30528067, 1507458.24765234, ...,
        194865.88167524, 1508997.29560916,  559837.08726987])
```

Get Model Evaluation

```
from sklearn.metrics import mean_squared_error, mean_absolute_error,
mean_absolute_percentage_error, r2_score
```

```
mean_squared_error(y_test,y_pred)
```

```
152798998815.43036
```

```
mean_absolute_percentage_error(y_test,y_pred)
```

```
0.7562522664663961
```

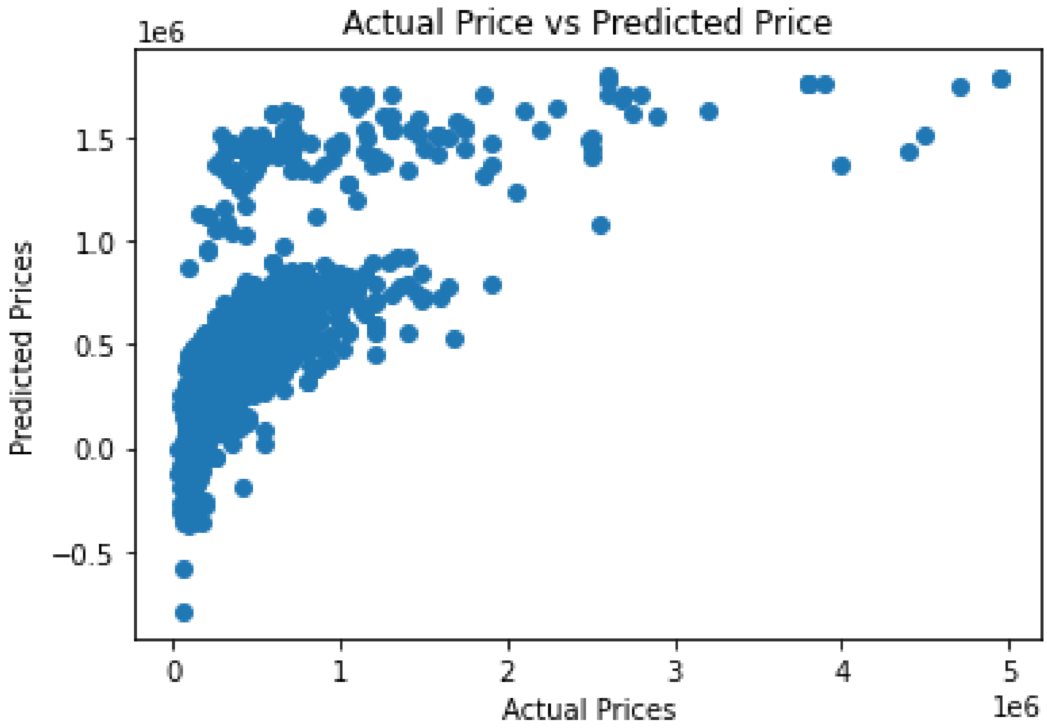
```
r2_score(y_test,y_pred)
```

```
0.4523964518624757
```

#Geet Visualization of Actual Vs Predicted Results

```
import matplotlib.pyplot as plt
```

```
plt.scatter(y_test,y_pred)
plt.xlabel("Actual Prices")
plt.ylabel('Predicted Prices')
plt.title('Actual Price vs Predicted Price')
plt.show()
```



```
X_new= df.sample(1)
```

```
X_new
```

```
      Brand                     Model  Year  Selling_Price  KM_Driven  
Fuel  \
697  Maruti  Maruti Wagon R LXI Minor  2009         150000      53000  
1   

     Seller_Type  Transmission  Owner  
697            0             1      0  
```

```
X_new.shape
```

```
(1, 9)
```

```
X_new=X_new.drop(['Selling_Price','Brand','Model'],axis=1)
```

```
X_new
```

```
     Year  KM_Driven  Fuel  Seller_Type  Transmission  Owner
697  2009      53000     1            0             1      0
```

```
X_new.shape
```

```
(1, 6)
```

```
y_pred_new= lr.predict(X_new)
```

```
y_pred_new
```

```
array([125601.80485147])
```