In [54]:
```
import pandas as pd
```

In [55]:
```
data=pd.read_csv("fiat500.csv")
```

In [56]:
```
data
```

Out[56]:

	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
...	...	...	...	...	...	...	...	...	...
1533	1534	sport	51	3712	115280	1	45.069679	7.704920	5200
1534	1535	lounge	74	3835	112000	1	45.845692	8.666870	4600
1535	1536	pop	51	2223	60457	1	45.481541	9.413480	7500
1536	1537	lounge	51	2557	80750	1	45.000702	7.682270	5990
1537	1538	pop	51	1766	54276	1	40.323410	17.568270	7900

1538 rows × 9 columns

In [57]:
```
data=data.drop(['lat','lon','ID',],axis=1)
```

In [58]:
```
data
```

Out[58]:

	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 [59]:
```
data=pd.get_dummies(data)
```

In [60]:
```
data.shape
#data['model'] =data['model'].map({'lounge':1,'pop':2,'sport':3})
```

Out[60]:
```
(1538, 8)
```

In [61]:
```
data
```

Out[61]:

	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 [62]:
```
y=data['price']
```

In [63]:
```
x=data.drop('price',axis=1)
```

In [64]:
```
y
```

Out[64]:
```
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 [65]:
```
!pip install scikit-learn
```

```
Requirement already satisfied: scikit-learn in ./anaconda3/lib/python3.10/site-packages (1.2.1)
Requirement already satisfied: numpy>=1.17.3 in ./anaconda3/lib/python3.10/site-packages (from scikit-lear
n) (1.23.5)
Requirement already satisfied: threadpoolctl>=2.0.0 in ./anaconda3/lib/python3.10/site-packages (from sciki
t-learn) (2.2.0)
Requirement already satisfied: joblib>=1.1.1 in ./anaconda3/lib/python3.10/site-packages (from scikit-lear
n) (1.1.1)
Requirement already satisfied: scipy>=1.3.2 in ./anaconda3/lib/python3.10/site-packages (from scikit-learn)
(1.10.0)
```

In [66]:
```
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 [67]:
```
x_test.head(5)
```

Out[67]:

	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 [68]:
```
x_train.shape
```

Out[68]:
```
(1030, 7)
```

In [69]:
```
y_train
```

Out[69]:
```
527      9990
129      9500
602      7590
331      8750
323      9100
        ...
1130    10990
1294     9800
860      5500
1459     9990
1126     8900
Name: price, Length: 1030, dtype: int64
```

In [70]:
```
from sklearn.linear_model import LinearRegression
reg = LinearRegression() #creating object of LinearRegression
reg.fit(x_train,y_train) #training and fitting LR object using training data
```

Out[70]:
```
LinearRegression()
```

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In [71]:
```
ypred=reg.predict(x_test)
```

In [72]:
```
ypred
```

```
array([ 5534.45288323,  4495.02309231, 10199.78432943, 10024.87037067,
        5465.58034188,  8520.72057674,  7034.71038647, 10054.65061446,
       10191.12067767,  6008.34860428,  9748.18097947,  9669.4333196 ,
        9145.3756075 ,  9175.66562699, 10087.86753845,  9825.02990067,
        7340.29803785,  5083.8487301 ,  9441.50914802, 10243.05490667,
        5556.42300245, 10676.01945733,  6126.99295838,  9845.16661356,
        9850.77978959,  7840.83596305,  6552.05146566,  9938.82104889,
        8327.79232274,  9119.62204137,  6111.83787367, 10410.00504522,
        6360.97695249,  8601.59209793,  8377.80258216,  9803.81343895,
        8285.09831762, 10091.75635129, 10003.86694939, 10028.60283146,
       10354.61956534,  8552.21002673,  6726.65446676,  9381.22662706,
        6520.9999373 , 10352.85155564,  9063.7534579 , 10456.89121831,
        9127.72470241,  9952.37340054,  8376.6975881 ,  9220.36267675,
       10036.24981328,  8418.65456209,  4717.7579531 , 10076.86950203,
       10017.8490121 , 10590.33289679, 10161.75393066,  4927.49556508,
        7276.18410037,  9678.26477249,  9764.65653403,  5643.53722047,
       10062.84554534,  5163.04602382,  8307.60791348,  7441.80993846,
        7868.82460983,  9725.36143983,  8669.20982667, 10447.15719448,
        7124.58453563,  9718.32989102,  8059.66615638,  7430.65975056,
       10425.57075395, 10364.18738085,  5433.2724385 ,  9102.40298437,
```

In [73]:
```
from sklearn .metrics import r2_score
r2_score(y_test,ypred)
```

Out[73]:
```
0.8415526986865394
```

In [74]:
```
from sklearn.metrics import mean_squared_error
mean_squared_error(ypred,y_test)
```

Out[74]:
```
581887.727391353
```

In [75]:
```
#from sklearn.metrics import accuracy_score
#accuracy_score(y_test)
```

In [76]:
```
Results= pd.DataFrame(columns=['price','predicted'])
Results['price']=y_test
Results['predicted']=ypred
Results=Results.reset_index()
Results['Id']=Results.index
Results.head(15)
```

Out[76]:

	index	price	predicted	Id
0	481	7900	5867.650338	0
1	76	7900	7133.701423	1
2	1502	9400	9866.357762	2
3	669	8500	9723.288745	3
4	1409	9700	10039.591012	4
5	1414	9900	9654.075826	5
6	1089	9900	9673.145630	6
7	1507	9950	10118.707281	7
8	970	10700	9903.859527	8
9	1198	8999	9351.558284	9
10	1088	9890	10434.349636	10
11	576	7990	7732.262557	11
12	965	7380	7698.672401	12
13	1488	6800	6565.952404	13
14	1432	8900	9662.901035	14

In [77]:
```
#ridge regressor
```

In [78]:
```
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[78]:
```
GridSearchCV(estimator=Ridge(),
             param_grid={'alpha': [1e-15, 1e-10, 1e-08, 0.0001, 0.001, 0.01, 1,
                                   5, 10, 20, 30]})
```

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In [79]:
```
ridge_regressor.best_params_
```

Out[79]:
```
{'alpha': 30}
```

In [80]:
```
ridge=Ridge(alpha=30)
ridge.fit(x_train,y_train)
y_pred_ridge=ridge.predict(x_test)
```

In [81]:
```
Ridge_Error=mean_squared_error(y_pred_ridge,y_test)
Ridge_Error
```

Out[81]:
```
579521.7970897449
```

In [82]:
```
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_ridge)
```

Out[82]:
```
0.8421969385523054
```

In [83]:
```
Results= pd.DataFrame(columns=['Price','Predicted'])
Results['Price']=y_test
Results['Predicted']=y_pred_ridge
Results=Results.reset_index()
Results['Id']=Results.index
Results.head(10)
```

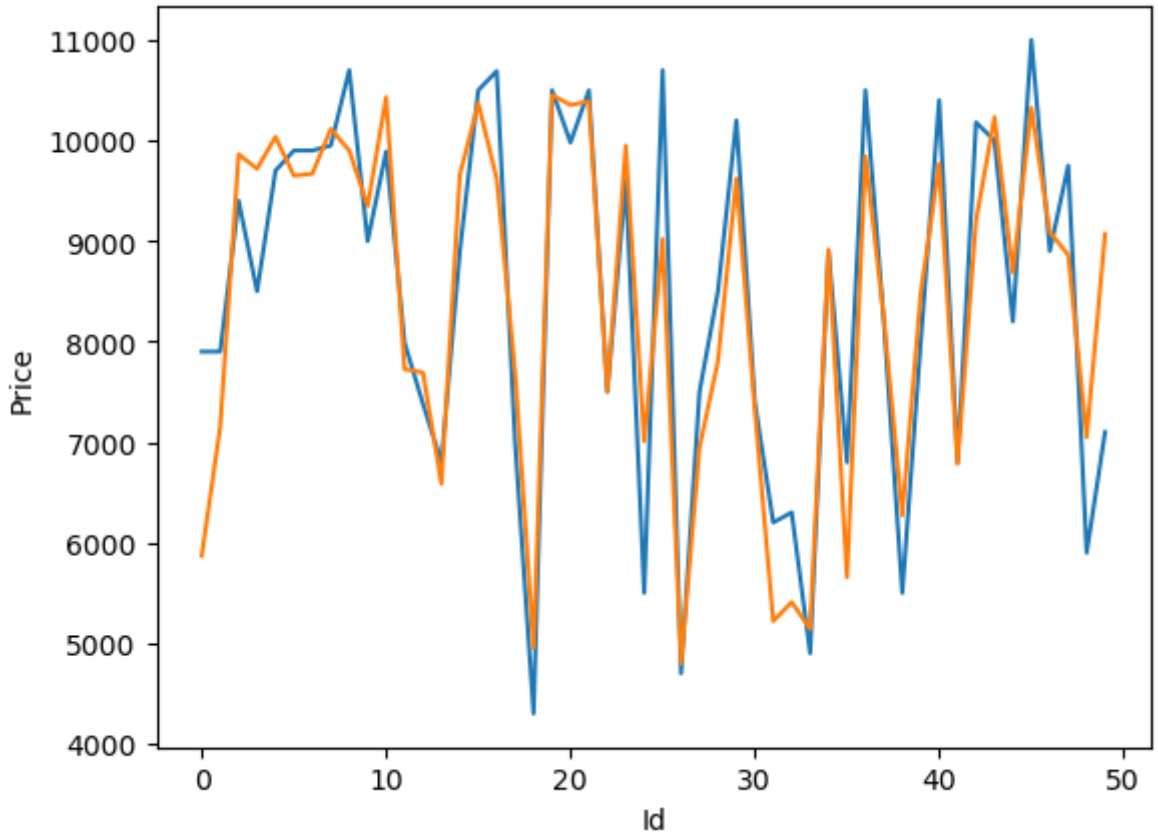
Out[83]:

	index	Price	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 [84]:
```
import seaborn as sns
import matplotlib.pyplot as plt

sns.lineplot(x='Id',y='Price',data=Results.head(50))
sns.lineplot(x='Id',y='Predicted',data=Results.head(50))
plt.plot()
```

Out[84]: []



In [85]:
```
#elastic
```

In [86]:
```
import pandas as a
import warnings
warnings.filterwarnings("ignore")
```

In [87]:
```
data=pd.read_csv("fiat500.csv")
```

In [88]:
```
data
```

Out[88]:

	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
...	...	...	...	...	...	...	...	...	...
1533	1534	sport	51	3712	115280	1	45.069679	7.704920	5200
1534	1535	lounge	74	3835	112000	1	45.845692	8.666870	4600
1535	1536	pop	51	2223	60457	1	45.481541	9.413480	7500
1536	1537	lounge	51	2557	80750	1	45.000702	7.682270	5990
1537	1538	pop	51	1766	54276	1	40.323410	17.568270	7900

1538 rows × 9 columns

In [89]:
```
data=data.loc[(data.previous_owners==1)]
```

In [90]:
```
data
```

Out[90]:

	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
...	...	...	...	...	...	...	...	...	...
1533	1534	sport	51	3712	115280	1	45.069679	7.704920	5200
1534	1535	lounge	74	3835	112000	1	45.845692	8.666870	4600
1535	1536	pop	51	2223	60457	1	45.481541	9.413480	7500
1536	1537	lounge	51	2557	80750	1	45.000702	7.682270	5990
1537	1538	pop	51	1766	54276	1	40.323410	17.568270	7900

1389 rows × 9 columns

In [91]:
```
data=data.drop(['ID','lat','lon'],axis=1)
```

In [92]:
```
data
```

Out[92]:

	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

1389 rows × 6 columns

In [93]:
```
data=pd.get_dummies(data)
```

In [94]:
```
data.shape
```

Out[94]: (1389, 8)

In [95]:
```
y=data['price']
x=data.drop('price',axis=1)
```

In [96]:
```
y
```

Out[96]:
```
0       8900
1       8800
2       4200
3       6000
4       5700
        ...
1533    5200
1534    4600
1535    7500
1536    5990
1537    7900
Name: price, Length: 1389, dtype: int64
```

In [97]:
```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.1,random_state=42)
```

In [98]:
```
x_test.head(5)
```

Out[98]:

	engine_power	age_in_days	km	previous_owners	model_lounge	model_pop	model_sport
625	51	3347	148000	1	1	0	0
187	51	4322	117000	1	1	0	0
279	51	4322	120000	1	0	1	0
734	51	974	12500	1	0	1	0
315	51	1096	37000	1	1	0	0

In [99]:
```
from sklearn.model_selection import GridSearchCV
from sklearn.linear_model import ElasticNet

elastic = ElasticNet()

parameters = {'alpha': [1e-15, 1e-10, 1e-8, 1e-4, 1e-3,1e-2, 1, 5, 10, 20]}

elastic_regressor = GridSearchCV(elastic, parameters)

elastic_regressor.fit(x_train, y_train)
```

Out[99]:
```
GridSearchCV(estimator=ElasticNet(),
             param_grid={'alpha': [1e-15, 1e-10, 1e-08, 0.0001, 0.001, 0.01, 1,
                                   5, 10, 20]})
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
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In [100]:
```
elastic_regressor.best_params_
```

Out[100]:
```
{'alpha': 0.01}
```

In [101]:
```
elastic=ElasticNet(alpha=.01)
elastic.fit(x_train,y_train)
y_pred_elastic=elastic.predict(x_test)
```

In [102]:
```
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_elastic)
```

Out[102]:
```
0.8488682857174344
```

In [103]:
```
from sklearn.metrics import mean_squared_error
elastic_Error=mean_squared_error(y_pred_elastic,y_test)
elastic_Error
```

Out[103]:
```
603966.023413073
```

In [104]:
```
Results= pd.DataFrame(columns=['Price','Predicted'])
Results['Price']=y_test
Results['Predicted']=y_pred_elastic
Results=Results.reset_index()
Results['Id']=Results.index
Results.head(10)
```

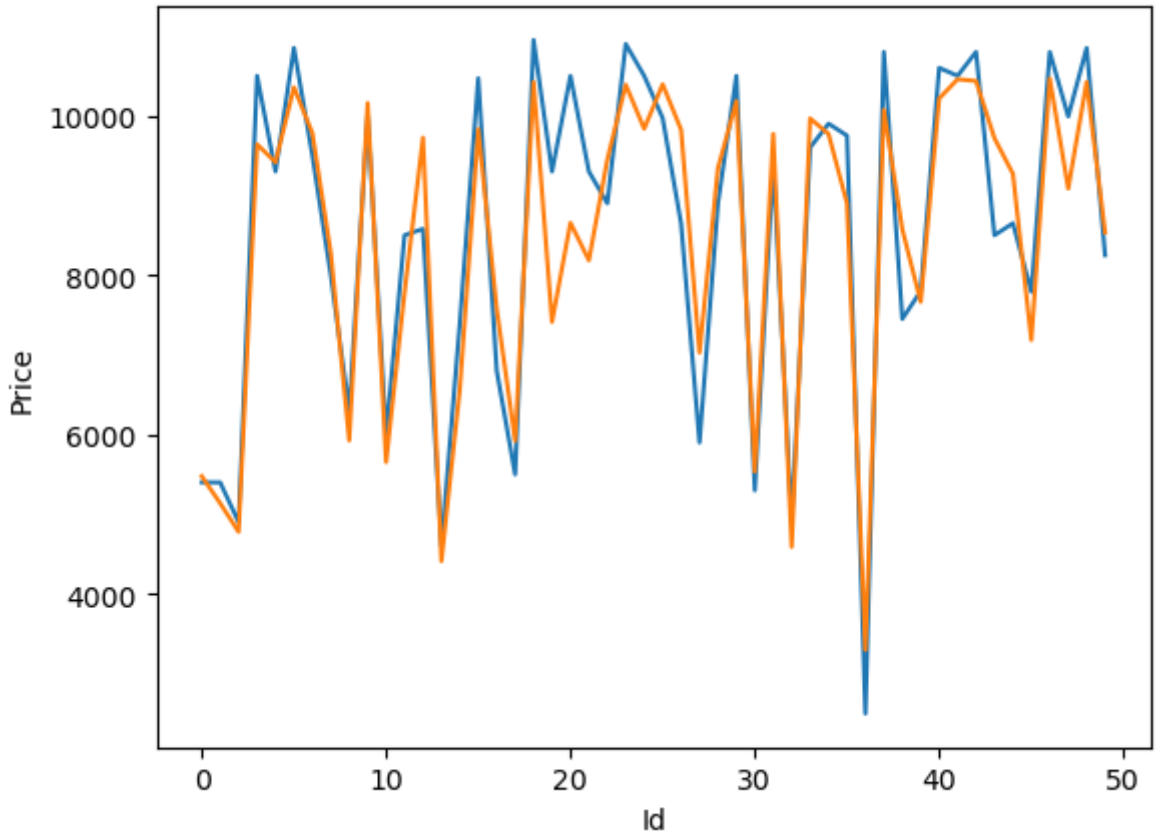
Out[104]:

	index	Price	Predicted	Id
0	625	5400	5477.052458	0
1	187	5399	5137.435504	1
2	279	4900	4778.564980	2
3	734	10500	9640.895436	3
4	315	9300	9415.174300	4
5	652	10850	10356.323449	5
6	1472	9500	9781.272728	6
7	619	7999	8276.238400	7
8	992	6300	5925.267808	8
9	1154	10000	10158.433547	9

In [105]:
```
import seaborn as sns
import matplotlib.pyplot as plt

sns.lineplot(x='Id',y='Price',data=Results.head(50))
sns.lineplot(x='Id',y='Predicted',data=Results.head(50))
plt.plot()
```

Out[105]: []



In [ ]:

In [ ]:

In [ ]:

In [ ]: