Task-3: To Explore Unsupervised Machine Learning

From the given ‘Iris’ dataset, predict the optimum number of clusters and represent it visually.

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

In [4]:

```
data = pd.read_csv(r'C:\Users\USER\Downloads\Iris.csv')
data.head()
```

Out[4]:

	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

Exploring the Data

In [5]:

```
data.shape
```

Out[5]:

```
(150, 6)
```

In [6]:

```
data.columns
```

Out[6]:

```
Index(['Id', 'SepalLengthCm', 'SepalWidthCm', 'PetalLengthCm', 'PetalWidthCm',
       'Species'],
      dtype='object')
```

In [7]:

```
data.info
```

Out[7]:

```
<bound method DataFrame.info of       Id  SepalLengthCm  SepalWidthCm  PetalLengthCm  PetalWidthCm  \
0      1            5.1           3.5            1.4           0.2
1      2            4.9           3.0            1.4           0.2
2      3            4.7           3.2            1.3           0.2
3      4            4.6           3.1            1.5           0.2
4      5            5.0           3.6            1.4           0.2
..   ...            ...           ...            ...           ...
145  146            6.7           3.0            5.2           2.3
146  147            6.3           2.5            5.0           1.9
147  148            6.5           3.0            5.2           2.0
148  149            6.2           3.4            5.4           2.3
149  150            5.9           3.0            5.1           1.8

            Species
0       Iris-setosa
1       Iris-setosa
2       Iris-setosa
3       Iris-setosa
4       Iris-setosa
..              ...
145  Iris-virginica
146  Iris-virginica
147  Iris-virginica
148  Iris-virginica
149  Iris-virginica

[150 rows x 6 columns]>
```

In [8]:

```
data.describe
```

Out[8]:

```
<bound method NDFrame.describe of       Id  SepalLengthCm  SepalWidthCm  PetalLengthCm  PetalWidthCm
\
0      1            5.1           3.5            1.4           0.2
1      2            4.9           3.0            1.4           0.2
2      3            4.7           3.2            1.3           0.2
3      4            4.6           3.1            1.5           0.2
4      5            5.0           3.6            1.4           0.2
..   ...            ...           ...            ...           ...
145  146            6.7           3.0            5.2           2.3
146  147            6.3           2.5            5.0           1.9
147  148            6.5           3.0            5.2           2.0
148  149            6.2           3.4            5.4           2.3
149  150            5.9           3.0            5.1           1.8

            Species
0       Iris-setosa
1       Iris-setosa
2       Iris-setosa
3       Iris-setosa
4       Iris-setosa
..              ...
145  Iris-virginica
146  Iris-virginica
147  Iris-virginica
148  Iris-virginica
149  Iris-virginica

[150 rows x 6 columns]>
```

In [9]:

```
data.Species.unique()
```

Out[9]:

```
array(['Iris-setosa', 'Iris-versicolor', 'Iris-virginica'], dtype=object)
```

Finding the optimum number of clusters

In [10]:

```
X = data.iloc[:, [1,2,3,4]].values
```

In [11]:

```
from sklearn.cluster import KMeans
```

In [12]:

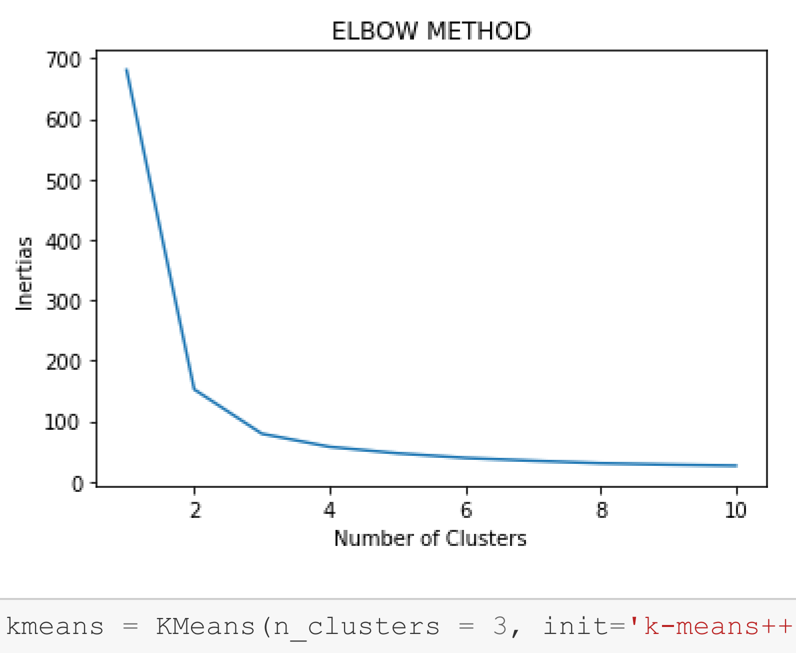
```
def elbowMethod(num_clusters, inertias):
    plt.plot(num_clusters, inertias)
    plt.title("ELBOW METHOD")
    plt.xlabel("Number of Clusters")
    plt.ylabel("Inertias")
    plt.show()
```

