DMPM lab 10 : K Means clustering on protein dataset

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Roll no.: 17

In [19]:

```
import pandas as pd
from matplotlib import pyplot as plot
import seaborn as sb
```

In [2]:

```
protein = pd.read_csv("D:/TY sem6/DMPM LAB/assn8/protein.csv")
```

In [3]:

```
protein.head()
```

Out[3]:

	Country	RedMeat	WhiteMeat	Eggs	Milk	Fish	Cereals	Starch	Nuts	Fr&Veg
0	Albania	10.1	1.4	0.5	8.9	0.2	42.3	0.6	5.5	1.7
1	Austria	8.9	14.0	4.3	19.9	2.1	28.0	3.6	1.3	4.3
2	Belgium	13.5	9.3	4.1	17.5	4.5	26.6	5.7	2.1	4.0
3	Bulgaria	7.8	6.0	1.6	8.3	1.2	56.7	1.1	3.7	4.2
4	Czechoslovakia	9.7	11.4	2.8	12.5	2.0	34.3	5.0	1.1	4.0

In [4]:

```
protein.isnull().sum()
```

Out[4]:

```
Country      0
RedMeat      0
WhiteMeat    0
Eggs         0
Milk         0
Fish         0
Cereals      0
Starch       0
Nuts         0
Fr&Veg       0
dtype: int64
```

In [5]:

```
protein["Country"].value_counts()
```

Out[5]:

```
Netherlands       1
Poland            1
UK                1
Ireland           1
Austria           1
Finland           1
Denmark           1
Sweden            1
Switzerland       1
Hungary           1
Norway            1
USSR              1
Greece            1
France            1
Romania           1
Albania           1
Spain             1
Czechoslovakia    1
W Germany         1
Portugal          1
Belgium           1
E Germany         1
Bulgaria          1
Yugoslavia        1
Italy             1
Name: Country, dtype: int64
```

In [6]:

```
protein.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 25 entries, 0 to 24
Data columns (total 10 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   Country    25 non-null     object 
 1   RedMeat    25 non-null     float64
 2   WhiteMeat  25 non-null     float64
 3   Eggs       25 non-null     float64
 4   Milk       25 non-null     float64
 5   Fish       25 non-null     float64
 6   Cereals    25 non-null     float64
 7   Starch     25 non-null     float64
 8   Nuts       25 non-null     float64
 9   Fr&Veg     25 non-null     float64
dtypes: float64(9), object(1)
memory usage: 2.1+ KB
```

In [7]:

```
X = protein.drop("Country",axis=1)
y = protein["Country"]
```

In [8]:

```
#from sklearn.preprocessing import LabelEncoder

#le = LabelEncoder()
#y = le.fit_transform(y)
```

In [9]:
```
X.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 25 entries, 0 to 24
Data columns (total 9 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   RedMeat    25 non-null     float64
 1   WhiteMeat  25 non-null     float64
 2   Eggs       25 non-null     float64
 3   Milk       25 non-null     float64
 4   Fish       25 non-null     float64
 5   Cereals    25 non-null     float64
 6   Starch     25 non-null     float64
 7   Nuts       25 non-null     float64
 8   Fr&Veg     25 non-null     float64
dtypes: float64(9)
memory usage: 1.9 KB
```

In [10]:
```
X.head()
```

Out[10]:

	RedMeat	WhiteMeat	Eggs	Milk	Fish	Cereals	Starch	Nuts	Fr&Veg
0	10.1	1.4	0.5	8.9	0.2	42.3	0.6	5.5	1.7
1	8.9	14.0	4.3	19.9	2.1	28.0	3.6	1.3	4.3
2	13.5	9.3	4.1	17.5	4.5	26.6	5.7	2.1	4.0
3	7.8	6.0	1.6	8.3	1.2	56.7	1.1	3.7	4.2
4	9.7	11.4	2.8	12.5	2.0	34.3	5.0	1.1	4.0

```
In [11]: y.head(20)
```

```
Out[11]: 0             Albania
         1             Austria
         2             Belgium
         3            Bulgaria
         4      Czechoslovakia
         5             Denmark
         6           E Germany
         7             Finland
         8              France
         9              Greece
         10            Hungary
         11            Ireland
         12              Italy
         13        Netherlands
         14             Norway
         15             Poland
         16           Portugal
         17            Romania
         18              Spain
         19             Sweden
         Name: Country, dtype: object
```

Scaling

```
In [12]: cols = X.columns
```

```
In [13]: from sklearn.preprocessing import MinMaxScaler

         ms = MinMaxScaler()

         X = ms.fit_transform(X)
```

```
In [14]: X = pd.DataFrame(X, columns=[cols])
```

In [15]:

```
X.head()
```

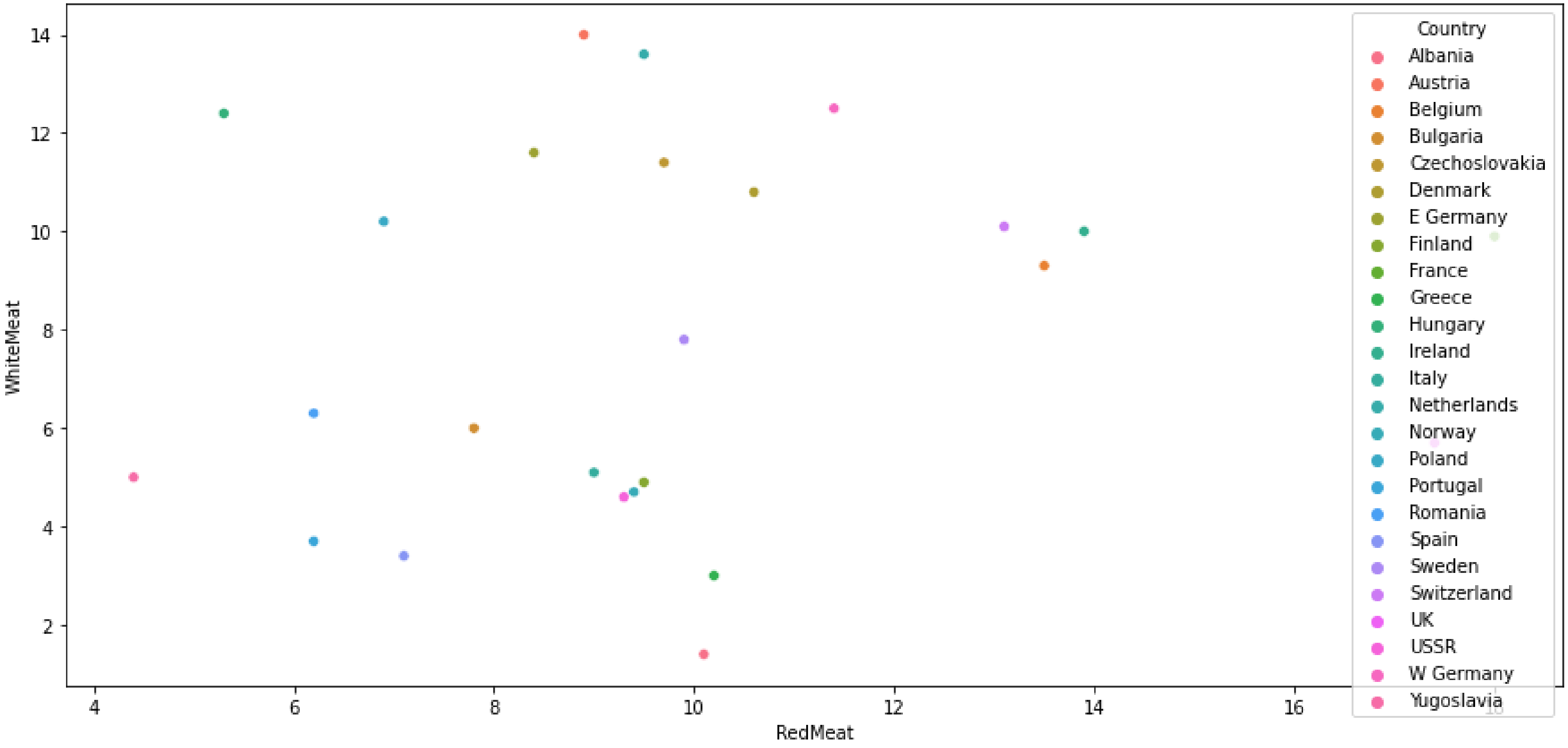
Out[15]:

	RedMeat	WhiteMeat	Eggs	Milk	Fish	Cereals	Starch	Nuts	Fr&Veg
0	0.419118	0.000000	0.000000	0.138889	0.000000	0.622047	0.000000	0.676056	0.046154
1	0.330882	1.000000	0.904762	0.520833	0.135714	0.246719	0.508475	0.084507	0.446154
2	0.669118	0.626984	0.857143	0.437500	0.307143	0.209974	0.864407	0.197183	0.400000
3	0.250000	0.365079	0.261905	0.118056	0.071429	1.000000	0.084746	0.422535	0.430769
4	0.389706	0.793651	0.547619	0.263889	0.128571	0.412073	0.745763	0.056338	0.400000

Before clustering

In [20]:

```
plot.figure(1, (15, 7))
sb.scatterplot(x='RedMeat', y='WhiteMeat', hue='Country',data=protein, legend="full")
plot.show()
```



K-Means Clustering

K=2

In [24]:

```
from sklearn.model_selection import train_test_split
from sklearn.cluster import KMeans
```

In [25]:

```
xtrain, xtest, ytrain, ytest = train_test_split(X,y, train_size=0.8)
print(xtrain.shape, xtest.shape, ytrain.shape, ytest.shape)
```

```
(20, 9) (5, 9) (20,) (5,)
```

In [26]:

```
model = KMeans(3)
model.fit(X,y)
model
```

Out[26]:

```
KMeans(n_clusters=3)
```

In [ ]:

```

```

In [27]:

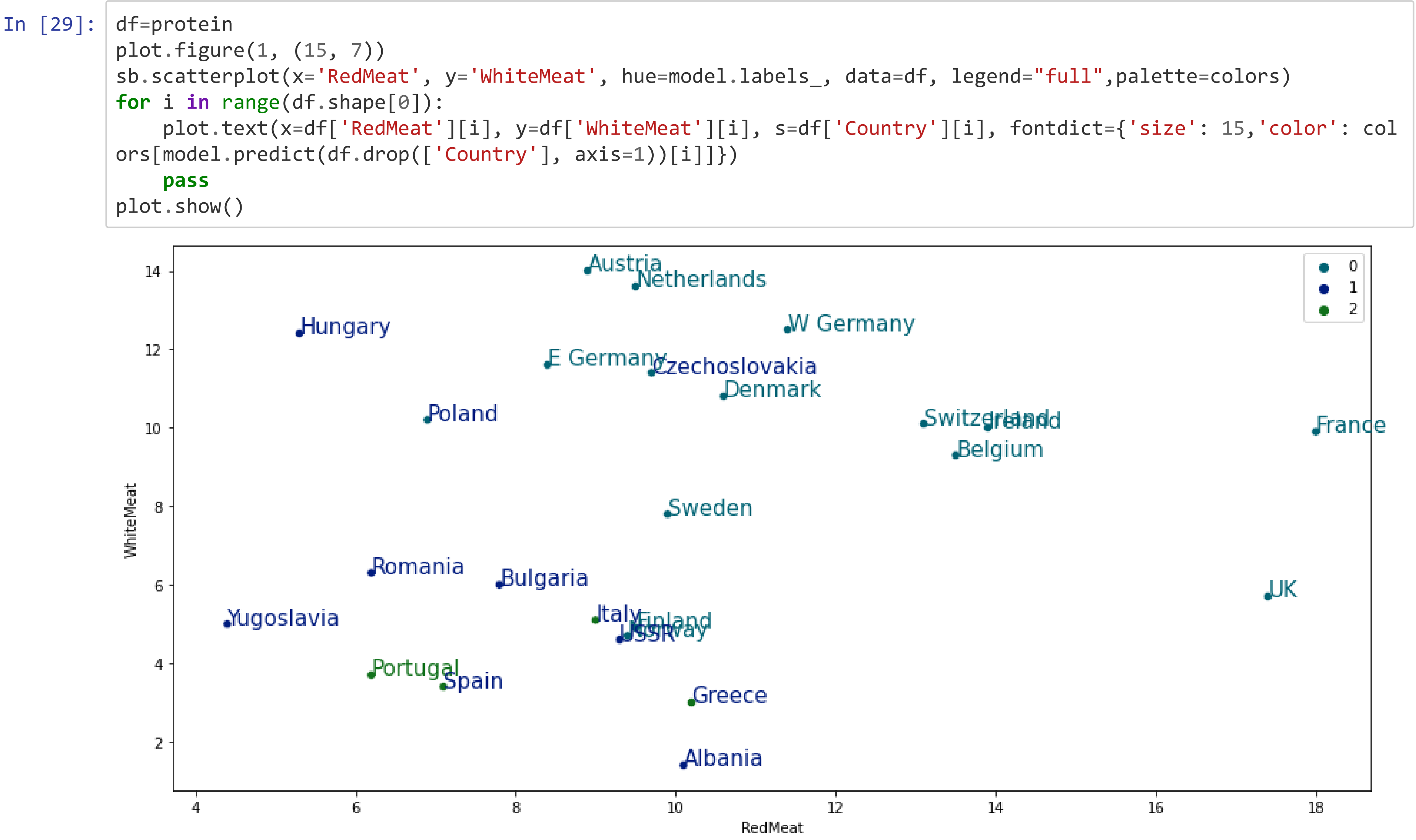
```
from matplotlib import pyplot as plot
import seaborn as sb
import random
```

In [28]:

```
colors = list(sb.color_palette("dark"))
colors = random.sample(colors, k=model.cluster_centers_.shape[0])
colors
```

Out[28]:

```
[(0.0, 0.38823529411764707, 0.4549019607843137),
 (0.0, 0.10980392156862745, 0.4980392156862745),
 (0.07058823529411765, 0.44313725490196076, 0.10980392156862745)]
```



```
In [29]: df=protein
         plot.figure(1, (15, 7))
         sb.scatterplot(x='RedMeat', y='WhiteMeat', hue=model.labels_, data=df, legend="full",palette=colors)
         for i in range(df.shape[0]):
             plot.text(x=df['RedMeat'][i], y=df['WhiteMeat'][i], s=df['Country'][i], fontdict={'size': 15,'color': col
         ors[model.predict(df.drop(['Country'], axis=1))[i]]})
             pass
         plot.show()
```

K=5

In [30]:

```
model = KMeans(5)
model.fit(X,y)
model
```

Out[30]:

```
KMeans(n_clusters=5)
```

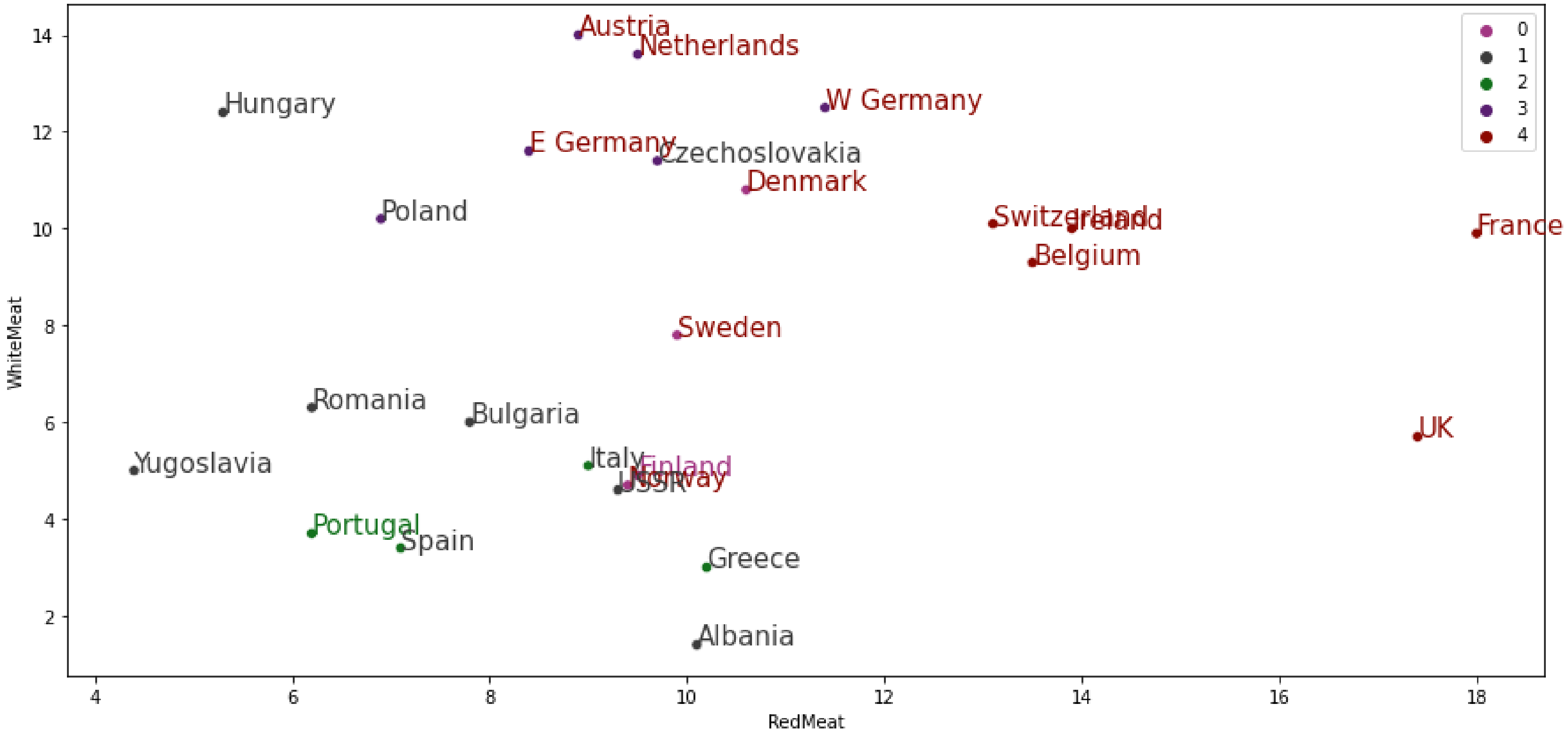
In [31]:

```
colors = list(sb.color_palette("dark"))
colors = random.sample(colors, k=model.cluster_centers_.shape[0])
colors
```

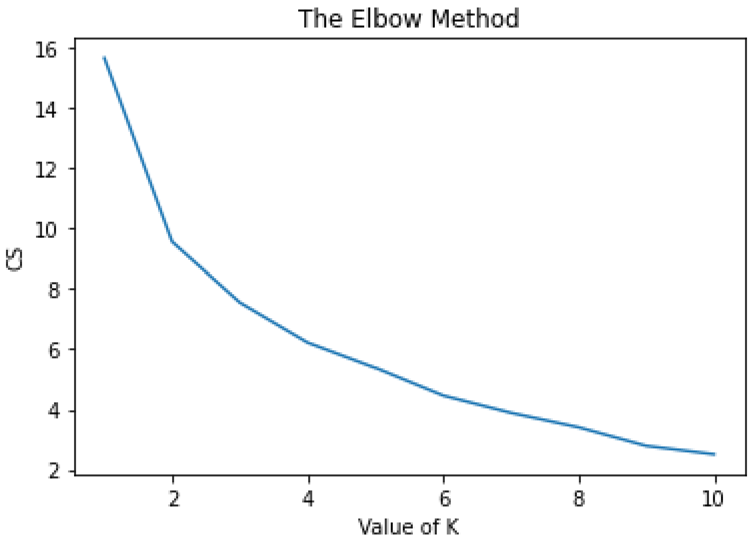
Out[31]:

```
[(0.6352941176470588, 0.20784313725490197, 0.5098039215686274),
 (0.23529411764705882, 0.23529411764705882, 0.23529411764705882),
 (0.07058823529411765, 0.44313725490196076, 0.10980392156862745),
 (0.34901960784313724, 0.11764705882352941, 0.44313725490196076),
 (0.5490196078431373, 0.03137254901960784, 0.0)]
```

```
In [32]: plot.figure(1, (15, 7))
         sb.scatterplot(x='RedMeat', y='WhiteMeat', hue=model.labels_, data=df, legend="full",palette=colors)
         for i in range(df.shape[0]):
             plot.text(x=df['RedMeat'][i], y=df['WhiteMeat'][i], s=df['Country'][i], fontdict={'size': 15,'color': col
         ors[model.predict(df.drop(['Country'], axis=1))[i]]})
             pass
         plot.show()
```



In [49]:
```
cs = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters = i, init = 'k-means++', max_iter = 300, n_init = 10, random_state = 0)
    kmeans.fit(X,y)
    cs.append(kmeans.inertia_)
plot.plot(range(1, 11), cs)
plot.title('The Elbow Method')
plot.xlabel('Value of K')
plot.ylabel('CS')
plot.show()
```



The end