Task Name : Prediction using Unsupervised ML

Task Description : From the given 'Iris' dataset, predict the optimum number of clusters and represent it visually.

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Import the following libraries

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.cluster import KMeans
%matplotlib inline
```

Reading Data from csv file

In [2]:
```
iris= pd.read_csv("Iris.csv")
iris.head()
```

Out[2]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa

Checking the shape of data

In [3]:
```
iris.shape
```

Out[3]:
```
(150, 6)
```

Looking for missing values

In [4]:
```
iris.isnull().sum()
```

Out[4]:
```
Id               0
SepalLengthCm    0
SepalWidthCm     0
PetalLengthCm    0
PetalWidthCm     0
Species          0
dtype: int64
```

There is no missing value

Overviewing the data

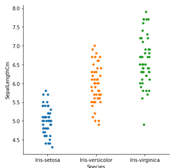
In [6]:
```
iris.describe()
```

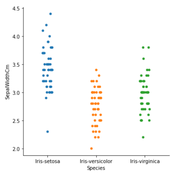
Out[6]:

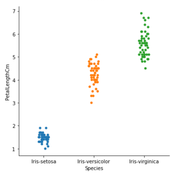
	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm
count	150.000000	150.000000	150.000000	150.000000	150.000000
mean	75.500000	5.843333	3.054000	3.758667	1.198667
std	43.445368	0.828066	0.433594	1.764420	0.763161
min	1.000000	4.300000	2.000000	1.000000	0.100000
25%	38.250000	5.100000	2.800000	1.600000	0.300000
50%	75.500000	5.800000	3.000000	4.350000	1.300000
75%	112.750000	6.400000	3.300000	5.100000	1.800000
max	150.000000	7.900000	4.400000	6.900000	2.500000

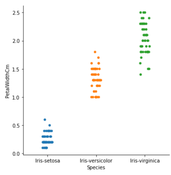
Visualizing the data

In [7]:
```
sns.catplot(x='Species', y='SepalLengthCm', data=iris)
sns.catplot(x='Species', y='SepalWidthCm', data=iris)
sns.catplot(x='Species', y='PetalLengthCm', data=iris)
sns.catplot(x='Species', y='PetalWidthCm', data=iris)
plt.show()
```









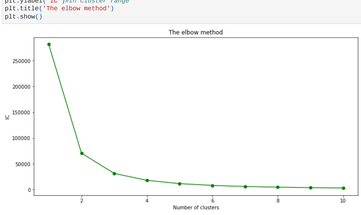
Kmeans clustering

In [8]:
```
from sklearn.cluster import KMeans
ic = []
for i in range(1,11):
    kmeans = KMeans( n_clusters = i, init='k-means++')
    kmeans.fit(iris.iloc[:,[0,1,2,3]])
    ic.append(kmeans.inertia_)
```

```
D:\anaconda\lib\site-packages\sklearn\cluster\_kmeans.py:1036: UserWarning: KMeans is known to have a memory leak on Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```

Plotting the elbow graph

In [9]:
```
df = pd.DataFrame({'Cluster': range(1,11), 'ic':ic})
plt.figure(figsize=(12,6))
plt.plot(df['Cluster'],df['ic'], marker='o',color='green')
plt.xlabel('Number of clusters')
plt.ylabel('IC')#In cluster range
plt.title('The elbow method')
plt.show()
```



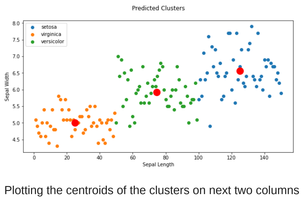
The inference from the "Elbow method" is that the elbow bend is found at 3. Hence, the Optimum number of clusters is 3.

Applying kmeans to the dataset

In [10]:
```
kmeans = KMeans(n_clusters = 3, init = 'k-means++')
y_kmeans= kmeans.fit_predict(iris.iloc[:, [0,1,2,3]].values)
```

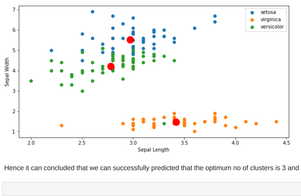
Plotting the centroids of the clusters on first two columns

In [11]:
```
x = iris.iloc[:,[0,1,2,3]].values
plt.figure(figsize=(10,5))
plt.scatter(x[y_kmeans==0,0],x[y_kmeans==0,1],label='setosa')
plt.scatter(x[y_kmeans==1,0],x[y_kmeans==1,1],label='virginica')
plt.scatter(x[y_kmeans==2,0],x[y_kmeans==2,1],label='versicolor')
plt.legend()
plt.title('Predicted Clusters\n')
plt.xlabel('Sepal Length')
plt.ylabel('Sepal Width')
plt.scatter(kmeans.cluster_centers_[:,0], kmeans.cluster_centers_[:,1], s = 200, c='red', label ='Centroids')
plt.show()
```



Plotting the centroids of the clusters on next two columns

In [12]:
```
plt.figure(figsize=(10,5))
plt.scatter(x[y_kmeans==0,2],x[y_kmeans==0,3],label='setosa')
plt.scatter(x[y_kmeans==1,2],x[y_kmeans==1,3],label='virginica')
plt.scatter(x[y_kmeans==2,2],x[y_kmeans==2,3],label='versicolor')
plt.legend()
plt.title('Predicted Clusters\n')
plt.xlabel('Sepal Length')
plt.ylabel('Sepal Width')
plt.scatter(kmeans.cluster_centers_[:,2], kmeans.cluster_centers_[:,3], s = 200, c='red', label ='Centroids')
plt.show()
```



Hence it can concluded that we can successfully predicted that the optimum no of clusters is 3 and also it can be visible.

In [ ]: