In [27]:

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.linear_model import Ridge, RidgeCV, Lasso
from sklearn.preprocessing import StandardScaler
```

In [28]:

```
df=pd.read_csv(r"C:\Users\MY HOME\Downloads\fiat500_VehicleSelection_Dataset.csv")
df
```

Out[28]:

	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 [29]:

```
#taking selected columns from dataset
df=df[['age_in_days','km']]

df
```

Out[29]:

```
      age_in_days      km
   0          882   25000
   1         1186   32500
   2         4658  142228
   3         2739  160000
   4         3074  106880
 ...          ...     ...
1533         3712  115280
1534         3835  112000
1535         2223   60457
1536         2557   80750
1537         1766   54276

1538 rows × 2 columns
```

In [30]:

```
#Renamin columns for easier process(OPTIONAL)
df.columns=['age_in_days','km']
df
```

Out[30]:

```
      age_in_days      km
   0          882   25000
   1         1186   32500
   2         4658  142228
   3         2739  160000
   4         3074  106880
 ...          ...     ...
1533         3712  115280
1534         3835  112000
1535         2223   60457
1536         2557   80750
1537         1766   54276

1538 rows × 2 columns
```

In [31]:

```
df.head(10)
```

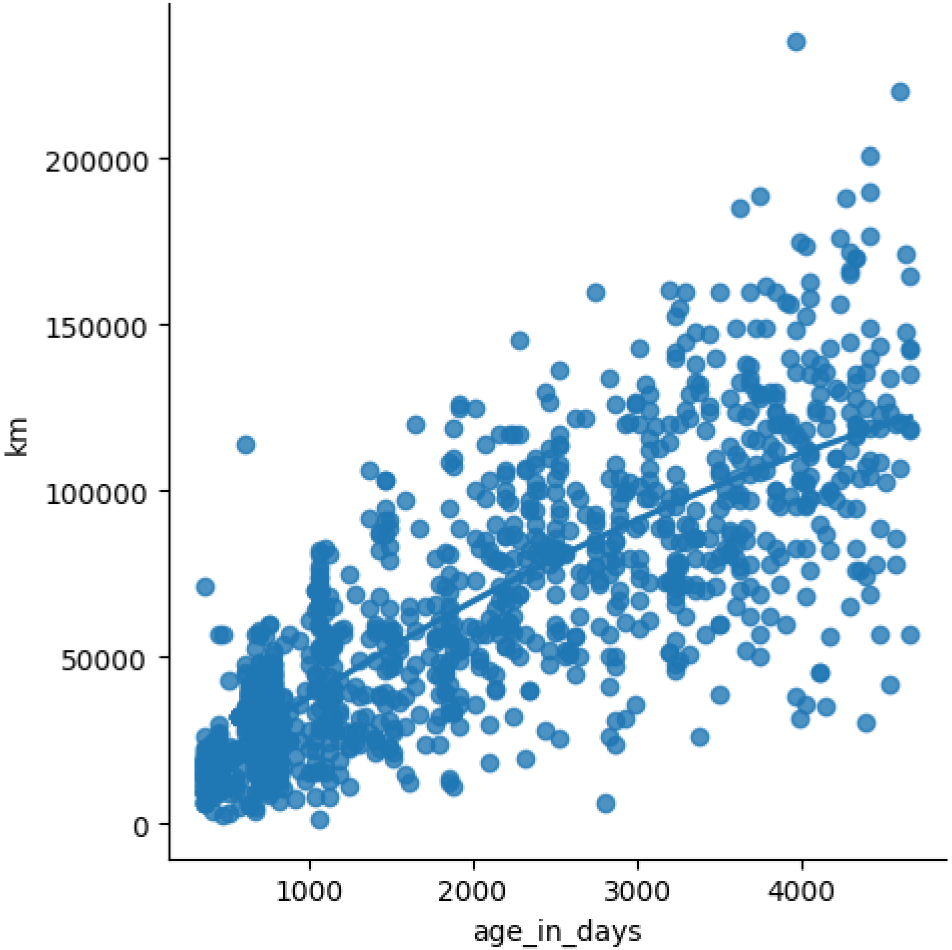
Out[31]:

```
   age_in_days      km
0          882   25000
1         1186   32500
2         4658  142228
3         2739  160000
4         3074  106880
5         3623   70225
6          731   11600
7         1521   49076
8         4049   76000
9         3653   89000
```

In [32]:

```
###step 3: Exploring to data scatter-pltting the data
```

In [33]:
```
sns.lmplot(x="age_in_days",y="km",order=2,data=df,ci=None)
plt.show()
```



In [34]:

```
df.describe()
```

Out[34]:

	age_in_days	km
count	1538.000000	1538.000000
mean	1650.980494	53396.011704
std	1289.522278	40046.830723
min	366.000000	1232.000000
25%	670.000000	20006.250000
50%	1035.000000	39031.000000
75%	2616.000000	79667.750000
max	4658.000000	235000.000000

In [35]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1538 entries, 0 to 1537
Data columns (total 2 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   age_in_days  1538 non-null   int64
 1   km           1538 non-null   int64
dtypes: int64(2)
memory usage: 24.2 KB
```

In [36]:

```
##step 4:Data cleaning-Eliminating Nan/missing values
```

In [37]:

```
df.fillna(method="ffill",inplace=True)
df
```

```
C:\Users\MY HOME\AppData\Local\Temp\ipykernel_18796\2729279820.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df.fillna(method="ffill",inplace=True)
```

Out[37]:

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

1538 rows × 2 columns

step 5:Training our model

In [38]:

```
#Separating data into independent & dependent variables
#Now each dataframe contains only one coloumn
x=np.array(df['age_in_days']).reshape(-1,1)
y=np.array(df['km']).reshape(-1,1)
#Dropping any rows with Nan values
df.dropna(inplace=True)
df
```

```
C:\Users\MY HOME\AppData\Local\Temp\ipykernel_18796\49978593.py:6: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df.dropna(inplace=True)
```

Out[38]:

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

1538 rows × 2 columns

In [39]:

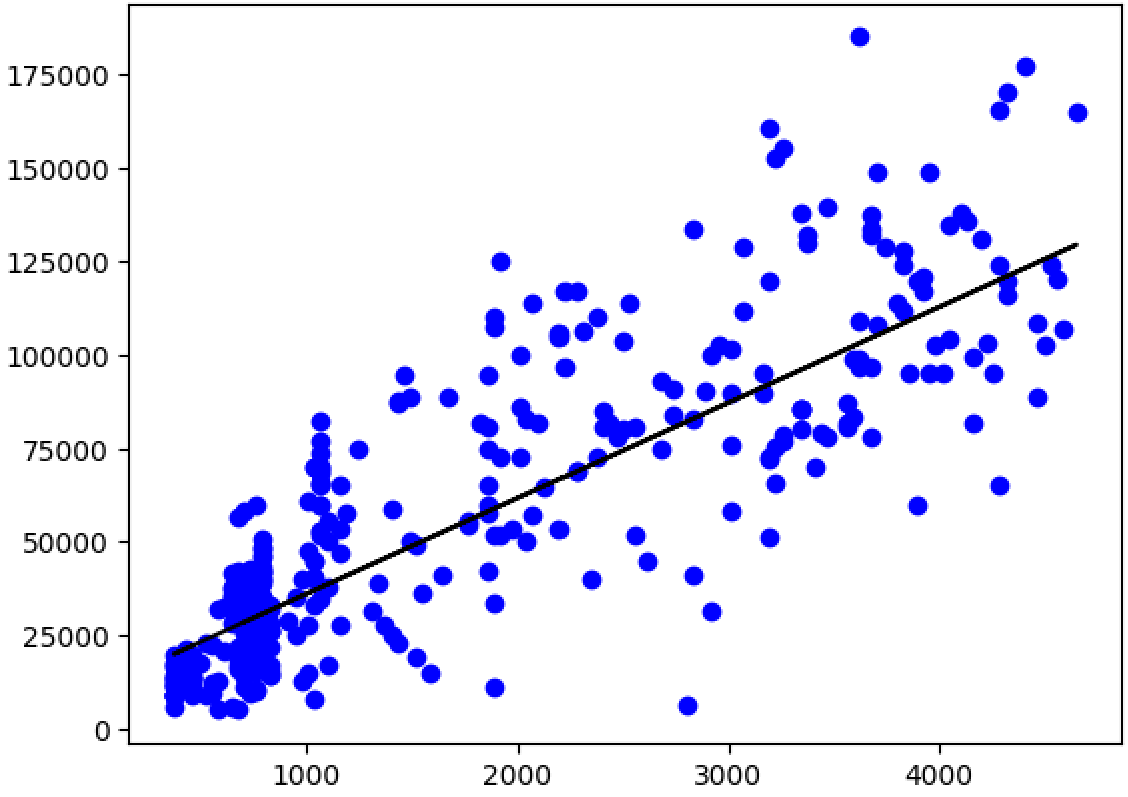
```
#Splitting the data into training and testing data
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.25)
regr=LinearRegression()
regr.fit(x_train,y_train)
print(regr.score(x_test,y_test))
```

```
0.7234238087715714
```