In [13]:

```
inertias = []
clusters = range(1,11)

for i in clusters:
    kmeans = KMeans(n_clusters = i, init='k-means++',  max_iter = 300, n_init = 10, random_state = 0)
    kmeans.fit(X)
    inertias.append(kmeans.inertia_)
elbowMethod(clusters, inertias)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:881: UserWarning: KMeans is kno
wn 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(
```



In [14]:

```
kmeans = KMeans(n_clusters = 3, init='k-means++',  max_iter = 300, n_init = 10, random_state = 0)

y_kmeans = kmeans.fit_predict(X)
```

In [15]:

```
kmeans.cluster_centers_
```

Out[15]:

```
array([[5.9016129 , 2.7483871 , 4.39354839, 1.43387097],
       [5.006     , 3.418     , 1.464     , 0.244     ],
       [6.85      , 3.07368421, 5.74210526, 2.07105263]])
```

In [16]:

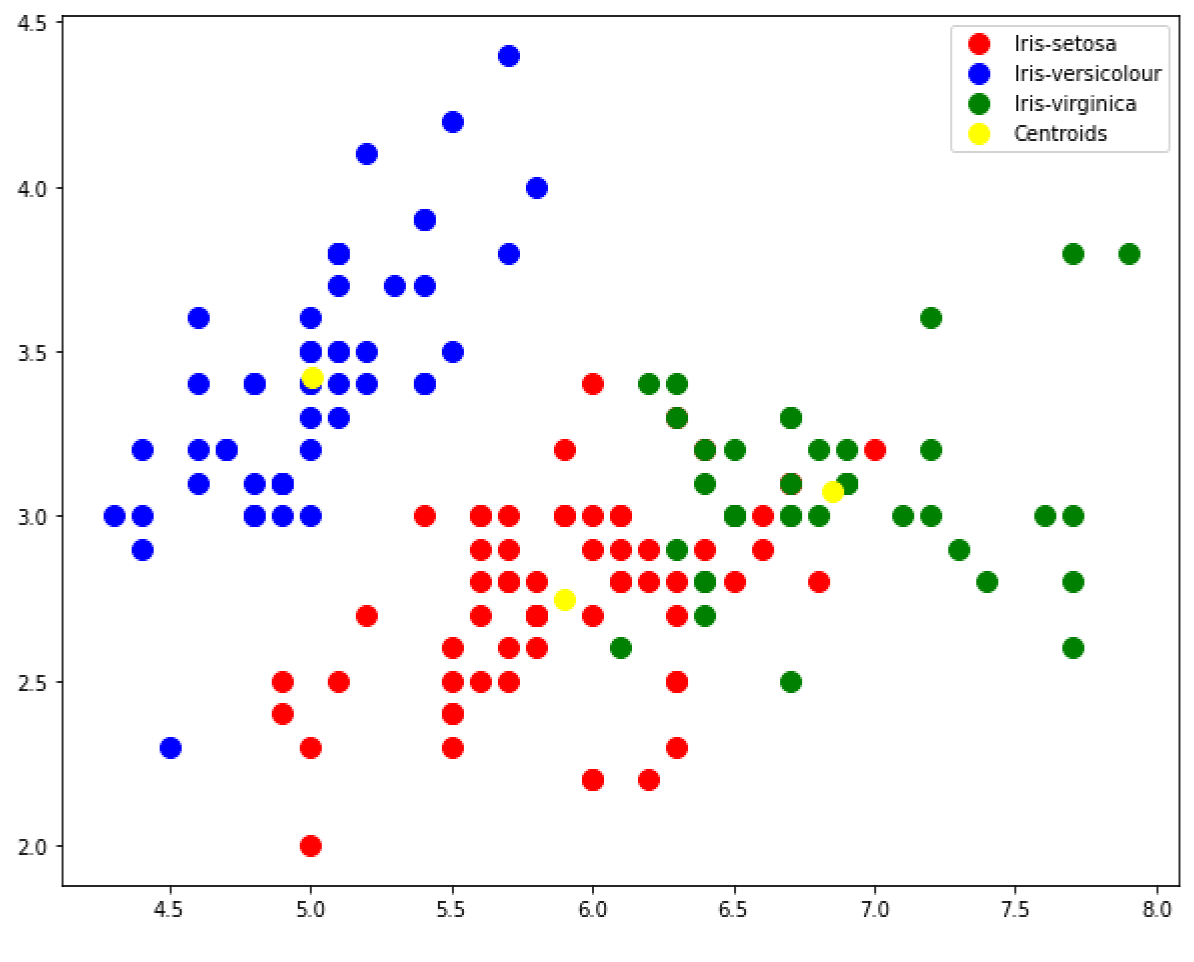
```
plt.figure(figsize = (10,8))

# Visualising the clusters - On the first two columns
plt.scatter(X[y_kmeans == 0, 0], X[y_kmeans == 0, 1],
            s = 100, c = 'red', label = 'Iris-setosa')
plt.scatter(X[y_kmeans == 1, 0], X[y_kmeans == 1, 1],
            s = 100, c = 'blue', label = 'Iris-versicolour')
plt.scatter(X[y_kmeans == 2, 0], X[y_kmeans == 2, 1],
            s = 100, c = 'green', label = 'Iris-virginica')

# Plotting the centroids of the clusters
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:,1],
            s = 100, c = 'yellow', label = 'Centroids')

plt.legend()

plt.show()
```



In [ ]: