In [22]:
```
import pandas as pd
```

In [23]:
```
data=pd.read_csv("/home/placement/Downloads/fiat500.csv")
```

In [24]:
```
data.describe()
```

Out[24]:

	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 [25]:
```
data.head(10)
```

Out[25]:

	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
5	6	pop	74	3623	70225	1	45.000702	7.682270	7900
6	7	lounge	51	731	11600	1	44.907242	8.611560	10750
7	8	lounge	51	1521	49076	1	41.903221	12.495650	9190
8	9	sport	73	4049	76000	1	45.548000	11.549470	5600
9	10	sport	51	3653	89000	1	45.438301	10.991700	6000

In [26]:
```
data1=data.drop(['lat','ID'],axis=1)
```

In [27]:
```
data1
```

Out[27]:

	model	engine_power	age_in_days	km	previous_owners	lon	price
0	lounge	51	882	25000	1	8.611560	8900
1	pop	51	1186	32500	1	12.241890	8800
2	sport	74	4658	142228	1	11.417840	4200
3	lounge	51	2739	160000	1	17.634609	6000
4	pop	73	3074	106880	1	12.495650	5700
...	...	...	...	...	...	...	...
1533	sport	51	3712	115280	1	7.704920	5200
1534	lounge	74	3835	112000	1	8.666870	4600
1535	pop	51	2223	60457	1	9.413480	7500
1536	lounge	51	2557	80750	1	7.682270	5990
1537	pop	51	1766	54276	1	17.568270	7900

1538 rows × 7 columns

In [28]:
```
data1=pd.get_dummies(data1)
```

In [29]:
```
data1.shape
```

Out[29]: (1538, 9)

In [30]:
```
data1
```

Out[30]:

	engine_power	age_in_days	km	previous_owners	lon	price	model_lounge	model_pop	model_sport
0	51	882	25000	1	8.611560	8900	1	0	0
1	51	1186	32500	1	12.241890	8800	0	1	0
2	74	4658	142228	1	11.417840	4200	0	0	1
3	51	2739	160000	1	17.634609	6000	1	0	0
4	73	3074	106880	1	12.495650	5700	0	1	0
...	...	...	...	...	...	...	...	...	...
1533	51	3712	115280	1	7.704920	5200	0	0	1
1534	74	3835	112000	1	8.666870	4600	1	0	0
1535	51	2223	60457	1	9.413480	7500	0	1	0
1536	51	2557	80750	1	7.682270	5990	1	0	0
1537	51	1766	54276	1	17.568270	7900	0	1	0

1538 rows × 9 columns

In [31]:
```
y=data1['price']
```

In [32]:
```
x=data1.drop('price',axis=1)
```

In [33]:
```
y
```

Out[33]:
```
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 [34]:
```
#!pip3 install scikit_learn
```

In [35]:
```
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 [36]:
```
from sklearn.model_selection import GridSearchCV
```

In [37]:
```
from sklearn.linear_model import Ridge
```

In [38]:
```
x_train.head(5)
```

Out[38]:

	engine_power	age_in_days	km	previous_owners	lon	model_lounge	model_pop	model_sport
527	51	425	13111	1	7.58602	1	0	0
129	51	1127	21400	1	7.54592	1	0	0
602	51	2039	57039	1	14.52835	0	1	0
331	51	1155	40700	1	12.54016	1	0	0
323	51	425	16783	1	12.49565	1	0	0

In [39]:
```
y_test.head(10)
```

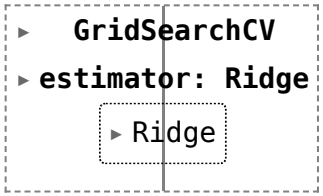
Out[39]:
```
481      7900
76       7900
1502     9400
669      8500
1409     9700
1414     9900
1089     9900
1507     9950
970     10700
1198     8999
Name: price, dtype: int64
```

In [40]:
```
alpha=[1e-15,1e-10,1e-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)
```

```
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.35498e-26): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=8.73659e-26): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=6.91502e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.08137e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.01088e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.5803e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.24144e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=6.91502e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.08137e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.01088e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.5803e-23): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.24144e-23): result may not be accurate.
```

```
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=6.92757e-21): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.09091e-21): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.02113e-21): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.57413e-21): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.23284e-21): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=6.92769e-17): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.09098e-17): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.02123e-17): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.57406e-17): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
/home/placement/anaconda3/lib/python3.10/site-packages/sklearn/linear_model/_ridge.py:216: LinAlgWarning: I
ll-conditioned matrix (rcond=7.23274e-17): result may not be accurate.
  return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
```

Out[40]:



In [41]:
```
ridge_regressor.best_params_
```

Out[41]:
```
{'alpha': 30}
```

In [43]:
```
ridge=Ridge(alpha=30)
ridge.fit(x_train,y_train)
y_pred_ridge=ridge.predict(x_test)
```

In [47]:
```
from sklearn.metrics import mean_squared_error
Ridge_Error=mean_squared_error(y_pred_ridge,y_test)
Ridge_Error
```

Out[47]:
```
575383.1771434229
```

In [48]:
```
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_ridge)
```

Out[48]:
```
0.8433238795940019
```

In [49]:
```
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(15)
```

Out[49]:

	index	price	predicted	ID
0	481	7900	5747.926902	0
1	76	7900	7208.382565	1
2	1502	9400	9818.102659	2
3	669	8500	9769.459155	3
4	1409	9700	10067.159538	4
5	1414	9900	9637.878391	5
6	1089	9900	9645.621130	6
7	1507	9950	10153.777414	7
8	970	10700	9844.599721	8
9	1198	8999	9305.396258	9
10	1088	9890	10479.065427	10
11	576	7990	7772.362188	11
12	965	7380	7666.138173	12
13	1488	6800	6523.634742	13
14	1432	8900	9616.023410	14

In [50]:
```
#extract column syntax.

data2=x.loc[:,"model_lounge"]
```

In [51]:
```
data2
```

Out[51]:
```
0       1
1       0
2       0
3       1
4       0
       ..
1533    0
1534    1
1535    0
1536    1
1537    0
Name: model_lounge, Length: 1538, dtype: uint8
```

In [53]:
```
data2=pd.get_dummies(data2)
```

In [54]:
```
data2
```

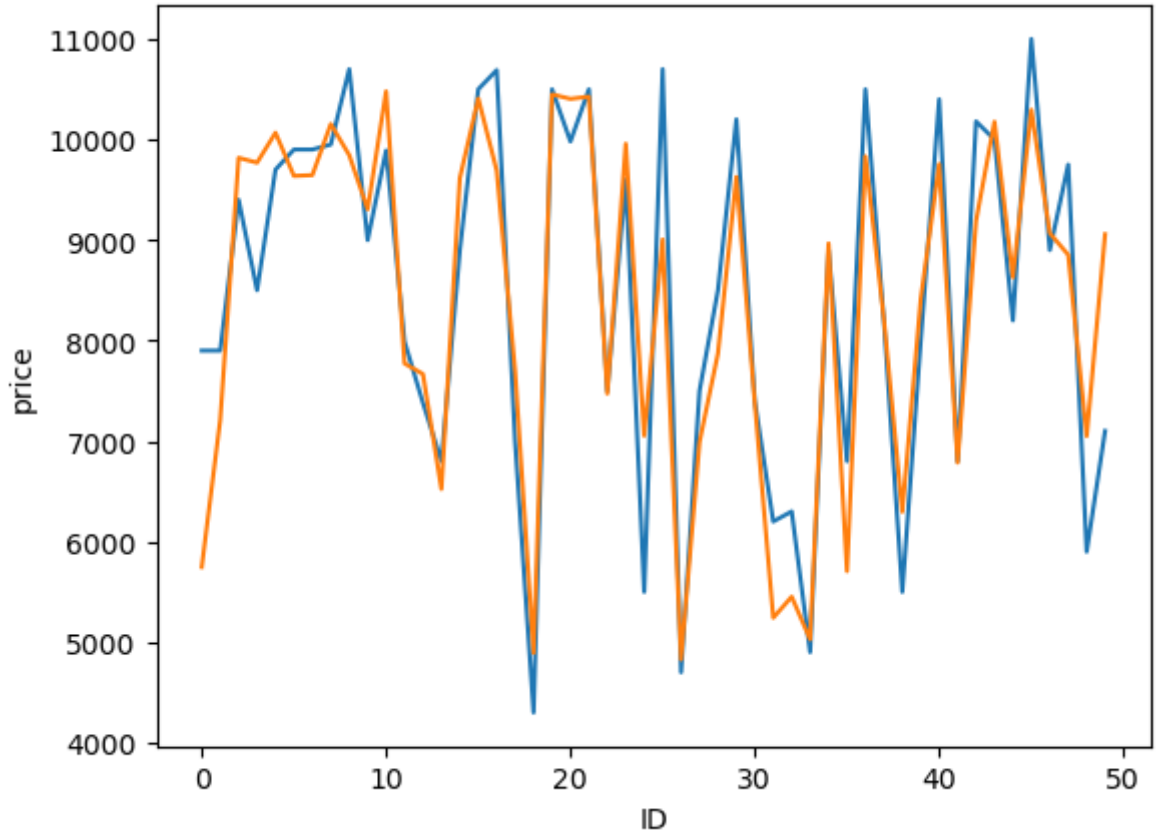
Out[54]:

	0	1
0	0	1
1	1	0
2	1	0
3	0	1
4	1	0
...	...	...
1533	1	0
1534	0	1
1535	1	0
1536	0	1
1537	1	0

1538 rows × 2 columns

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



In [ ]: