In [1]:
```
import pandas as pd
import warnings
warnings.filterwarnings("ignore")
```

In [2]:
```
data = pd.read_csv("/home/placement/Downloads/fiat500.csv")
```

In [3]:
```
data.describe()
```

Out[3]:

	ID	engine_power	age_in_days	km	previous_owners	lat	lon	price
count	1538.000000	1538.000000	1538.000000	1538.000000	1538.000000	1538.000000	1538.000000	1538.000000
mean	769.500000	51.904421	1650.980494	53396.011704	1.123537	43.541361	11.563428	8576.003901
std	444.126671	3.988023	1289.522278	40046.830723	0.416423	2.133518	2.328190	1939.958641
min	1.000000	51.000000	366.000000	1232.000000	1.000000	36.855839	7.245400	2500.000000
25%	385.250000	51.000000	670.000000	20006.250000	1.000000	41.802990	9.505090	7122.500000
50%	769.500000	51.000000	1035.000000	39031.000000	1.000000	44.394096	11.869260	9000.000000
75%	1153.750000	51.000000	2616.000000	79667.750000	1.000000	45.467960	12.769040	10000.000000
max	1538.000000	77.000000	4658.000000	235000.000000	4.000000	46.795612	18.365520	11100.000000

In [4]:
```
data.head()
```

Out[4]:

	ID	model	engine_power	age_in_days	km	previous_owners	lat	lon	price
0	1	lounge	51	882	25000	1	44.907242	8.611560	8900
1	2	pop	51	1186	32500	1	45.666359	12.241890	8800
2	3	sport	74	4658	142228	1	45.503300	11.417840	4200
3	4	lounge	51	2739	160000	1	40.633171	17.634609	6000
4	5	pop	73	3074	106880	1	41.903221	12.495650	5700

In [5]:
```
data1=data.drop(['lat','lon','ID'],axis=1)
```

In [6]:
```
data1
```

Out[6]:

	model	engine_power	age_in_days	km	previous_owners	price
0	lounge	51	882	25000	1	8900
1	pop	51	1186	32500	1	8800
2	sport	74	4658	142228	1	4200
3	lounge	51	2739	160000	1	6000
4	pop	73	3074	106880	1	5700
...	...	...	...	...	...	...
1533	sport	51	3712	115280	1	5200
1534	lounge	74	3835	112000	1	4600
1535	pop	51	2223	60457	1	7500
1536	lounge	51	2557	80750	1	5990
1537	pop	51	1766	54276	1	7900

1538 rows × 6 columns

In [7]:
```
data1=pd.get_dummies(data1)
```

In [8]:
```
data1.shape
```

Out[8]:
```
(1538, 8)
```

In [9]:
```
data1
```

Out[9]:

	engine_power	age_in_days	km	previous_owners	price	model_lounge	model_pop	model_sport
0	51	882	25000	1	8900	True	False	False
1	51	1186	32500	1	8800	False	True	False
2	74	4658	142228	1	4200	False	False	True
3	51	2739	160000	1	6000	True	False	False
4	73	3074	106880	1	5700	False	True	False
...	...	...	...	...	...	...	...	...
1533	51	3712	115280	1	5200	False	False	True
1534	74	3835	112000	1	4600	True	False	False
1535	51	2223	60457	1	7500	False	True	False
1536	51	2557	80750	1	5990	True	False	False
1537	51	1766	54276	1	7900	False	True	False

1538 rows × 8 columns

In [10]:
```
y=data1['price']
```

In [11]:
```
x = data1.drop('price',axis=1)
```

In [12]:
```
y
```

Out[12]:
```
0       8900
1       8800
2       4200
3       6000
4       5700
        ...
1533    5200
1534    4600
1535    7500
1536    5990
1537    7900
Name: price, Length: 1538, dtype: int64
```

In [13]:
```
#!pip3 install scikit-learn
```

In [14]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.33,random_state=42)
```

In [15]:
```
x_test.head(5)
```

Out[15]:

	engine_power	age_in_days	km	previous_owners	model_lounge	model_pop	model_sport
481	51	3197	120000	2	False	True	False
76	62	2101	103000	1	False	True	False
1502	51	670	32473	1	True	False	False
669	51	913	29000	1	True	False	False
1409	51	762	18800	1	True	False	False

In [16]:
```
x_train.shape
```

Out[16]:
```
(1030, 7)
```

In [17]:
```
y_test.head()
```

Out[17]:
```
481     7900
76      7900
1502    9400
669     8500
1409    9700
Name: price, dtype: int64
```

In [18]:
```
y_train.shape
```

Out[18]:
```
(1030,)
```

In [19]:
```
from sklearn.linear_model import LinearRegression
```

In [20]:
```
reg=LinearRegression()
```

In [21]:
```
reg.fit(x_train,y_train)
```

Out[21]:
```
▾ LinearRegression

LinearRegression()
```

In [22]:
```
ypred=reg.predict(x_test)
```

In [23]:
```
ypred
```

```
Out[23]: array([ 5867.6503378 ,  7133.70142341,  9866.35776216,  9723.28874535,
                10039.59101162,  9654.07582608,  9673.14563045, 10118.70728123,
                 9903.85952664,  9351.55828437, 10434.34963575,  7732.26255693,
                 7698.67240131,  6565.95240435,  9662.90103518, 10373.20344286,
                 9599.94844451,  7699.34400418,  4941.33017994, 10455.2719478 ,
                10370.51555682, 10391.60424404,  7529.06622456,  9952.37340054,
                 7006.13845729,  9000.1780961 ,  4798.36770637,  6953.10376491,
                 7810.39767825,  9623.80497535,  7333.52158317,  5229.18705519,
                 5398.21541073,  5157.65652129,  8948.63632836,  5666.62365159,
                 9822.1231461 ,  8258.46551788,  6279.2040404 ,  8457.38443276,
                 9773.86444066,  6767.04074749,  9182.99904787, 10210.05195479,
                 8694.90545226, 10328.43369248,  9069.05761443,  8866.7826029 ,
                 7058.39787506,  9073.33877162,  9412.68162121, 10293.69451263,
                10072.49011135,  6748.5794244 ,  9785.95841801,  9354.09969973,
                 9507.9444386 , 10443.01608254,  9795.31884316,  7197.84932877,
                10108.31707235,  7009.6597206 ,  9853.90699412,  7146.87414965,
                 6417.69133992,  9996.97382441,  9781.18795953,  8515.83255277,
                 8456.30006203,  6499.76668237,  7768.57829985,  6832.86406122,
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                10352.85155564,  8045.21588007, 10446.80664758,  3736.20118868,
                10348.63930496, 10435.96627494,  6167.80169017, 10390.11317804,
                 6527.69471073,  9116.4755691 , 10484.52829   ,  9335.69889855,
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                 8896.80120764,  9952.37340054, 10390.28377419,  9419.10788866,
                 9082.56591129, 10122.82465116, 10410.00504522, 10151.77663915,
                 9714.85367238,  9291.92963633, 10346.99073888,  5384.22311343,
                 9772.85146492,  6069.77107828,  9023.26394782, 10220.56195956,
                 9238.89392583,  9931.47195375,  8321.42715662,  8377.80491069,
                 7528.53327408, 10552.64805598, 10465.02437243, 10110.68940664,
                10238.17869436,  6841.77264488,  9625.64505547, 10412.59988875,
                 9653.06224923,  7948.63618724,  9704.82523573,  7971.05970955,
                10399.51752022,  9176.43567301,  5803.03205787,  6698.19524313,
                 8257.83550573, 10452.95284574,  9948.66454584,  9789.65062843,
                10582.50828537,  7568.91955482,  6804.97705225,  8065.01292384,
                10310.29143419,  8836.34894739,  8390.05091229,  9582.13932508,
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```

```
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```

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```

```
        10092.46332921, 10381.52000388,  9723.92466625,  5996.3331428 ,
         9786.14866981,  7708.49649098,  5583.48163469,  4932.92788329,
         9856.66053994,  9236.22981005, 10092.64052142,  6256.43516278,
         8592.63841379, 10341.5365957 ,  5177.96595576, 10032.66513491,
         6281.53627686,  9986.327508  ,  8381.51701951, 10371.14255313])
```

In [24]:
```python
from sklearn.metrics import r2_score
```

In [25]:
```python
r2_score(y_test,ypred)
```

Out[25]: 0.8415526986865394

In [26]:
```python
from sklearn.metrics import mean_squared_error
```

In [27]:
```python
mean_squared_error(ypred,y_test)
```

Out[27]: 581887.727391353

In [28]:
```python
n = 581887.727391353 ** (1/2)
print(n)
```

```
762.8156575420782
```

In [29]:
```python
#!pip3 install scikit-learn
```

In [30]:
```python
from sklearn.model_selection import GridSearchCV
from sklearn.linear_model import Ridge
alpha=[1e-15,1e-10,1e-8,1e-4,1e-3,1e-2,1,5,10,20,30]
ridge=Ridge()
parameters={'alpha':alpha}
ridge_regressor=GridSearchCV(ridge,parameters)
ridge_regressor.fit(x_train,y_train)
```

Out[30]:

▸ **GridSearchCV**

▸ **estimator: Ridge**

▸ Ridge

In [31]:
```
ridge_regressor.best_params_
```

Out[31]: {'alpha': 30}

In [32]:
```
ridge = Ridge(alpha=30)
ridge.fit(x_train,y_train)
y_pred_ridge=ridge.predict(x_test)
```

In [33]:
```
from sklearn.metrics import mean_squared_error
Ridge_Error = mean_squared_error(y_pred_ridge,y_test)
Ridge_Error
```

Out[33]: 579521.7970897449

In [34]:
```
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_ridge)
```

Out[34]: 0.8421969385523054

In [35]:
```
import seaborn as sns
Results=pd.DataFrame(columns=['Actual','Predicted'])
Results['Actual']=y_test
Results['Predicted']=y_pred_ridge
Results=Results.reset_index()
Results['ID']=Results.index
Results.head(10)
```

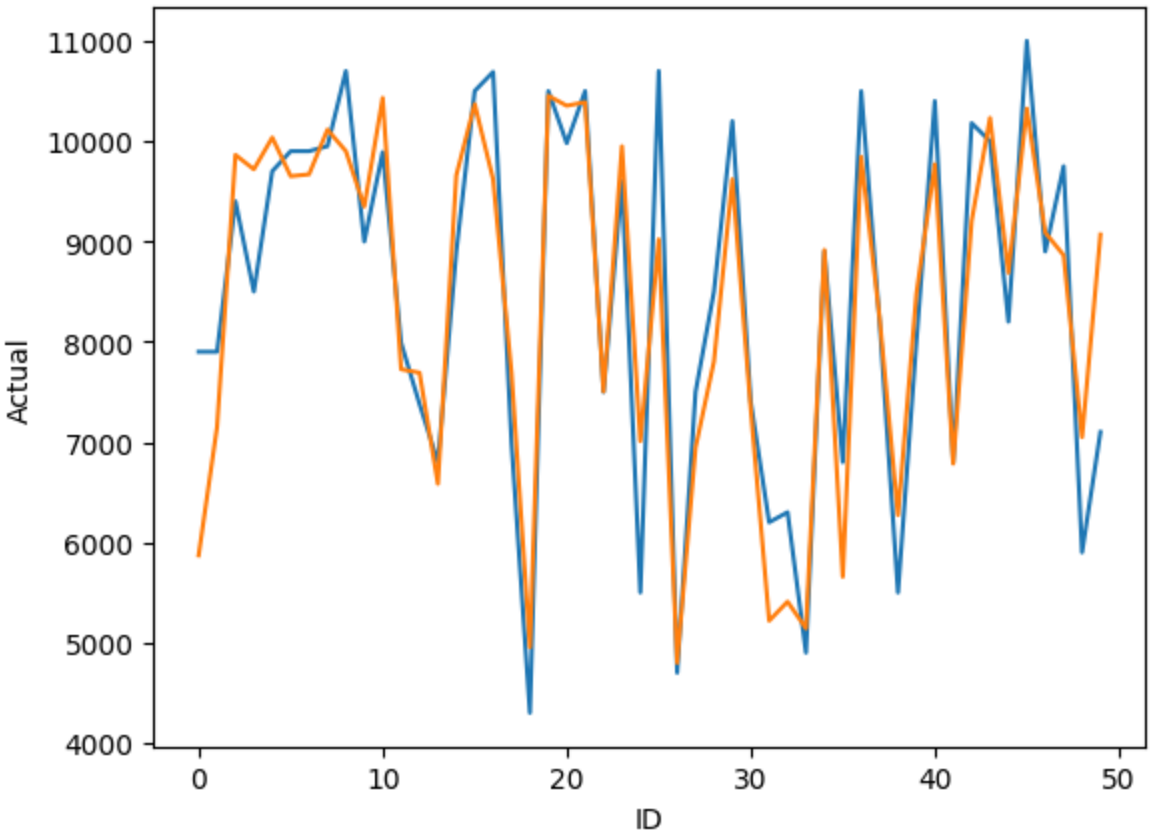
Out[35]:

	index	Actual	Predicted	ID
0	481	7900	5869.741155	0
1	76	7900	7149.563327	1
2	1502	9400	9862.785355	2
3	669	8500	9719.283532	3
4	1409	9700	10035.895686	4
5	1414	9900	9650.311090	5
6	1089	9900	9669.183317	6
7	1507	9950	10115.128380	7
8	970	10700	9900.241944	8
9	1198	8999	9347.080772	9

In [36]:

```
import matplotlib.pyplot as plt
sns.lineplot(x='ID',y='Actual',data=Results.head(50))
sns.lineplot(x='ID',y='Predicted',data=Results.head(50))
plt.plot()
```

Out[36]: []


11000
10000
9000
8000
7000
6000
5000
4000
Actual
0
10
20
30
40
50
ID

In [ ]: