Forward School

Program Code: J620-002-4:2020

Program Name: FRONT-END SOFTWARE DEVELOPMENT

Title : Exe25 - k-Means Exercise

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Introduction : Practising on this exercise using k-means clustering method.

Conclusion : Succeeded in plotting the graph with the k-means clustering method and plotting the cluster centers in the same graph.

Exercise 1: Build and Plot k-Means

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.datasets import make_blobs

import warnings

warnings.filterwarnings('ignore')
```

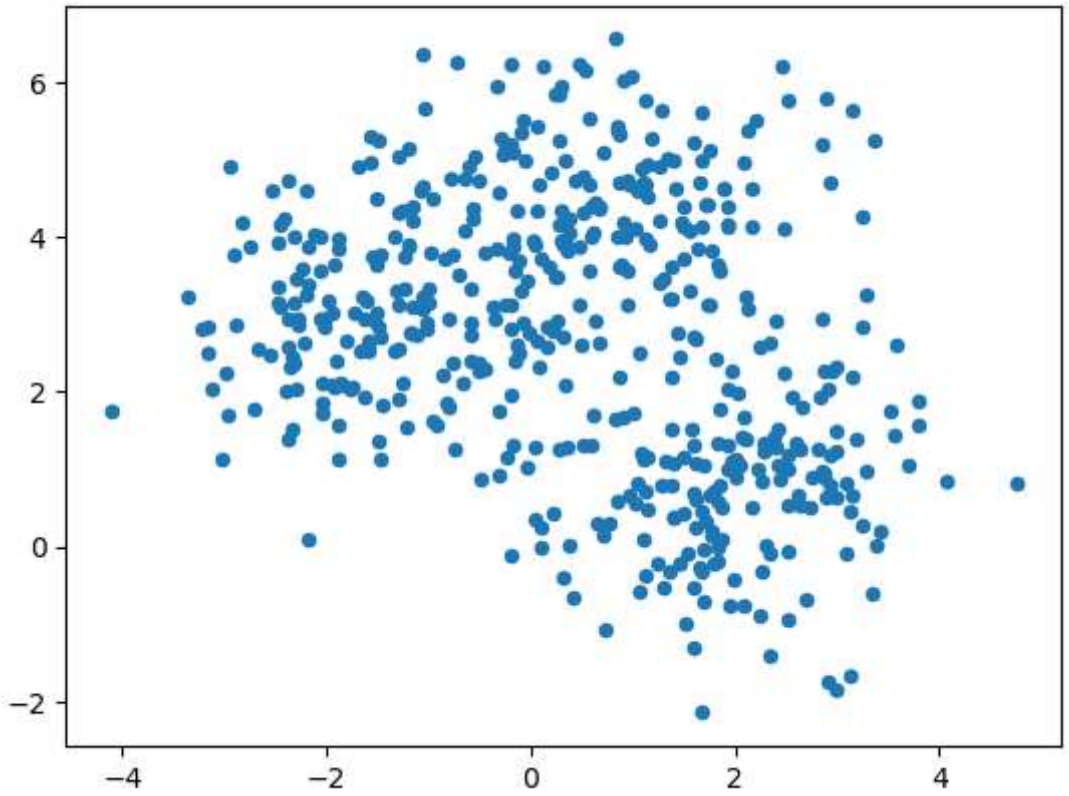
Step 1: create blobs with the size of 500, and center of 3

In [2]:
```
from sklearn.datasets import make_blobs
# X, y = make_blobs(n_samples=500, centers=3, cluster_std=0.60, random_stat
X, y = make_blobs(n_samples=500, centers=3, random_state=0)
```

Step 2: Plot the distribution of the blobs

In [3]:
```
plt.scatter(X[:, 0], X[:, 1], s=20)
```

Out[3]: <matplotlib.collections.PathCollection at 0x2dcaef59600>



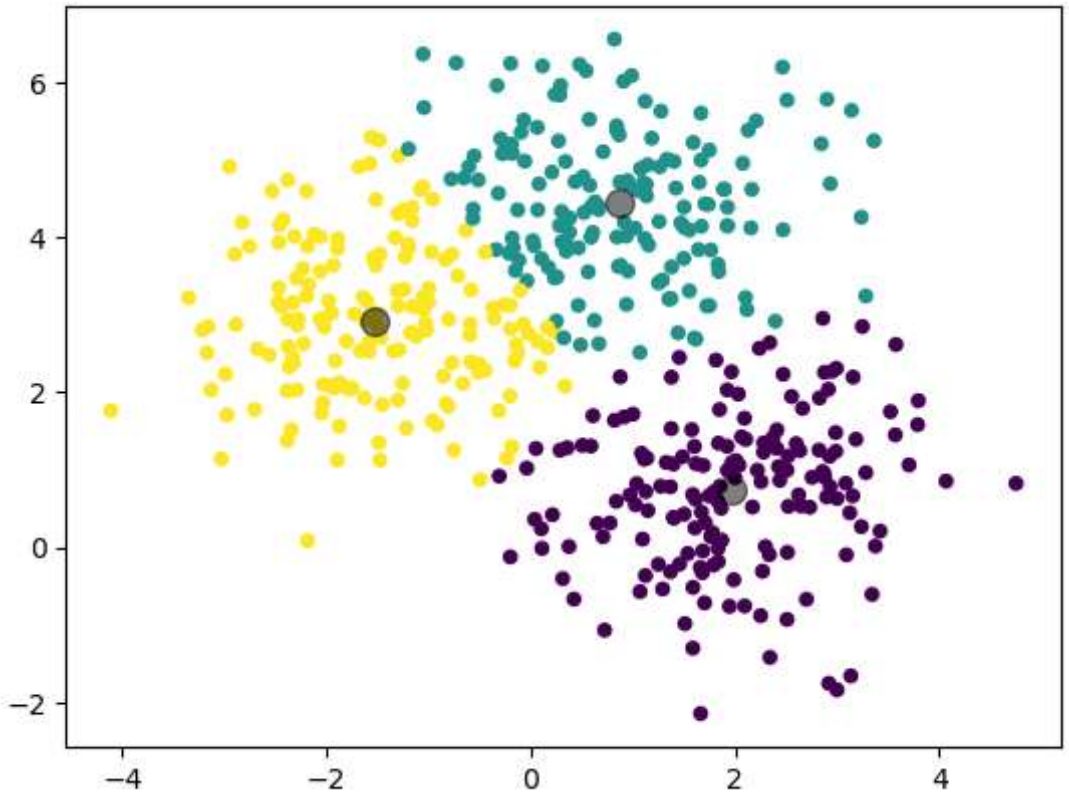
Step 3: Use K-means, find the centers of these clusters

In [4]:
```
from sklearn.cluster import KMeans
kmeans = KMeans(n_clusters=3, random_state=0)
kmeans.fit(X)
y_kmeans = kmeans.predict(X)
```

Step 4: Plot the blobs with the found centers

In [5]:
```
plt.scatter(X[:, 0], X[:, 1], c=y_kmeans, s=20, cmap='viridis')

centers = kmeans.cluster_centers_
plt.scatter(centers[:, 0], centers[:, 1], c='black', s=100, alpha=0.5)
```

Out[5]:
```
<matplotlib.collections.PathCollection at 0x2dcafbc1c90>
```

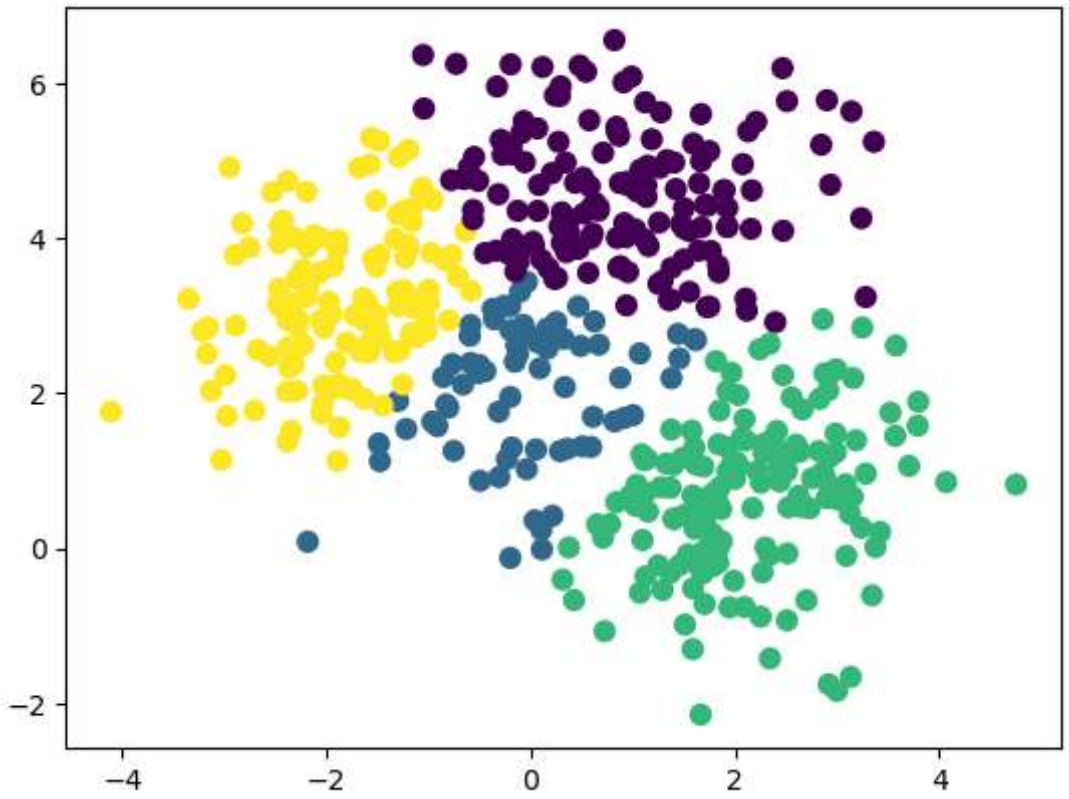


Additional/Optional:

Step 5: How can you find out the automatically assigned "labels" in the produced clusters?

In [6]:
```
from sklearn.metrics import pairwise_distances_argmin

def find_clusters(X, n_clusters, rseed=2):
    # 1. Randomly choose clusters
    rng = np.random.RandomState(rseed)
    i = rng.permutation(X.shape[0])[:n_clusters]
    centers = X[i]

    while True:
        # 2a. Assign labels based on closest center
        labels = pairwise_distances_argmin(X, centers)

        # 2b. Find new centers from means of points
        new_centers = np.array([X[labels == i].mean(0) for i in range(n_clu

        # 2c. Check for convergence
        if np.all(centers == new_centers):
            break
        centers = new_centers

    return centers, labels

centers, labels = find_clusters(X, 4)
plt.scatter(X[:, 0], X[:, 1], c=labels, s=50, cmap='viridis')
```

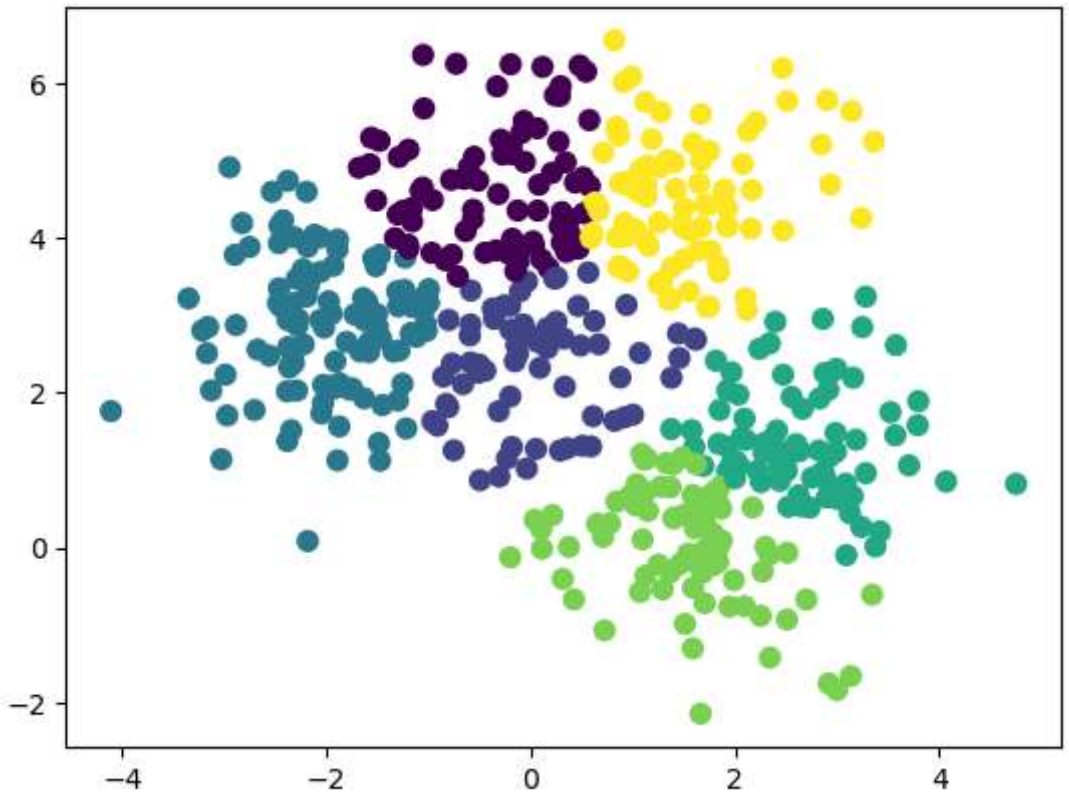
Out[6]: <matplotlib.collections.PathCollection at 0x2dcaacb87c0>



Step 6: How about classes? How to find out where there are classes.

In [7]:
```
labels = KMeans(6, random_state=0).fit_predict(X)
plt.scatter(X[:, 0], X[:, 1], c=labels, s=50, cmap='viridis')
```

Out[7]:
```
<matplotlib.collections.PathCollection at 0x2dcb1303b50>
```



Exercise 2: k-Means with the Iris dataset

Step 1: Load the iris dataset from sklearn and other necessary libraries

In [8]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris

import warnings

warnings.filterwarnings('ignore')

iris = load_iris()
```

Step 2: Set the training and target data as X and y respectively. Display the targets.

In [9]:
```
X = iris.data
y = iris.target

y
```

Out[9]:
```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2])
```

Introducing - *the Elbow Method:* A technique to allow you to identify the best K

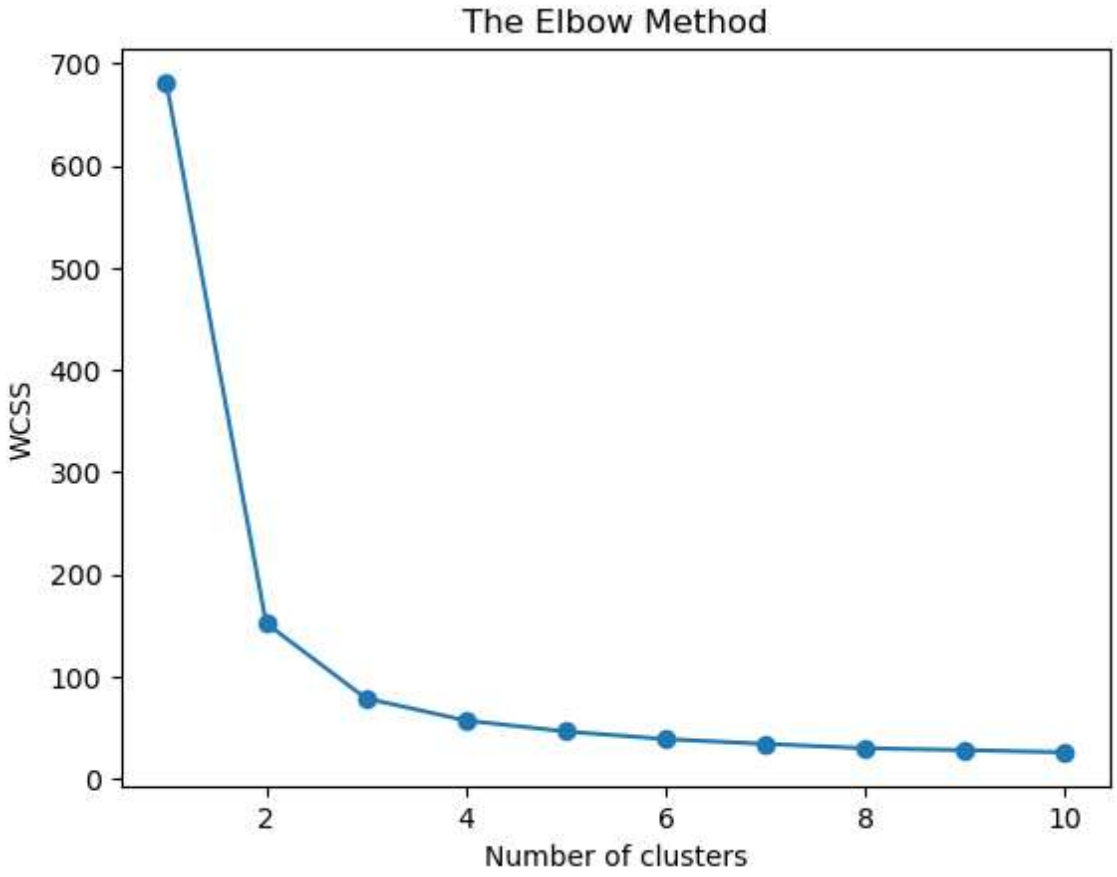
General idea: iterate the creation of k-Means clusters with increasing sizes, and record down the value of kmeans.inertia_ (inertia_: Sum of squared distances of samples to their closest cluster center.)

Step 3: create a list named wcss and store the inertia values for a selected range of ks.

In [10]:
```
from sklearn.cluster import KMeans

wcss = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters = i, init = 'k-means++', max_iter = 300, n_
    kmeans.fit(X)
    wcss.append(kmeans.inertia_)
```

Step 4: Plot a graph to look at 'The elbow'

In [11]:
```
plt.plot(range(1, 11), wcss, marker='o')
plt.title('The Elbow Method')
plt.xlabel('Number of clusters')
plt.ylabel('WCSS')
plt.show()
```



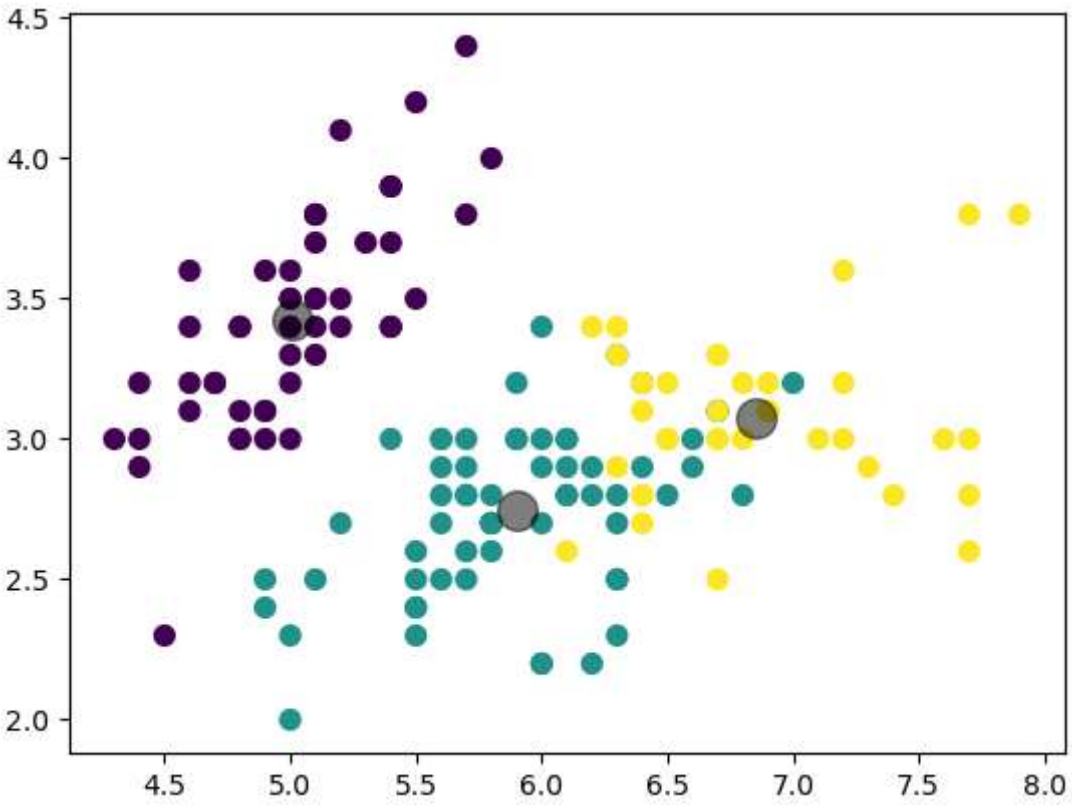
Step 5: Apply the best K for your k-means clustering

In [15]:
```
k=3
```

Step 6: Visualize the clusters. Name the clusters accordingly, and also plot the centriods.

In [16]:
```
kmeans = KMeans(n_clusters=k)
kmeans.fit(X)
y_kmeans = kmeans.predict(X)

plt.scatter(X[:, 0], X[:, 1], c=y_kmeans, s=50, cmap='viridis')

centers = kmeans.cluster_centers_
plt.scatter(centers[:, 0], centers[:, 1], c='black', s=200, alpha=0.5)
```

Out[16]: <matplotlib.collections.PathCollection at 0x2dcb1892a10>



Additional/Optional:

Step 7: Plot the actual and Predicted side by side

In [17]:
```
comparison = pd.DataFrame({'Actual': iris.target, 'Predicted': y_kmeans})
comparison
```

Out[17]:

	Actual	Predicted
0	0	0
1	0	0
2	0	0
3	0	0
4	0	0
...	...	...
145	2	2
146	2	1
147	2	2
148	2	2
149	2	1

150 rows × 2 columns