###step 6:Exploring our results

In [40]:

```
#Data scatter to predict the values
y_pred=regr.predict(x_test)
plt.scatter(x_test,y_test,color='b')
plt.plot(x_test,y_pred,color='k')
plt.show()
```



In [41]:

```python
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score
#Train the model
model=LinearRegression()
model.fit(x_train,y_train)
#evaluate the model on the test set
y_pred=model.predict(x_test)
r2=r2_score(y_test,y_pred)
print("r2 Score:",r2)
```

```
r2 Score: 0.7234238087715714
```

###step 7:Working with the smaller dataset

In [42]:

```
#selecting the first 500 rows
df500=df[:][:400]
df500
```

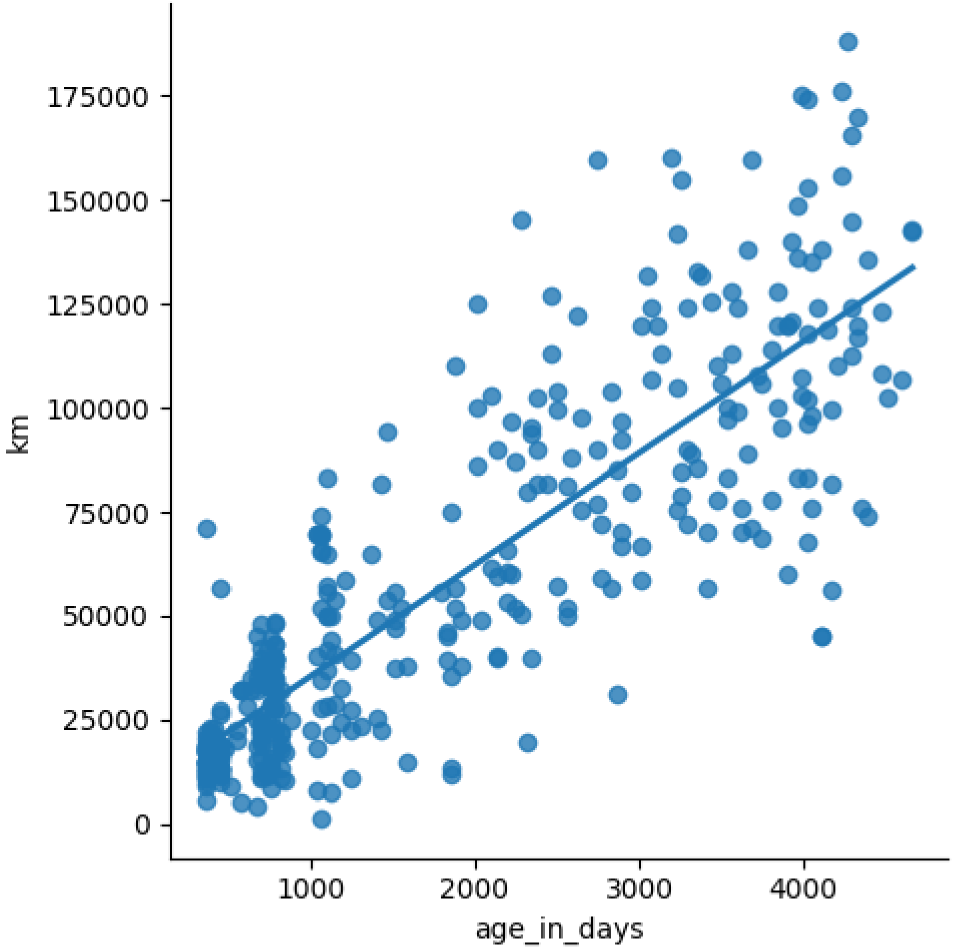
Out[42]:

	age_in_days	km
0	882	25000
1	1186	32500
2	4658	142228
3	2739	160000
4	3074	106880
...	...	...
395	366	18818
396	821	10800
397	578	32057
398	1035	69900
399	3258	155000

400 rows × 2 columns

In [43]:

```
sns.lmplot(x="age_in_days",y="km",data=df500,order=1,ci=None)
plt.show()
```



In [44]:

```
df500.fillna(method='ffill',inplace=True)
df500
```

Out[44]:

	age_in_days	km
0	882	25000
1	1186	32500
2	4658	142228
3	2739	160000
4	3074	106880
...	...	...
395	366	18818
396	821	10800
397	578	32057
398	1035	69900
399	3258	155000

400 rows × 2 columns

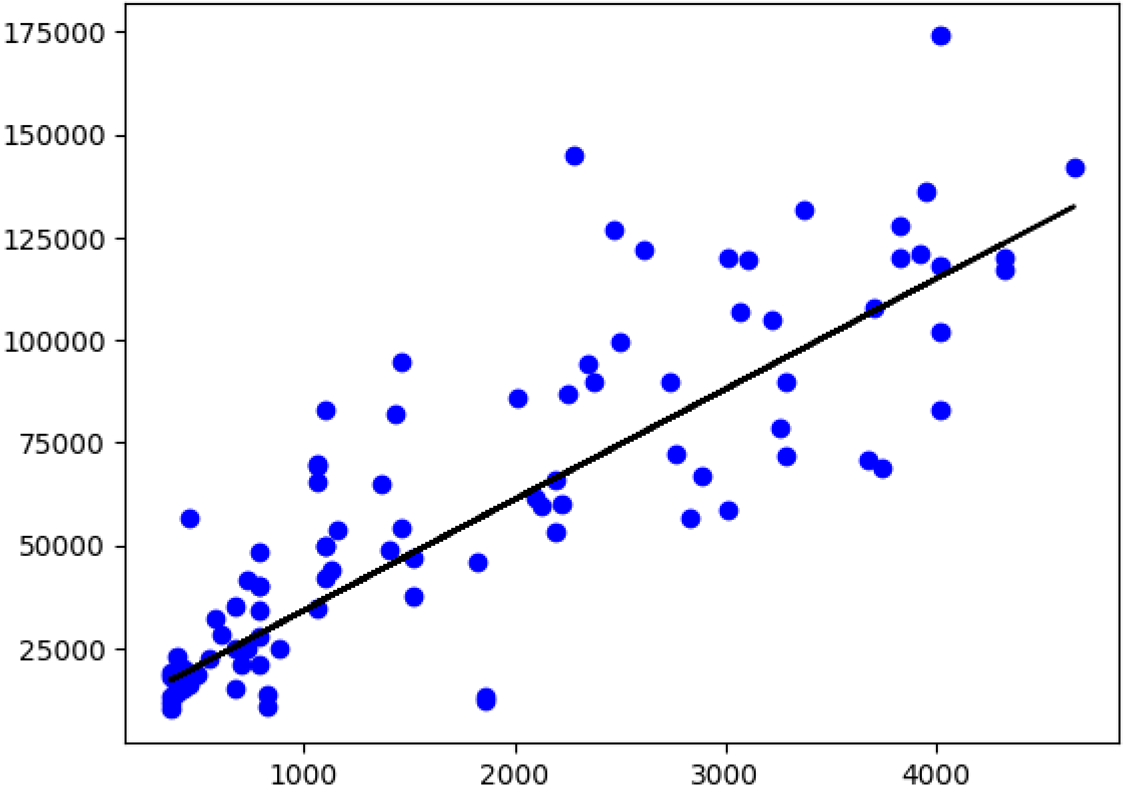
In [45]:

```
x=np.array(df500['age_in_days']).reshape(-1,1)
y=np.array(df500['km']).reshape(-1,1)
df500.dropna(inplace=True)
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.25)
regr=LinearRegression()
regr.fit(x_train,y_train)
print("regression:",regr.score(x_test,y_test))
```

```
regression: 0.7137331345634482
```

In [46]:

```
y_pred=regr.predict(x_test)
plt.scatter(x_test,y_test,color='b')
plt.plot(x_test,y_pred,color='k')
plt.show()
```



In [47]:

```
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score
#Train the model
model=LinearRegression()
model.fit(x_train,y_train)
#evaluate the model on the test set
y_pred=model.predict(x_test)
r2=r2_score(y_test,y_pred)
print("r2 Score:",r2)
```

```
r2 Score: 0.7137331345634482
```

conclusion:

the dataset we have taken is acceptable.but,maybe it cannot be a best fit .

In [ ]:

```
```

In [48]:

```
#Model
lr = LinearRegression()
#Fit model
lr.fit(x_train, y_train)
#predict
#prediction = lr.predict(X_test)
#actual
actual = y_test
train_score_lr = lr.score(x_train, y_train)
test_score_lr = lr.score(x_test, y_test)
print("\nLinear Regression Model:\n")
print("The train score for lr model is {}".format(train_score_lr))
print("The test score for lr model is {}".format(test_score_lr))
```

```

Linear Regression Model:

The train score for lr model is 0.7403823424609443
The test score for lr model is 0.7137331345634482
```

In [49]:

```
#Ridge Regression Model
ridgeReg = Ridge(alpha=10)
ridgeReg.fit(x_train,y_train)
#train and test scorefor ridge regression
train_score_ridge = ridgeReg.score(x_train, y_train)
test_score_ridge = ridgeReg.score(x_test, y_test)
print("\nRidge Model:\n")
print("The train score for ridge model is {}".format(train_score_ridge))
print("The test score for ridge model is {}".format(test_score_ridge))
```

```

Ridge Model:

The train score for ridge model is 0.740382342460944
The test score for ridge model is 0.7137331346114721
```

In [64]:

```
features="age_in_days"

target="km"
```

In [66]:

```
#Lasso regression model
print("\nLasso Model: \n")
lasso = Lasso(alpha = 10)
lasso.fit(x_train,y_train)
train_score_ls =lasso.score(x_train,y_train)
test_score_ls =lasso.score(x_test,y_test)
print("The train score for ls model is {}".format(train_score_ls))
print("The test score for ls model is {}".format(test_score_ls))
```

```

Lasso Model: 

The train score for ls model is 0.740382342460917
The test score for ls model is 0.7137331350992013
```

In [52]:

```
#Using the linear CV model
from sklearn.linear_model import LassoCV
#Lasso Cross validation
lasso_cv = LassoCV(alphas = [0.0001, 0.001,0.01, 0.1, 1, 10], random_state=0).fit(x_train,y_train)
#score
print(lasso_cv.score(x_train, y_train))
print(lasso_cv.score(x_test, y_test))
```

```
0.7403823424609443
0.7137331345634536

C:\Users\MY HOME\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\linear_model\_coordinate_des
cent.py:1568: DataConversionWarning: A column-vector y was passed when a 1d array was expected. Please change t
he shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
```

ElasticNet Regression

In [53]:

```
from sklearn.linear_model import ElasticNet
regr=ElasticNet()
regr.fit(x,y)
print(regr.coef_)
print(regr.intercept_)
```

```
[26.87965684]
[8517.79832742]
```

In [55]:

```
y_pred_elastic=regr.predict(x_train)
```

In [56]:

```
mean_squared_error=np.mean((y_pred_elastic-y_train)**2)
print("Mean Squared Error on test set",mean_squared_error)
```

```
Mean Squared Error on test set 3293485044.7461805
```

In [ ]: