Open in Colab

In [1]:

```
!curl https://raw.githubusercontent.com/HeptaDecane/LP2_SEM7/main/A02/Cars.csv --output
Cars.csv
```

```
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  8455  100  8455    0     0   175k      0 --:--:-- --:--:-- --:--:--  175k
```

In [2]:

```
import numpy as np
import pandas as pd

import seaborn as sns
import matplotlib.pyplot as plt
```

In [3]:

```
df = pd.read_csv('Cars.csv')
df.head()
```

Out[3]:

	mpg	cylinders	cubicinches	hp	weightlbs	time-to-60	year	brand
0	**14.0**	**8**	**350**	**165**	**4209**	**12**	**1972**	**US.**
1	**31.9**	**4**	**89**	**71**	**1925**	**14**	**1980**	**Europe.**
2	**17.0**	**8**	**302**	**140**	**3449**	**11**	**1971**	**US.**
3	**15.0**	**8**	**400**	**150**	**3761**	**10**	**1971**	**US.**
4	**30.5**	**4**	**98**	**63**	**2051**	**17**	**1978**	**US.**

In [4]:

```
x = df.drop(columns=['brand'])
x.head()
```

Out[4]:

	mpg	cylinders	cubicinches	hp	weightlbs	time-to-60	year
0	**14.0**	**8**	**350**	**165**	**4209**	**12**	**1972**
1	**31.9**	**4**	**89**	**71**	**1925**	**14**	**1980**
2	**17.0**	**8**	**302**	**140**	**3449**	**11**	**1971**
3	**15.0**	**8**	**400**	**150**	**3761**	**10**	**1971**
4	**30.5**	**4**	**98**	**63**	**2051**	**17**	**1978**

In [5]:

```
x = x.apply(pd.to_numeric, errors='coerce')
x.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 261 entries, 0 to 260
Data columns (total 7 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   mpg          261 non-null    float64
 1   cylinders    261 non-null    int64
 2   cubicinches  259 non-null    float64
 3   hp           261 non-null    int64
```

```
 4   weightlbs     258 non-null    float64
 5   time-to-60    261 non-null    int64
 6   year          261 non-null    int64
dtypes: float64(3), int64(4)
memory usage: 14.4 KB
```

In [6]:

```
for col in x.columns:
    x[col] = x[col].fillna(int(x[col].mean()))
x.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 261 entries, 0 to 260
Data columns (total 7 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   mpg           261 non-null    float64
 1   cylinders     261 non-null    int64
 2   cubicinches   261 non-null    float64
 3   hp            261 non-null    int64
 4   weightlbs     261 non-null    float64
 5   time-to-60    261 non-null    int64
 6   year          261 non-null    int64
dtypes: float64(3), int64(4)
memory usage: 14.4 KB
```

In [7]:

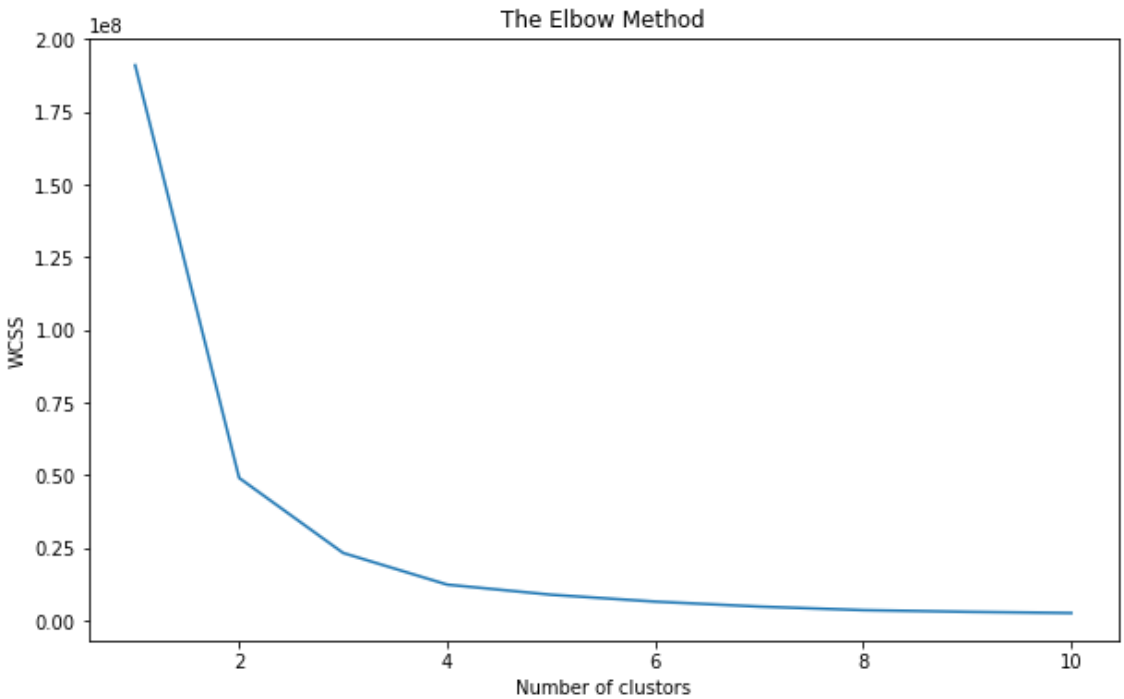
```
from sklearn.cluster import KMeans

wcss = []
for i in range(1,11):
    model = KMeans(n_clusters=i)
    model.fit(x)
    wcss.append(model.inertia_)

fig, axs = plt.subplots(figsize=(10,6))
axs.set_title('The Elbow Method')
axs.set_xlabel('Number of clustors')
axs.set_ylabel('WCSS')
sns.lineplot(x=range(1,11),y=wcss)
```

Out[7]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f71e4d5a450>
```



In [8]:

```
model = KMeans(n_clusters=3)
model.fit(x)
```

Out[8]:

```
KMeans(algorithm='auto', copy_x=True, init='k-means++', max_iter=300,
       n_clusters=3, n_init=10, n_jobs=None, precompute_distances='auto',
       random_state=None, tol=0.0001, verbose=0)
```

In [9]:

```
model.cluster_centers_
```

Out[9]:

```
array([[2.02012346e+01, 6.11111111e+00, 2.24716049e+02, 1.09074074e+02,
        3.19348148e+03, 1.56790123e+01, 1.97671605e+03],
       [2.95466102e+01, 4.05084746e+00, 1.07669492e+02, 7.70338983e+01,
        2.24153390e+03, 1.66101695e+01, 1.97771186e+03],
       [1.48064516e+01, 7.83870968e+00, 3.47274194e+02, 1.58629032e+02,
        4.23211290e+03, 1.33548387e+01, 1.97525806e+03]])
```

In [10]:

```
model.labels_
```

Out[10]:

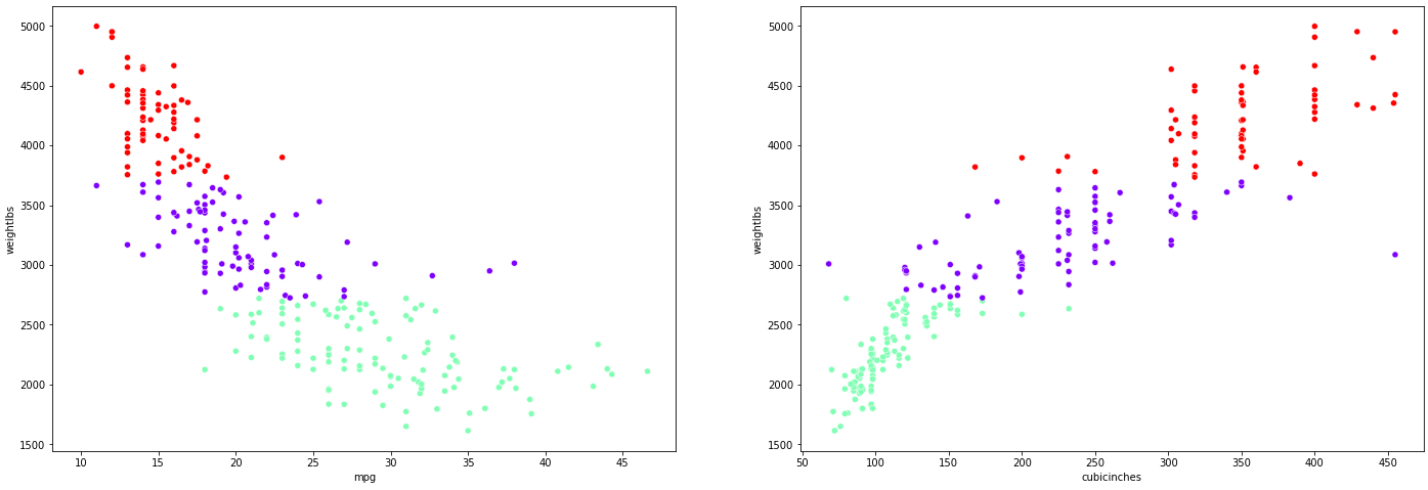
```
array([2, 1, 0, 2, 1, 2, 2, 2, 0, 1, 1, 1, 2, 0, 0, 2, 1, 0, 1, 1, 1, 1,
       0, 2, 1, 1, 1, 2, 0, 1, 1, 0, 1, 0, 1, 0, 1, 1, 2, 0, 2, 2, 0, 0,
       0, 1, 2, 1, 1, 0, 2, 0, 0, 1, 2, 2, 0, 1, 1, 2, 0, 1, 0, 1, 2, 0,
       1, 1, 1, 2, 0, 1, 1, 1, 1, 0, 0, 1, 1, 1, 2, 2, 0, 1, 1, 1, 0, 0,
       1, 1, 1, 1, 2, 0, 1, 2, 2, 0, 2, 2, 2, 2, 1, 1, 1, 1, 1, 1, 1, 0,
       1, 0, 2, 1, 1, 2, 0, 0, 1, 2, 1, 1, 2, 0, 1, 1, 2, 1, 1, 1, 1, 1,
       2, 0, 2, 2, 1, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 2, 0,
       1, 0, 1, 1, 1, 0, 0, 2, 0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 1,
       2, 0, 0, 1, 0, 1, 2, 0, 1, 0, 0, 2, 2, 2, 1, 1, 2, 2, 2, 1, 1, 1,
       1, 1, 1, 1, 0, 0, 1, 2, 1, 0, 2, 0, 0, 0, 1, 1, 0, 1, 1, 2, 1, 2,
       0, 0, 2, 2, 2, 1, 2, 1, 1, 0, 0, 1, 1, 2, 0, 1, 2, 0, 1, 1, 2, 0,
       2, 1, 2, 0, 2, 1, 1, 1, 1, 1, 0, 2, 0, 1, 2, 1, 0, 0, 0],
      dtype=int32)
```

In [11]:

```
fig, axs = plt.subplots(1,2, figsize=(24,8))
sns.scatterplot(x=x['mpg'],y=x['weightlbs'],c=model.labels_,cmap='rainbow', ax=axs[0])
sns.scatterplot(x=x['cubicinches'],y=x['weightlbs'],c=model.labels_,cmap='rainbow', ax=a
xs[1])
```

Out[11]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f71d8f81d50>
```

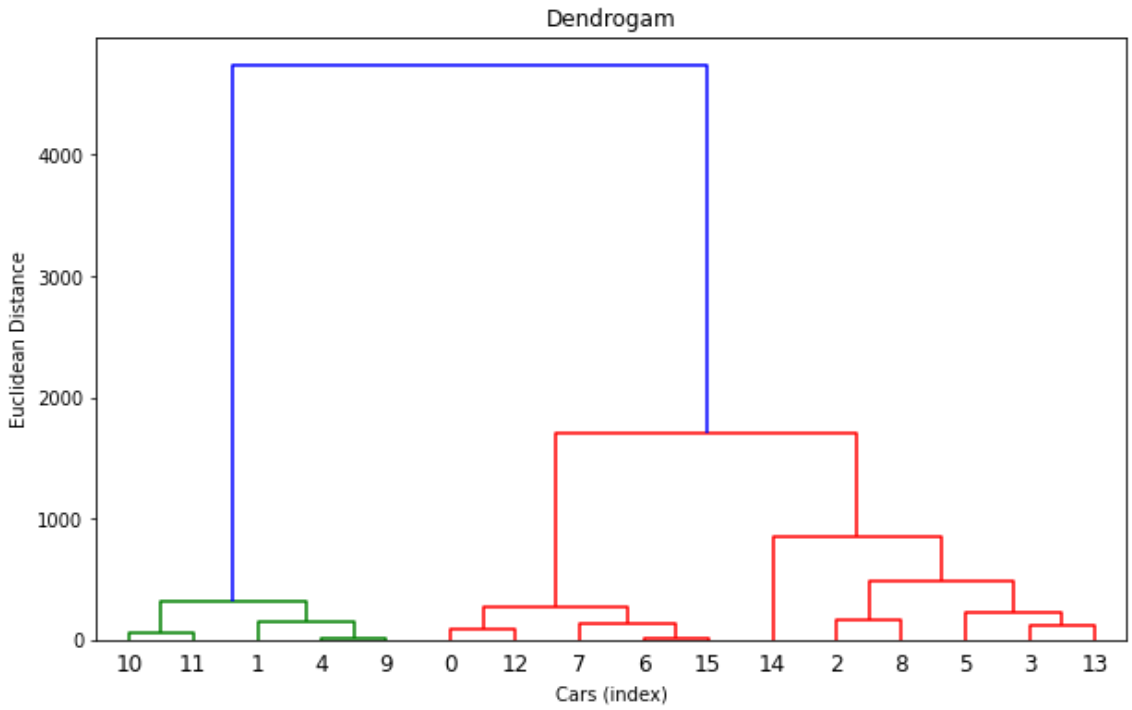


In [12]:

```
import scipy.cluster.hierarchy as sch
```

```
import scipy.cluster.hierarchy as sch

fig, axs = plt.subplots(figsize=(10,6))
axs.set_title('Dendrogam')
axs.set_xlabel('Cars (index)')
axs.set_ylabel('Euclidean Distance')
dendogram = sch.dendrogram(sch.linkage(x.loc[0:15],method='ward'), ax=axs)
```



In [13]:

```
from sklearn.cluster import AgglomerativeClustering

model = AgglomerativeClustering(n_clusters=3)
model.fit(x)
```

Out[13]:

```
AgglomerativeClustering(affinity='euclidean', compute_full_tree='auto',
                        connectivity=None, distance_threshold=None,
                        linkage='ward', memory=None, n_clusters=3)
```

In [14]:

```
model.labels_
```

Out[14]:

```
array([0, 2, 0, 0, 2, 0, 0, 0, 0, 2, 2, 2, 0, 0, 1, 0, 2, 0, 2, 2, 2, 1,
       1, 0, 2, 2, 2, 0, 0, 2, 2, 0, 1, 1, 2, 0, 2, 1, 0, 0, 0, 0, 0, 0,
       1, 1, 0, 2, 2, 1, 0, 1, 0, 2, 0, 0, 1, 2, 2, 0, 1, 2, 1, 2, 0, 0,
       2, 2, 2, 0, 1, 1, 2, 1, 2, 1, 1, 1, 2, 2, 0, 0, 0, 1, 2, 2, 1, 0,
       2, 1, 2, 2, 0, 0, 2, 0, 0, 1, 0, 0, 0, 0, 2, 2, 2, 1, 2, 2, 1, 0,
       2, 1, 0, 2, 2, 0, 1, 1, 2, 0, 2, 2, 0, 1, 2, 1, 0, 2, 1, 2, 2, 1,
       0, 0, 0, 0, 2, 1, 1, 1, 1, 2, 1, 2, 0, 1, 0, 1, 0, 1, 1, 1, 0, 1,
       2, 0, 2, 2, 1, 0, 1, 0, 1, 1, 2, 0, 0, 1, 1, 2, 2, 1, 1, 1, 2, 2,
       0, 0, 0, 2, 1, 2, 0, 0, 2, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 2, 1, 2,
       2, 2, 2, 1, 0, 0, 2, 0, 2, 1, 0, 1, 1, 0, 2, 2, 1, 1, 2, 0, 1, 0,
       1, 1, 0, 0, 0, 2, 0, 2, 1, 1, 0, 1, 1, 0, 1, 2, 0, 1, 2, 2, 0, 1,
       0, 1, 0, 0, 0, 2, 2, 1, 2, 1, 1, 0, 1, 2, 0, 2, 1, 0, 0])
```

In [15]:

```
fig, axs = plt.subplots(1,2, figsize=(24,8))
sns.scatterplot(x=x['mpg'],y=x['weightlbs'],c=model.labels_,cmap='rainbow', ax=axs[0])
sns.scatterplot(x=x['cubicinches'],y=x['weightlbs'],c=model.labels_,cmap='rainbow', ax=a
xs[1])
```

Out[15]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f71d7604b50>
```

<matplotlib.axes._subplots.AxesSubplot at 0x7f7da7004b50>