In [123]:
```
import pandas as pd
```

In [124]:
```
data=pd.read_csv("/home/placement/Downloads/fiat500.csv")
```

In [125]:
```
data.describe()
```

Out[125]:

	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 [126]:
```
data.head(5)
```

Out[126]:

	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 [127]:
```
data1=data.drop(['ID','lat','lon'],axis=1)
```

```
In [128]: data1
```

```
Out[128]:
            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 [129]: data2=pd.get_dummies(data1)
```

In [130]:
```
data2
```

Out[130]:

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

1538 rows × 8 columns

In [131]:
```
data2.shape
```

Out[131]:
```
(1538, 8)
```

In [132]:
```
y=data2['price']
x=data2.drop('price',axis=1)
```

In [133]:
```
x
```

Out[133]:

	engine_power	age_in_days	km	previous_owners	model_lounge	model_pop	model_sport
0	51	882	25000	1	1	0	0
1	51	1186	32500	1	0	1	0
2	74	4658	142228	1	0	0	1
3	51	2739	160000	1	1	0	0
4	73	3074	106880	1	0	1	0
...	...	...	...	...	...	...	...
1533	51	3712	115280	1	0	0	1
1534	74	3835	112000	1	1	0	0
1535	51	2223	60457	1	0	1	0
1536	51	2557	80750	1	1	0	0
1537	51	1766	54276	1	0	1	0

1538 rows × 7 columns

In [134]:
```
y
```

Out[134]:
```
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 [135]:

```
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 [136]:

```
x_test.head(5)
```

Out[136]:

	engine_power	age_in_days	km	previous_owners	model_lounge	model_pop	model_sport
481	51	3197	120000	2	0	1	0
76	62	2101	103000	1	0	1	0
1502	51	670	32473	1	1	0	0
669	51	913	29000	1	1	0	0
1409	51	762	18800	1	1	0	0

In [137]:

```
y_test.head(5)
```

Out[137]:

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

In [138]:

```
x_train.head(5)
```

Out[138]:

	engine_power	age_in_days	km	previous_owners	model_lounge	model_pop	model_sport
527	51	425	13111	1	1	0	0
129	51	1127	21400	1	1	0	0
602	51	2039	57039	1	0	1	0
331	51	1155	40700	1	1	0	0
323	51	425	16783	1	1	0	0

In [139]:

```
y_train.head(5)
```

Out[139]:

```
527    9990
129    9500
602    7590
331    8750
323    9100
Name: price, dtype: int64
```

In [140]:

```
import warnings
warnings.filterwarnings("ignore")
```

In [141]:

```
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[141]:

```
▸   GridSearchCV
▸ estimator: Ridge
      ▸ Ridge
```

In [142]:

```
ridge_regressor.best_params_
```

Out[142]:

```
{'alpha': 30}
```

In [143]:

```
ridge=Ridge(alpha=30)
```

In [144]:

```
ridge.fit(x_train,y_train)
y_pred_ridge=ridge.predict(x_test)
```

In [145]:

```
from sklearn.metrics import mean_squared_error
Ridge_Error=mean_squared_error(y_pred_ridge,y_test)
Ridge_Error
```

Out[145]:

```
579521.7970897449
```

In [146]:

```
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_ridge)
```

Out[146]:

```
0.8421969385523054
```

In [147]:

```
#only for lounge model
```

In [148]:

```
data2=data.loc[(data.model=='lounge')]
data2
```

Out[148]:

	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
3	4	lounge	51	2739	160000	1	40.633171	17.634609	6000
6	7	lounge	51	731	11600	1	44.907242	8.611560	10750
7	8	lounge	51	1521	49076	1	41.903221	12.495650	9190
11	12	lounge	51	366	17500	1	45.069679	7.704920	10990
...	...	...	...	...	...	...	...	...	...
1528	1529	lounge	51	2861	126000	1	43.841980	10.515310	5500
1529	1530	lounge	51	731	22551	1	38.122070	13.361120	9900
1530	1531	lounge	51	670	29000	1	45.764648	8.994500	10800
1534	1535	lounge	74	3835	112000	1	45.845692	8.666870	4600
1536	1537	lounge	51	2557	80750	1	45.000702	7.682270	5990

1094 rows × 9 columns

In [149]:

```
data3=pd.get_dummies(data2)
```

In [150]:
```
data3
```

Out[150]:

	ID	engine_power	age_in_days	km	previous_owners	lat	lon	price	model_lounge
0	1	51	882	25000	1	44.907242	8.611560	8900	1
3	4	51	2739	160000	1	40.633171	17.634609	6000	1
6	7	51	731	11600	1	44.907242	8.611560	10750	1
7	8	51	1521	49076	1	41.903221	12.495650	9190	1
11	12	51	366	17500	1	45.069679	7.704920	10990	1
...	...	...	...	...	...	...	...	...	...
1528	1529	51	2861	126000	1	43.841980	10.515310	5500	1
1529	1530	51	731	22551	1	38.122070	13.361120	9900	1
1530	1531	51	670	29000	1	45.764648	8.994500	10800	1
1534	1535	74	3835	112000	1	45.845692	8.666870	4600	1
1536	1537	51	2557	80750	1	45.000702	7.682270	5990	1

1094 rows × 9 columns

In [151]:
```
data4=data3.drop(['ID','lat','lon'],axis=1)
```

In [152]:
```
data4
```

Out[152]:

	engine_power	age_in_days	km	previous_owners	price	model_lounge
0	51	882	25000	1	8900	1
3	51	2739	160000	1	6000	1
6	51	731	11600	1	10750	1
7	51	1521	49076	1	9190	1
11	51	366	17500	1	10990	1
...	...	...	...	...	...	...
1528	51	2861	126000	1	5500	1
1529	51	731	22551	1	9900	1
1530	51	670	29000	1	10800	1
1534	74	3835	112000	1	4600	1
1536	51	2557	80750	1	5990	1

1094 rows × 6 columns

In [153]:
```
data4.shape
```

Out[153]:
```
(1094, 6)
```

In [154]:
```
y=data4['price']
x=data4.drop('price',axis=1)
```

In [155]:

```
x
```

Out[155]:

	engine_power	age_in_days	km	previous_owners	model_lounge
0	51	882	25000	1	1
3	51	2739	160000	1	1
6	51	731	11600	1	1
7	51	1521	49076	1	1
11	51	366	17500	1	1
...	...	...	...	...	...
1528	51	2861	126000	1	1
1529	51	731	22551	1	1
1530	51	670	29000	1	1
1534	74	3835	112000	1	1
1536	51	2557	80750	1	1

1094 rows × 5 columns

In [156]:
```
y
```

Out[156]:
```
0        8900
3        6000
6       10750
7        9190
11      10990
        ...  
1528     5500
1529     9900
1530    10800
1534     4600
1536     5990
Name: price, Length: 1094, dtype: int64
```

In [157]:
```
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 [158]:
```
x_test.head(5)
```

Out[158]:

	engine_power	age_in_days	km	previous_owners	model_lounge
676	51	762	18609	1	1
215	51	701	25000	1	1
146	51	4018	152900	1	1
1319	51	731	20025	1	1
1041	51	640	38231	1	1

In [159]:
```
y_test.head(5)
```

Out[159]:
```
676     10250
215      9790
146      5500
1319     9900
1041     8900
Name: price, dtype: int64
```

In [160]:
```
x_train.head(5)
```

Out[160]:

	engine_power	age_in_days	km	previous_owners	model_lounge
441	51	762	36448	1	1
701	51	701	27100	1	1
695	51	3197	51083	1	1
1415	51	670	33000	1	1
404	51	456	14000	1	1

In [161]:
```
y_train.head(5)
```

Out[161]:
```
441      8980
701     10300
695      5880
1415    10490
404      9499
Name: price, dtype: int64
```

In [162]:
```
import warnings
warnings.filterwarnings("ignore")
```

In [163]:
```
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[163]:
```
▸   GridSearchCV
▸ estimator: Ridge
      ▸ Ridge
```

```
In [164]: ridge_regressor.best_params_    #get alpha value or constant

Out[164]: {'alpha': 30}
```

```
In [165]: ridge=Ridge(alpha=30)
```

```
In [166]: ridge.fit(x_train,y_train)
          y_pred_ridge=ridge.predict(x_test) #predicted value
```

```
In [167]: from sklearn.metrics import mean_squared_error  #rms value
          Ridge_Error=mean_squared_error(y_pred_ridge,y_test
          Ridge_Error

Out[167]: 519771.8129989745
```

```
In [168]: from sklearn.metrics import r2_score
          r2_score(y_test,y_pred_ridge) #efficiency

Out[168]: 0.8373030813683994
```

In [169]:

```
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[169]:

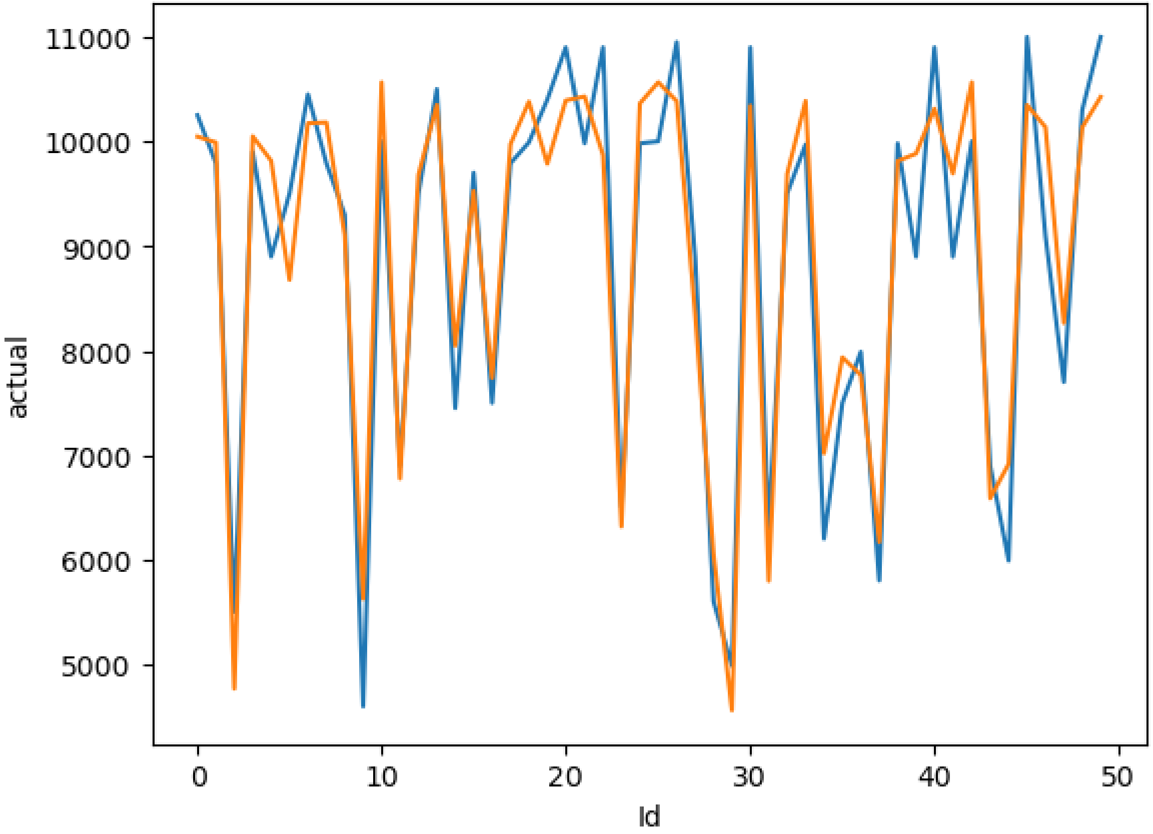
```
   index  actual     Predicted  Id
0    676   10250  10045.347779   0
1    215    9790   9989.171535   1
2    146    5500   4769.099603   2
3   1319    9900  10048.683238   3
4   1041    8900   9813.944798   4
5   1425    9500   8678.143561   5
6    409   10450  10173.797921   6
7    617    9790  10180.627008   7
8   1526    9300   9107.315259   8
9   1010    4600   5625.007407   9
```

In [175]:

```
import seaborn as hh
import matplotlib.pyplot as plt
```

In [183]:
```
hh.lineplot(x='Id',y='actual',data=results.head(50))
hh.lineplot(x='Id',y='Predicted',data=results.head(50))
```

Out[183]:
```
<Axes: xlabel='Id', ylabel='actual'>
```



```
In [ ]:
```