Mini Project 7: Exchange Vehicle Price Prediction

1. Bike Price Prediction

Step 1: Import library

```
import pandas as pd
```

```
import numpy as np
```

```
import seaborn as sns
```

Step 2: Import Data

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

```
df
```

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		odel	Selling_Price	Year	Seller_Type	Owner	KM_Driven	Ex_Showroom_Price
0	TVS	TVS XL 100	30000	2017	Individual	1st owner	8000	30490.0
1	Bajaj	Bajaj ct 100	18000	2017	Individual	1st owner	35000	32000.0
2	Yo	Yo Style	20000	2011	Individual	1st owner	10000	37675.0
3	Bajaj	Bajaj Discover 100	25000	2010	Individual	1st owner	43000	42859.0
4	Bajaj	Bajaj Discover 100	24999	2012	Individual	2nd owner	35000	42859.0
...	...	...	...	...	...	...	...	...
1056	Royal	Royal Enfield Electra 5 S	90000	2012	Individual	1st owner	40000	NaN
1057	Hero	Hero Honda Hunk	20000	2010	Individual	1st owner	17000	NaN
1058	Bajaj	Bajaj Pulsar 220 DTS-i	60000	2014	Individual	1st owner	16000	NaN

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1061 entries, 0 to 1060
Data columns (total 8 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Brand              1061 non-null   object 
 1   Model              1061 non-null   object 
 2   Selling_Price      1061 non-null   int64  
 3   Year               1061 non-null   int64  
 4   Seller_Type        1061 non-null   object 
 5   Owner              1061 non-null   object 
 6   KM_Driven          1061 non-null   int64  
 7   Ex_Showroom_Price  626 non-null    float64
dtypes: float64(1), int64(3), object(4)
memory usage: 66.4+ KB
```

Auxillary Step: Drop Missing Value Rows

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

```
df.describe()
```

	Selling_Price	Year	KM_Driven	Ex_Showroom_Price
count	626.000000	626.000000	626.000000	6.260000e+02
mean	59445.164537	2014.800319	32671.576677	8.795871e+04
std	59904.350888	3.018885	45479.661039	7.749659e+04
min	6000.000000	2001.000000	380.000000	3.049000e+04
25%	30000.000000	2013.000000	13031.250000	5.485200e+04
50%	45000.000000	2015.000000	25000.000000	7.275250e+04
75%	65000.000000	2017.000000	40000.000000	8.703150e+04
max	760000.000000	2020.000000	585659.000000	1.278000e+06

```
df.shape
```

```
(626, 8)
```

```
df.columns
```

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

Auxillary Step: Fetching Categories and Counts of y

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```
Brand
Honda        170
Bajaj        143
Hero         108
Yamaha        94
Royal         40
TVS           23
Suzuki        18
KTM            6
Mahindra       6
Kawasaki       4
UM             3
Activa         3
Harley         2
Vespa          2
BMW            1
Hyosung        1
Benelli        1
Yo             1
dtype: int64
```

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

```
Model
Honda Activa [2000-2015]                    23
Honda CB Hornet 160R                        22
Bajaj Pulsar 180                            20
Yamaha FZ S V 2.0                           16
Bajaj Discover 125                          16
                                            ..
Royal Enfield Thunderbird 500                1
Royal Enfield Continental GT [2013 - 2018]   1
Royal Enfield Classic Stealth Black          1
Royal Enfield Classic Squadron Blue          1
Yo Style                                     1
Length: 183, dtype: int64
```

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```
Seller_Type
Individual     623
Dealer           3
dtype: int64
```

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

```
Owner
1st owner    556
2nd owner     66
3rd owner      3
4th owner      1
dtype: int64
```

Auxillary Step: Encoding Categorical Features

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

```
/usr/local/lib/python3.7/dist-packages/pandas/core/indexing.py:1773: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ve
  self._setitem_single_column(ilocs[0], value, pi)
```

```
df.replace({'Owner':{'1st owner':0,'2nd owner':1,'3rd owner':2,'4th owner':3}},inplace=True)
```

```
/usr/local/lib/python3.7/dist-packages/pandas/core/indexing.py:1773: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

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```
ation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ve
locs[0], value, pi)
```

Step 3. Define y and X

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

```
y.shape
```

```
(626,)
```

```
y
```

```
0        30000
1        18000
2        20000
3        25000
4        24999
         ...  
621     330000
622     300000
623     425000
624     760000
625     750000
Name: Selling_Price, Length: 626, dtype: int64
```

```
#X=df.drop(['Brand', 'Model', 'Selling_Price'],axis=1)
#or
X=df[['Year', 'Seller_Type', 'Owner','KM_Driven', 'Ex_Showroom_Price']]
```

```
X.shape
```

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```
X
```

	Year	Seller_Type	Owner	KM_Driven	Ex_Showroom_Price
0	2017	0	0	8000	30490.0
1	2017	0	0	35000	32000.0
2	2011	0	0	10000	37675.0
3	2010	0	0	43000	42859.0
4	2012	0	1	35000	42859.0
...	...	...	...	...	...
621	2014	0	3	6500	534000.0
622	2011	0	0	12000	589000.0
623	2017	0	1	13600	599000.0
624	2019	0	0	2800	752020.0
625	2013	0	1	12000	1278000.0

626 rows × 5 columns

Step 4: Splitting Data

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

```
X_train,X_test,y_train,y_test=train_test_split(X,y,train_size=0.7,random_state=2529)
```

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```
hape,y_test.shape
```

```
    ((438, 5), (188, 5), (438,), (188,))
```

Step 5: Creating Model

```
from sklearn.linear_model import LinearRegression
model=LinearRegression()
```

Step 6: Training Model

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

```
    LinearRegression()
```

Step 7: Predicting Model

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

```
y_pred.shape
```

```
    (188,)
```

```
y_pred
```

```
    array([ 27210.52271465,  56340.08335163,  63471.94671996,  53627.63844785,
            55612.75744268.  53888.92259719,  33751.35275102,  60311.4950183 ,
```

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```
                      49332954,  27826.7399381 ,  49919.83255841,
                      12664064,  48277.75426038, 127646.56079335,
  70047.10661635,  39350.67963653,  36081.03597878,  45360.79436339,
  48079.89470577,  44803.02464799,  55161.44026111,  71041.51821318,
  91689.22699159,  49301.53594645,  55988.19326252, 108171.54600296,
  32771.06897901,  25468.20072996,  17128.61806164, 179271.41130746,
  45698.99857622,  31371.09285079,  67886.52106737,  41492.49575815,
  56855.22238602,  47820.47003468,  74682.14053958,  24984.21822736,
  55374.00513699,  41412.36775222,  67991.60287764,  26553.59421844,
  89788.69870689,  45764.83633686, 133888.03770389, 106988.113825  ,
  71176.40667714,  25332.25485946,  79512.43778826,  63914.38088173,
  28632.12110986,  53656.13623937,  -5396.37132904,  70377.44571174,
  33313.03576476,  53994.92478411,  67509.85836352,  59735.05378847,
  22199.83644217,  15374.18984158,  44510.76819427,  30279.52476752,
 108243.77037514,  19291.8895874 ,  53614.312976  ,  59230.23269131,
  60174.2108109 ,  45924.63468736,  25770.81883496,  63471.36257814,
 242123.45729792,  61387.72544548,  56510.98127074,  48123.28087213,
  51668.27442011,  90279.76190495,  14827.76533556, 112437.70820504,
  35066.88027405,  30902.41069172,  31441.48921433, 125593.75847157,
  27705.38813164, -11590.29205553,  15582.17108685,  75113.64511232,
 504085.44522282, 123545.42050116,  74770.89327697,  50747.47663245,
  44174.3618212 ,  25426.7156106 ,  30298.3052462 ,  47625.67836414,
  27850.37544807,  28845.23330928,  31580.38624692,  32309.63375635,
  47979.16788554,  65955.46375944,  13432.28218017,  15368.80064986,
  31973.23052409, 110353.92870546,  68181.49509136,  23143.49139797,
  53194.65732076,  34603.36376989,  56002.50967868,  62432.66994305,
 391470.77533201,   3558.29480891,  36019.18494305,  70876.34866549,
  72890.00667025, 137596.01384364,  27620.36308877, 135789.30486854,
  39674.40366791,  58367.0924453 ,  42401.21202624,  61864.4379567 ,
  42688.89652842,  63710.34571021,  10604.39360071,  38458.82820943,
 112251.84744225, 115403.00577536,  13658.41734785,  36196.83359584,
  54146.22998932,  97297.85724851,  55029.68137265,  22923.26533437,
 104569.97029689,  41965.75852017,  38759.68546491,  28930.61369011,
  45231.66612551,  48475.43422775,  26739.7225731 ,  53598.65972203,
  32558.54954524,  32212.22834942,  68172.98738422,  71839.47716461,
  32003.46692215,  40652.69995971,  39935.92211843,  63444.41846202,
  44545.5818771 , 120873.38389616,  60926.58683174,  62641.82167496,
  60816.47379994,  27098.95433573,  26803.64749618,  48956.00468627,
  62032.88118713,  26471.97495723, 104937.23068766, 132903.3578847 ,
  37469.2040942 ,  57579.12080094,  40371.00915736,  -7039.40662503,
                      42554145,  52153.21149321,  56453.74542453,
```

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```
                                   46870273,  49505.97985573,  24288.36959514,
                                   26333955,  23399.66596746,  63678.40865459,
       70144.29372668,  33434.89010059,  60885.29444481,  58389.55370878,
       35118.7040348 ,  58729.4540196 ,  34627.9532246 ,  38583.4623973 ])
```

Step 8: Accuracy

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

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

```
     554715615.5043668
```

```
mean_absolute_error(y_test,y_pred)
```

```
     12225.7370104107
```

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

```
     0.8810414402984937
```

Data Visualisation

```
import matplotlib.pyplot as plt
plt.scatter(y_test,y_pred)
plt.xlabel('Actual Prices')
plt.ylabel('Predicted Prices')
plt.title('Actual v/s Predicted Prices')
plt.show
```

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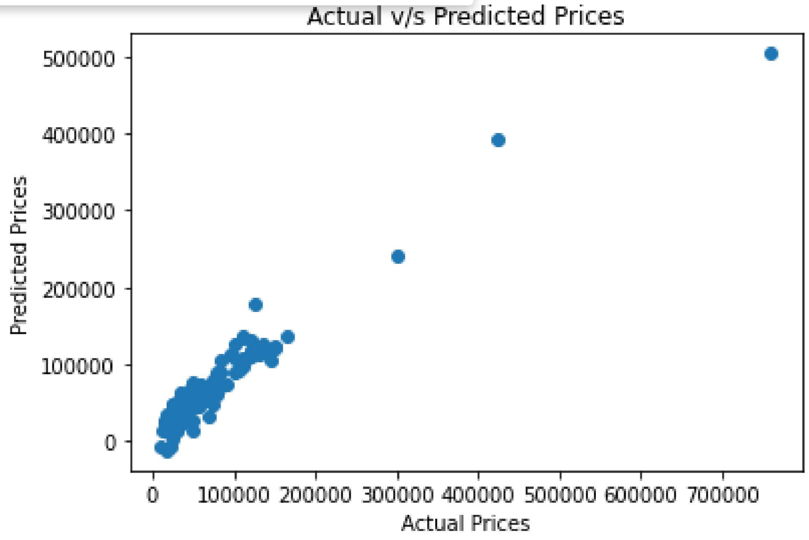
```
w>
```



Step 10: Future Predictions Example

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

```
df_new
```

	Brand	Model	Selling_Price	Year	Seller_Type	Owner	KM_Driven	Ex_Showroom_Price
367	Yamaha	Yamaha FZ16	30000	2009	0	1	26000	78712.0

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

```
X_new.shape
```

```
(1, 5)
```

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```
y_pred_new
```

```
    array([21810.4089662])
```

2. Car Price Prediction

Step 1: Import library

```
import pandas as pd
```

```
import numpy as np
```

```
import seaborn as sns
```

Step 2: Import Data

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

```
df
```

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		Model	Year	Selling_Price	KM_Driven	Fuel	Seller_Type	Transmission	Owner
0	Maruti	Maruti 800 AC	2007	60000	70000	Petrol	Individual	Manual	First Owner
1	Maruti	Maruti Wagon R LXI Minor	2007	135000	50000	Petrol	Individual	Manual	First Owner
2	Hyundai	Hyundai Verna 1.6 SX	2012	600000	100000	Diesel	Individual	Manual	First Owner
3	Datsun	Datsun RediGO T Option	2017	250000	46000	Petrol	Individual	Manual	First Owner
4	Honda	Honda Amaze VX i-DTEC	2014	450000	141000	Diesel	Individual	Manual	Second Owner
...	...	...	...	...	...	...	...	...	...
4335	Hyundai	Hyundai i20 Magna 1.4 CRDi (Diesel)	2014	409999	80000	Diesel	Individual	Manual	Second Owner
4336	Hyundai	Hyundai i20 Magna 1.4 CRDi	2014	409999	80000	Diesel	Individual	Manual	Second Owner
4337	Maruti	Maruti 800 AC BSIII	2009	110000	83000	Petrol	Individual	Manual	Second Owner
4338	Hyundai	Hyundai Creta 1.6 CRDi SX Option	2016	865000	90000	Diesel	Individual	Manual	First Owner

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 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: 305.3+ KB
```

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	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.shape
```

```
(4340, 9)
```

```
df.columns
```

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

Auxillary Step: Fetching Categories and Counts of y

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

```
Brand
```

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```
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[['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
                                              ..
                                               1
```

Saved successfully!

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

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

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

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

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

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

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

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

```
    Owner
    First Owner              2832
    Second Owner             1106
```

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```
    dtype: int64
```

Auxillary Step: Encoding Categorical Features

```
df.replace({'Fuel':{'Petrol':0,'Diesel':1,'CNG':2,'LPG':3,'Electric':4}},inplace=True)
```

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

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

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

Step 3. Define y and X

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

```
y.shape
```

```
    (4340,)
```

```
y
```

```
    0        60000
    1       135000
    2       600000
```

Saved successfully!

```
                ...
     4335    409999
     4336    409999
     4337    110000
     4338    865000
     4339    225000
     Name: Selling_Price, Length: 4340, dtype: int64
```

```
#X=df.drop(['Brand', 'Model', 'Selling_Price'],axis=1)
#or
X=df[['Year', 'KM_Driven','Fuel', 'Seller_Type','Transmission', 'Owner']]
```

```
X.shape
```

```
     (4340, 6)
```

```
X
```

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				eller_Type	Transmission	Owner
0	2007	70000	0	0	0	0
1	2007	50000	0	0	0	0
2	2012	100000	1	0	0	0
4335	2014	80000	1	0	0	1
4337	2009	83000	0	0	0	1

Step 4: Splitting Data

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

```
X_train,X_test,y_train,y_test=train_test_split(X,y,train_size=0.7,random_state=2529)
```

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

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

Step 5: Creating Model

```
from sklearn.linear_model import LinearRegression
model=LinearRegression()
```

Step 6: Training Model

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

```
LinearRegression()
```

Saved successfully!

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

```
y_pred.shape
```

```
    (1302,)
```

```
y_pred
```

```
    array([502458.82786413, 646333.17428704, 521962.74075836, ...,
           620183.32683781, 315403.8278857 , 731862.54196037])
```

Step 8: Accuracy

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

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

```
    193242972302.19553
```

```
mean_absolute_error(y_test,y_pred)
```

```
    228808.95522977872
```

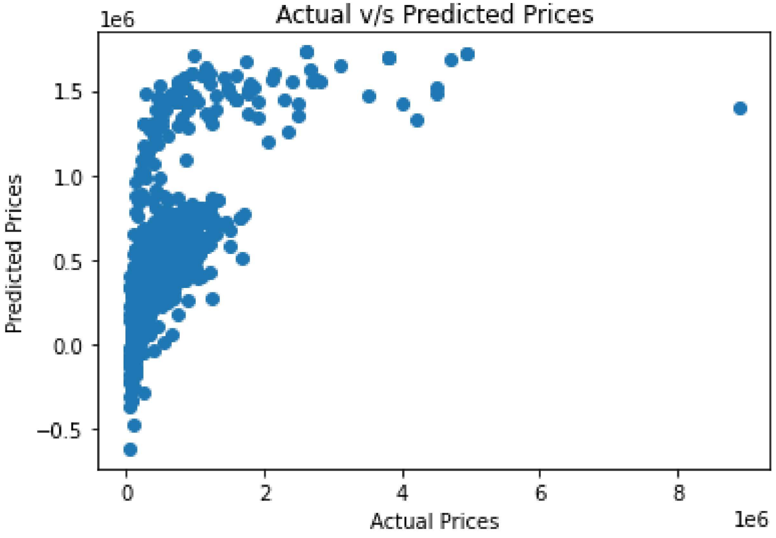
```
r2_score(y_test,y_pred)
```

Saved successfully!

Data Visualisation

```
import matplotlib.pyplot as plt
plt.scatter(y_test,y_pred)
plt.xlabel('Actual Prices')
plt.ylabel('Predicted Prices')
plt.title('Actual v/s Predicted Prices')
plt.show
```

```
<function matplotlib.pyplot.show>
```



Future Predictions Example

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

Saved successfully!

	Brand	Model	Year	Selling_Price	KM_Driven	Fuel	Seller_Type	Transmission	Owner
306	Mahindra	Mahindra Bolero Power Plus Plus AC BSIV PS	2015	430000	200000	1	0	0	0

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

```
X_new.shape
```

```
(1, 6)
```

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

```
y_pred_new
```

```
array([481052.59195395])
```

Link for the same:

https://colab.research.google.com/drive/1Ict9DHDz1BwNsTbQrk1aHJU3ki1x1cIN?usp=sharing

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