In [ ]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import warnings
warnings.filterwarnings('ignore')
```

Import all of the datas

In [ ]:

```
bmw=pd.read_csv("car_data/bmw.csv")
audi=pd.read_csv("car_data/audi.csv")
ford=pd.read_csv("car_data/ford.csv")
hyundi=pd.read_csv("car_data/hyundi.csv")
benz=pd.read_csv("car_data/merc.csv")
toyota=pd.read_csv("car_data/toyota.csv")
```

In [ ]:

```
bmw.head()
```

Out[ ]:

	model	year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	5 Series	2014	11200	Automatic	67068	Diesel	125	57.6	2.0
1	6 Series	2018	27000	Automatic	14827	Petrol	145	42.8	2.0
2	5 Series	2016	16000	Automatic	62794	Diesel	160	51.4	3.0
3	1 Series	2017	12750	Automatic	26676	Diesel	145	72.4	1.5
4	7 Series	2014	14500	Automatic	39554	Diesel	160	50.4	3.0

In [ ]:

```
audi.head()
```

Out[ ]:

	model	year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	A1	2017	12500	Manual	15735	Petrol	150	55.4	1.4
1	A6	2016	16500	Automatic	36203	Diesel	20	64.2	2.0
2	A1	2016	11000	Manual	29946	Petrol	30	55.4	1.4
3	A4	2017	16800	Automatic	25952	Diesel	145	67.3	2.0
4	A3	2019	17300	Manual	1998	Petrol	145	49.6	1.0

In [ ]:

```
ford.head()
```

Out[ ]:

	model	year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	Fiesta	2017	12000	Automatic	15944	Petrol	150	57.7	1.0
1	Focus	2018	14000	Manual	9083	Petrol	150	57.7	1.0
2	Focus	2017	13000	Manual	12456	Petrol	150	57.7	1.0
3	Fiesta	2019	17500	Manual	10460	Petrol	145	40.3	1.5
4	Fiesta	2019	16500	Automatic	1482	Petrol	145	48.7	1.0

In [ ]:

```
hyundi.head()
```

Out[ ]:

	model	year	price	transmission	mileage	fuelType	tax(£)	mpg	engineSize
0	I20	2017	7999	Manual	17307	Petrol	145	58.9	1.2
1	Tucson	2016	14499	Automatic	25233	Diesel	235	43.5	2.0
2	Tucson	2016	11399	Manual	37877	Diesel	30	61.7	1.7
3	I10	2016	6499	Manual	23789	Petrol	20	60.1	1.0
4	IX35	2015	10199	Manual	33177	Diesel	160	51.4	2.0

In [ ]:

```
benz.head()
```

Out[ ]:

	model	year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	SLK	2005	5200	Automatic	63000	Petrol	325	32.1	1.8
1	S Class	2017	34948	Automatic	27000	Hybrid	20	61.4	2.1
2	SL CLASS	2016	49948	Automatic	6200	Petrol	555	28.0	5.5
3	G Class	2016	61948	Automatic	16000	Petrol	325	30.4	4.0
4	G Class	2016	73948	Automatic	4000	Petrol	325	30.1	4.0

In [ ]:

```
toyota.head()
```

Out[ ]:

	model	year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	GT86	2016	16000	Manual	24089	Petrol	265	36.2	2.0
1	GT86	2017	15995	Manual	18615	Petrol	145	36.2	2.0
2	GT86	2015	13998	Manual	27469	Petrol	265	36.2	2.0
3	GT86	2017	18998	Manual	14736	Petrol	150	36.2	2.0
4	GT86	2017	17498	Manual	36284	Petrol	145	36.2	2.0

1. Overview

The data sets consist of 9 columns:

- model: The model of the car; categorical
- year: The year of which the car was made; numerical
- price: Selling price for the used cars; numerical
- mileage: The distance of the car had been drived; numerical
- fuelType: Categorical->[Petrol,Disel,Hybrid,Electric,other]
- tax: The amount of the tax of the car; numerical
- mpg: Energy consumption of the car; miles per gallon; numerical
- engineSize: The size of the engine; numerical

2. Data Check

2.1 Consistency

It's easy to see that the feature 'tax' in "hyundi" data frame has a different name with other data frames. So, we need to change the name of it to ensure consistency. Then, we merge the data.

In [ ]:

```
hyundi.rename(columns={'tax(£)': 'tax'}, inplace=True)

frames = [bmw,audi,ford,hyundi,benz,toyota]
merged = pd.concat(frames)
```

2.2 Check Missing Values

In [ ]:

```
merged.isnull().mean()
```

Out[ ]:

```
model           0.0
year            0.0
price           0.0
transmission    0.0
mileage         0.0
fuelType        0.0
tax             0.0
mpg             0.0
engineSize      0.0
dtype: float64
```

There's no missing values

2.3 Check Duplicates

In [ ]:

```
merged.duplicated().sum()
```

Out[ ]:

```
758
```

In [ ]:

```
merged.drop_duplicates(inplace=True)
```

2.4 Check Data Types

In [ ]:

```
merged.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 63373 entries, 0 to 6737
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   model         63373 non-null  object 
 1   year          63373 non-null  int64  
 2   price         63373 non-null  int64  
 3   transmission  63373 non-null  object 
 4   mileage       63373 non-null  int64  
 5   fuelType      63373 non-null  object 
 6   tax           63373 non-null  int64  
 7   mpg           63373 non-null  float64
 8   engineSize    63373 non-null  float64
dtypes: float64(2), int64(4), object(3)
memory usage: 4.8+ MB
```

2.5 Unique Values of Each Column

In [ ]:

```
merged.nunique()
```

Out[ ]:

```
model             134
year               27
price           10865
transmission        4
mileage         33533
fuelType            5
tax                48
mpg               186
engineSize         40
dtype: int64
```

2.6 Basic Stats of Numerical Features

In [ ]:

```
merged.describe()
```

Out[ ]:

	year	price	mileage	tax	mpg	engineSize
count	63373.000000	63373.000000	63373.000000	63373.000000	63373.000000	63373.000000
mean	2017.020151	18359.714358	23608.468812	120.456030	56.179665	1.753783
std	2.173193	10849.740128	21400.434999	65.664091	17.896790	0.616098
min	1970.000000	495.000000	1.000000	0.000000	1.100000	0.000000
25%	2016.000000	10900.000000	7730.000000	125.000000	47.900000	1.300000
50%	2017.000000	15995.000000	17953.000000	145.000000	56.500000	1.700000
75%	2019.000000	22898.000000	33014.000000	145.000000	64.200000	2.000000
max	2060.000000	159999.000000	323000.000000	580.000000	470.800000	6.600000

2.7 Edge Case

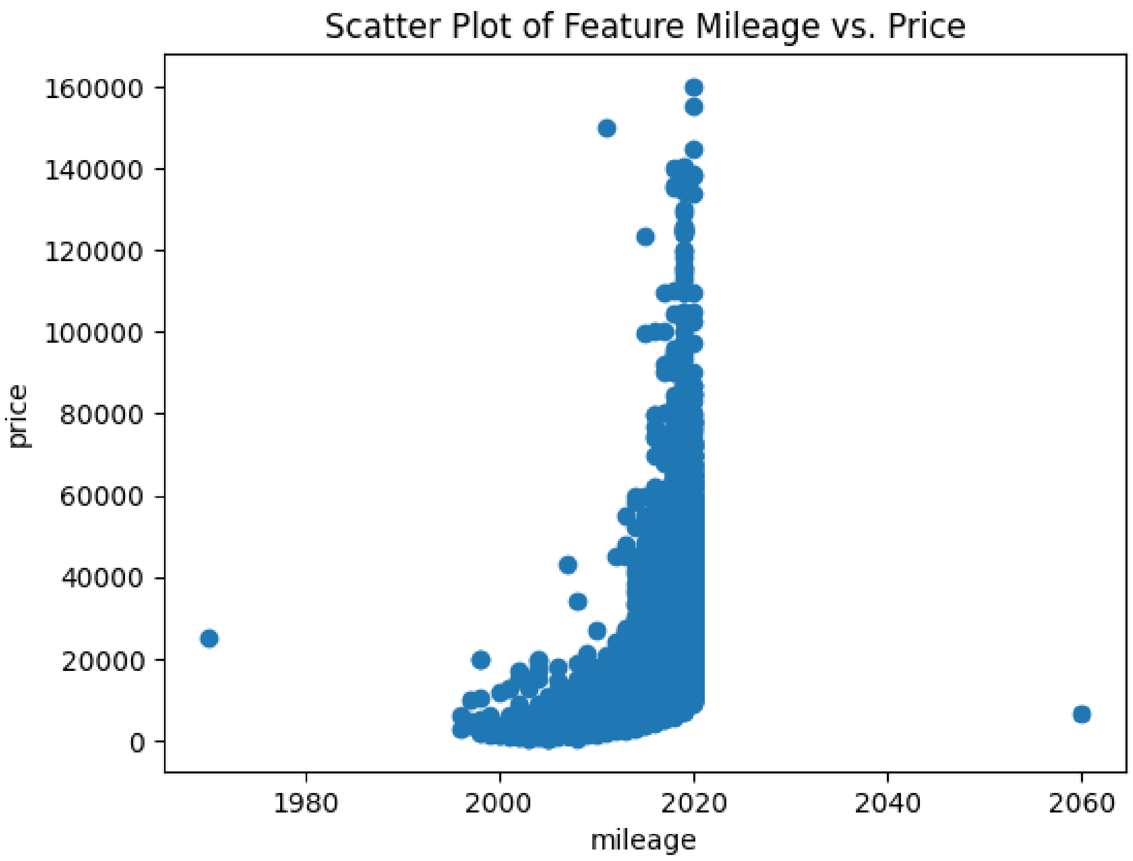
In [ ]:

```
duplicates_mask = merged.duplicated(subset='model', keep=False)
unique_models_df = merged[~duplicates_mask]
once=unique_models_df['model'].tolist()
```

3. Visualization

In [ ]:

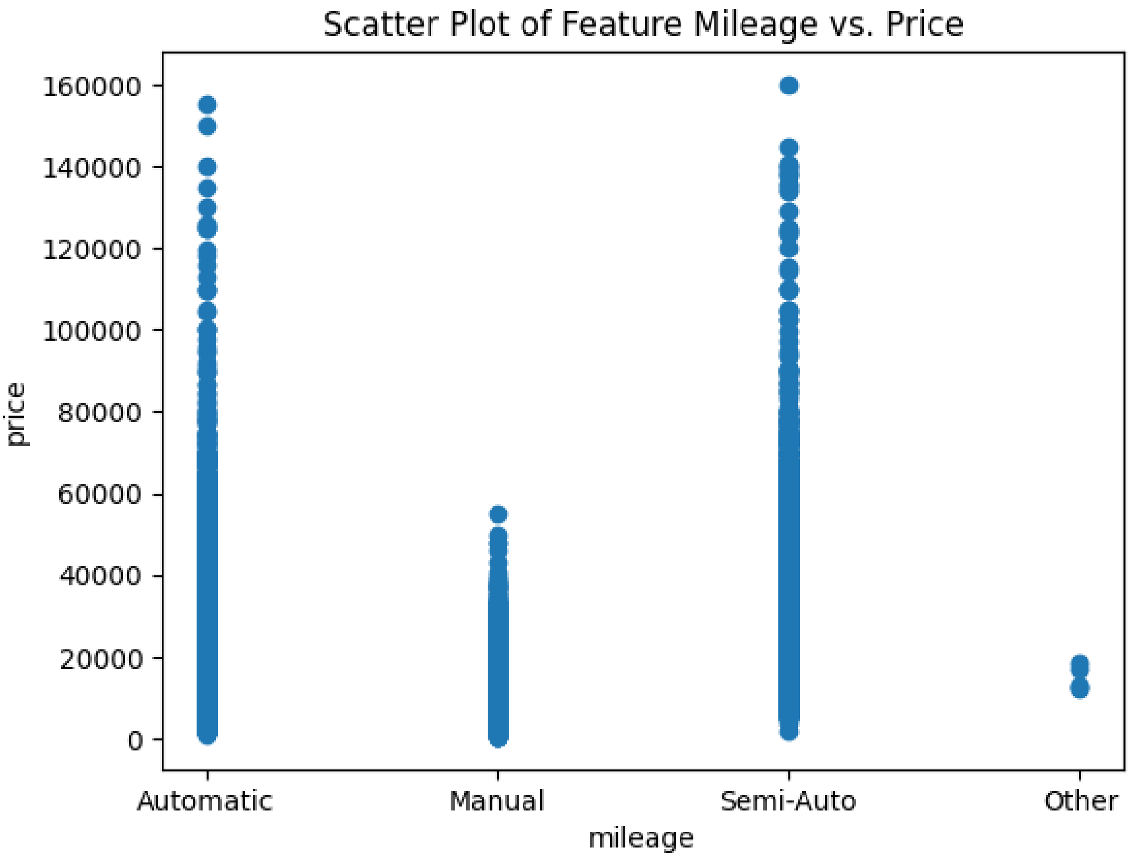
```
plt.scatter(merged['year'], merged['price'])
plt.xlabel('mileage')
plt.ylabel('price')
plt.title('Scatter Plot of Feature Mileage vs. Price')
plt.show()
```



Price tends to drop when mileage increases

In [ ]:

```
plt.scatter(merged['transmission'], merged['price'])
plt.xlabel('mileage')
plt.ylabel('price')
plt.title('Scatter Plot of Feature Mileage vs. Price')
plt.show()
```


Scatter Plot of Feature Mileage vs. Price
price
Automatic
Manual
Semi-Auto
Other
mileage