Jaydeep Mahajan CE066-ML-LAB02

In [3]:

```
import numpy as np
import pandas as pd
import seaborn as sns
from sklearn.preprocessing import StandardScaler,MinMaxScaler,OneHotEncoder,Imputer
```

In [11]:

```
car_data = pd.read_csv("D:/Mywork/ML/Datasets/CarData.csv"
,usecols=['Price','Age','KM','FuelType','HP','MetColor','Automatic','CC','Doors','Weight']
,na_values=['????','??'])
car_data.head(15)
```

Out[11]:

	Price	Age	KM	FuelType	HP	MetColor	Automatic	CC	Doors	Weight
0	13500	23.0	46986.0	Diesel	90.0	1.0	0	2000	three	1165
1	13750	23.0	72937.0	Diesel	90.0	1.0	0	2000	3	1165
2	13950	24.0	41711.0	Diesel	90.0	NaN	0	2000	3	1165
3	14950	26.0	48000.0	Diesel	90.0	0.0	0	2000	3	1165
4	13750	30.0	38500.0	Diesel	90.0	0.0	0	2000	3	1170
5	12950	32.0	61000.0	Diesel	90.0	0.0	0	2000	3	1170
6	16900	27.0	NaN	Diesel	NaN	NaN	0	2000	3	1245
7	18600	30.0	75889.0	NaN	90.0	1.0	0	2000	3	1245
8	21500	27.0	19700.0	Petrol	192.0	0.0	0	1800	3	1185
9	12950	23.0	71138.0	Diesel	NaN	NaN	0	1900	3	1105
10	20950	25.0	31461.0	Petrol	192.0	0.0	0	1800	3	1185
11	19950	22.0	43610.0	Petrol	192.0	0.0	0	1800	3	1185
12	19600	25.0	32189.0	Petrol	192.0	0.0	0	1800	3	1185
13	21500	31.0	23000.0	Petrol	192.0	1.0	0	1800	3	1185
14	22500	32.0	34131.0	Petrol	192.0	1.0	0	1800	3	1185

getting information

In [12]:

```
car_data.info()
car_data.describe()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1436 entries, 0 to 1435
Data columns (total 10 columns):
Price        1436 non-null int64
Age          1336 non-null float64
KM           1421 non-null float64
FuelType     1336 non-null object
HP           1430 non-null float64
MetColor     1286 non-null float64
Automatic    1436 non-null int64
CC           1436 non-null int64
Doors        1436 non-null object
Weight       1436 non-null int64
dtypes: float64(4), int64(4), object(2)
memory usage: 112.3+ KB
```

Out[12]:

	Price	Age	KM	HP	MetColor	Automatic	
count	1436.000000	1336.000000	1421.000000	1430.000000	1286.000000	1436.000000	1436.
mean	10730.824513	55.672156	68647.239972	101.478322	0.674961	0.055710	1566.
std	3626.964585	18.589804	37333.023589	14.768255	0.468572	0.229441	187.
min	4350.000000	1.000000	1.000000	69.000000	0.000000	0.000000	1300.
25%	8450.000000	43.000000	43210.000000	90.000000	0.000000	0.000000	1400.
50%	9900.000000	60.000000	63634.000000	110.000000	1.000000	0.000000	1600.
75%	11950.000000	70.000000	87000.000000	110.000000	1.000000	0.000000	1600.
max	32500.000000	80.000000	243000.000000	192.000000	1.000000	1.000000	2000.

In [13]:

```
#removing rows of empty box values
car_data = car_data.drop(columns = ['Price'],axis=1)
car_data.head()
```

Out[13]:

	Age	KM	FuelType	HP	MetColor	Automatic	CC	Doors	Weight
0	23.0	46986.0	Diesel	90.0	1.0	0	2000	three	1165
1	23.0	72937.0	Diesel	90.0	1.0	0	2000	3	1165
2	24.0	41711.0	Diesel	90.0	NaN	0	2000	3	1165
3	26.0	48000.0	Diesel	90.0	0.0	0	2000	3	1165
4	30.0	38500.0	Diesel	90.0	0.0	0	2000	3	1170

In [14]:

```
car_data.dropna(axis=0,how='any',subset=['MetColor','FuelType','Age'],inplace=True)
car_data.head(15)
```

Out[14]:

	Age	KM	FuelType	HP	MetColor	Automatic	CC	Doors	Weight
0	23.0	46986.0	Diesel	90.0	1.0	0	2000	three	1165
1	23.0	72937.0	Diesel	90.0	1.0	0	2000	3	1165
3	26.0	48000.0	Diesel	90.0	0.0	0	2000	3	1165
4	30.0	38500.0	Diesel	90.0	0.0	0	2000	3	1170
5	32.0	61000.0	Diesel	90.0	0.0	0	2000	3	1170
8	27.0	19700.0	Petrol	192.0	0.0	0	1800	3	1185
10	25.0	31461.0	Petrol	192.0	0.0	0	1800	3	1185
11	22.0	43610.0	Petrol	192.0	0.0	0	1800	3	1185
12	25.0	32189.0	Petrol	192.0	0.0	0	1800	3	1185
13	31.0	23000.0	Petrol	192.0	1.0	0	1800	3	1185
14	32.0	34131.0	Petrol	192.0	1.0	0	1800	3	1185
15	28.0	18739.0	Petrol	NaN	0.0	0	1800	3	1185
16	30.0	34000.0	Petrol	192.0	1.0	0	1800	3	1185
17	24.0	21716.0	Petrol	110.0	1.0	0	1600	3	1105
18	24.0	25563.0	Petrol	110.0	0.0	0	1600	3	1065

In [17]:

```
hp_imputer = Imputer(missing_values = np.nan,strategy='mean')
hp_imputer = hp_imputer.fit(car_data.iloc[:,3:4].values)
car_data.iloc[:,3:4] = hp_imputer.transform(car_data.iloc[:,3:4].values)
km_imputer = Imputer(missing_values = np.nan,strategy='mean')
km_imputer = km_imputer.fit(car_data.iloc[:,1:2].values)
car_data.iloc[:,1:2] = km_imputer.transform(car_data.iloc[:,1:2].values)
car_data.head(15)
```

Out[17]:

	Age	KM	FuelType	HP	MetColor	Automatic	CC	Doors	Weight
0	23.0	46986.0	Diesel	90.000000	1.0	0	2000	three	1165
1	23.0	72937.0	Diesel	90.000000	1.0	0	2000	3	1165
3	26.0	48000.0	Diesel	90.000000	0.0	0	2000	3	1165
4	30.0	38500.0	Diesel	90.000000	0.0	0	2000	3	1170
5	32.0	61000.0	Diesel	90.000000	0.0	0	2000	3	1170
8	27.0	19700.0	Petrol	192.000000	0.0	0	1800	3	1185
10	25.0	31461.0	Petrol	192.000000	0.0	0	1800	3	1185
11	22.0	43610.0	Petrol	192.000000	0.0	0	1800	3	1185
12	25.0	32189.0	Petrol	192.000000	0.0	0	1800	3	1185
13	31.0	23000.0	Petrol	192.000000	1.0	0	1800	3	1185
14	32.0	34131.0	Petrol	192.000000	1.0	0	1800	3	1185
15	28.0	18739.0	Petrol	101.738267	0.0	0	1800	3	1185
16	30.0	34000.0	Petrol	192.000000	1.0	0	1800	3	1185
17	24.0	21716.0	Petrol	110.000000	1.0	0	1600	3	1105
18	24.0	25563.0	Petrol	110.000000	0.0	0	1600	3	1065

In [18]:

```
#scale age
std_scale = MinMaxScaler()
age = car_data.iloc[:,0:1].values
car_data['Age']= std_scale.fit_transform(age)

#scale cc
std_scale = MinMaxScaler()
cc = car_data.iloc[:,6:7].values
car_data['CC']= std_scale.fit_transform(cc)

#scale weight
std_scale = MinMaxScaler()
weight = car_data.iloc[:,8:9].values
car_data['Weight']= std_scale.fit_transform(weight)

#scale km
std_scale = MinMaxScaler()
km = car_data.iloc[:,1:2].values
car_data['KM']= std_scale.fit_transform(km)

#scale hp
std_scale = MinMaxScaler()
hp = car_data.iloc[:,3:4].values
car_data['HP']= std_scale.fit_transform(hp)
car_data.head()
```

```
E:\Jupyter\lib\site-packages\sklearn\utils\validation.py:475: DataConversion
Warning: Data with input dtype int64 was converted to float64 by MinMaxScale
r.
  warnings.warn(msg, DataConversionWarning)
E:\Jupyter\lib\site-packages\sklearn\utils\validation.py:475: DataConversion
Warning: Data with input dtype int64 was converted to float64 by MinMaxScale
r.
  warnings.warn(msg, DataConversionWarning)
```

Out[18]:

	Age	KM	FuelType	HP	MetColor	Automatic	CC	Doors	Weight
0	0.278481	0.193355	Diesel	0.170732	1.0	0	1.0	three	0.268293
1	0.278481	0.300149	Diesel	0.170732	1.0	0	1.0	3	0.268293
3	0.316456	0.197528	Diesel	0.170732	0.0	0	1.0	3	0.268293
4	0.367089	0.158433	Diesel	0.170732	0.0	0	1.0	3	0.276423
5	0.392405	0.251026	Diesel	0.170732	0.0	0	1.0	3	0.276423

In [19]:

```
car_data.describe()
```

Out[19]:

	Age	KM	HP	MetColor	Automatic	CC	Weight
count	1111.000000	1111.000000	1111.000000	1111.000000	1111.000000	1111.000000	1111.000000
mean	0.690962	0.285123	0.266165	0.675068	0.053105	0.384948	0.120114
std	0.238344	0.155902	0.122004	0.468561	0.224344	0.265622	0.085546
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	0.531646	0.179935	0.170732	0.000000	0.000000	0.142857	0.073171
50%	0.746835	0.262882	0.333333	1.000000	0.000000	0.428571	0.113821
75%	0.873418	0.360897	0.333333	1.000000	0.000000	0.428571	0.146341
max	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

Handel Doors columns

In [20]:

```
car_data['Doors'] = car_data['Doors'].replace('three',3)
car_data['Doors'] = car_data['Doors'].replace('four',4)
car_data['Doors'] = car_data['Doors'].replace('five',5)
car_data.head(5)
```

Out[20]:

	Age	KM	FuelType	HP	MetColor	Automatic	CC	Doors	Weight
0	0.278481	0.193355	Diesel	0.170732	1.0	0	1.0	3	0.268293
1	0.278481	0.300149	Diesel	0.170732	1.0	0	1.0	3	0.268293
3	0.316456	0.197528	Diesel	0.170732	0.0	0	1.0	3	0.268293
4	0.367089	0.158433	Diesel	0.170732	0.0	0	1.0	3	0.276423
5	0.392405	0.251026	Diesel	0.170732	0.0	0	1.0	3	0.276423

In [21]:

```
car_data['Doors'] = car_data['Doors'].astype(int)
car_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1111 entries, 0 to 1435
Data columns (total 9 columns):
Age          1111 non-null float64
KM           1111 non-null float64
FuelType     1111 non-null object
HP           1111 non-null float64
MetColor     1111 non-null float64
Automatic    1111 non-null int64
CC           1111 non-null float64
Doors        1111 non-null int32
Weight       1111 non-null float64
dtypes: float64(6), int32(1), int64(1), object(1)
memory usage: 82.5+ KB
```

Feature selction step

In [26]:

```
corr_mat = car_data.corr()
corr_mat
```

Out[26]:

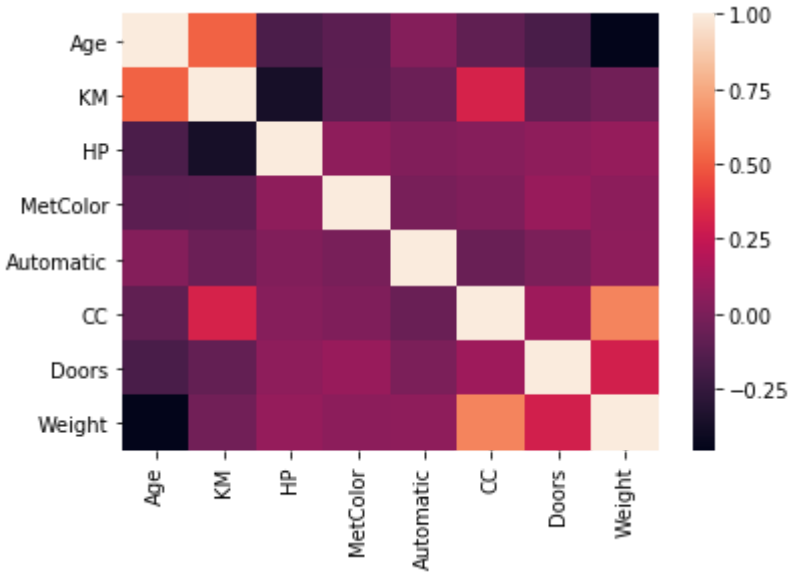
	CNG	Diesel	Petrol	Age	KM	HP	MetColor	Automati
CNG	1.000000	-0.036362	-0.284575	0.012015	0.160851	0.057554	-0.001874	-0.02474
Diesel	-0.036362	1.000000	-0.947672	-0.057519	0.437573	-0.533161	-0.024817	-0.08240
Petrol	-0.284575	-0.947672	1.000000	0.051339	-0.471143	0.493069	0.024405	0.08695
Age	0.012015	-0.057519	0.051339	1.000000	0.520458	-0.166037	-0.108185	0.03144
KM	0.160851	0.437573	-0.471143	0.520458	1.000000	-0.366112	-0.105365	-0.05431
HP	0.057554	-0.533161	0.493069	-0.166037	-0.366112	1.000000	0.065443	0.01965
MetColor	-0.001874	-0.024817	0.024405	-0.108185	-0.105365	0.065443	1.000000	-0.00710
Automatic	-0.024746	-0.082408	0.086959	0.031442	-0.054317	0.019653	-0.007105	1.00000
CC	0.017075	0.765078	-0.739386	-0.092548	0.316058	0.038990	0.015111	-0.05883
Doors	0.011340	0.037765	-0.039851	-0.172241	-0.078913	0.064210	0.098079	0.00118

In [23]:

```
sns.heatmap(corr_mat)
```

Out[23]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x18ed6483b38>
```



In [24]:

```
columns = np.full((corr_mat.shape[0],), True, dtype=bool)
for i in range(corr_mat.shape[0]):
    for j in range(i+1, corr_mat.shape[0]):
        if corr_mat.iloc[i,j] >= 0.6:
            if columns[j]:
                columns[j] = False
```

handel FuelType column(represent in one hot coding) and remove weigth column

In [25]:

```
dummy_fueltype = pd.get_dummies(car_data['FuelType'])
car_data = car_data.drop('FuelType',axis=1)
selected_columns = car_data.columns[columns]
car_data = pd.concat([dummy_fueltype,car_data[selected_columns]],axis=1)
car_data.head(10)
```

Out[25]:

	CNG	Diesel	Petrol	Age	KM	HP	MetColor	Automatic	CC	Doors
0	0	1	0	0.278481	0.193355	0.170732	1.0	0	1.000000	3
1	0	1	0	0.278481	0.300149	0.170732	1.0	0	1.000000	3
3	0	1	0	0.316456	0.197528	0.170732	0.0	0	1.000000	3
4	0	1	0	0.367089	0.158433	0.170732	0.0	0	1.000000	3
5	0	1	0	0.392405	0.251026	0.170732	0.0	0	1.000000	3
8	0	0	1	0.329114	0.081066	1.000000	0.0	0	0.714286	3
10	0	0	1	0.303797	0.129466	1.000000	0.0	0	0.714286	3
11	0	0	1	0.265823	0.179462	1.000000	0.0	0	0.714286	3
12	0	0	1	0.303797	0.132461	1.000000	0.0	0	0.714286	3
13	0	0	1	0.379747	0.094646	1.000000	1.0	0	0.714286	3

In [ ]:

```

```