Forward School

Program Code: J620-002-4:2020

Program Name: FRONT-END SOFTWARE DEVELOPMENT ¶

Title : Exe25 - k-Means Exercise

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Date :

Introduction :

Conclusion :

Exercise 1: Build and Plot k-Means

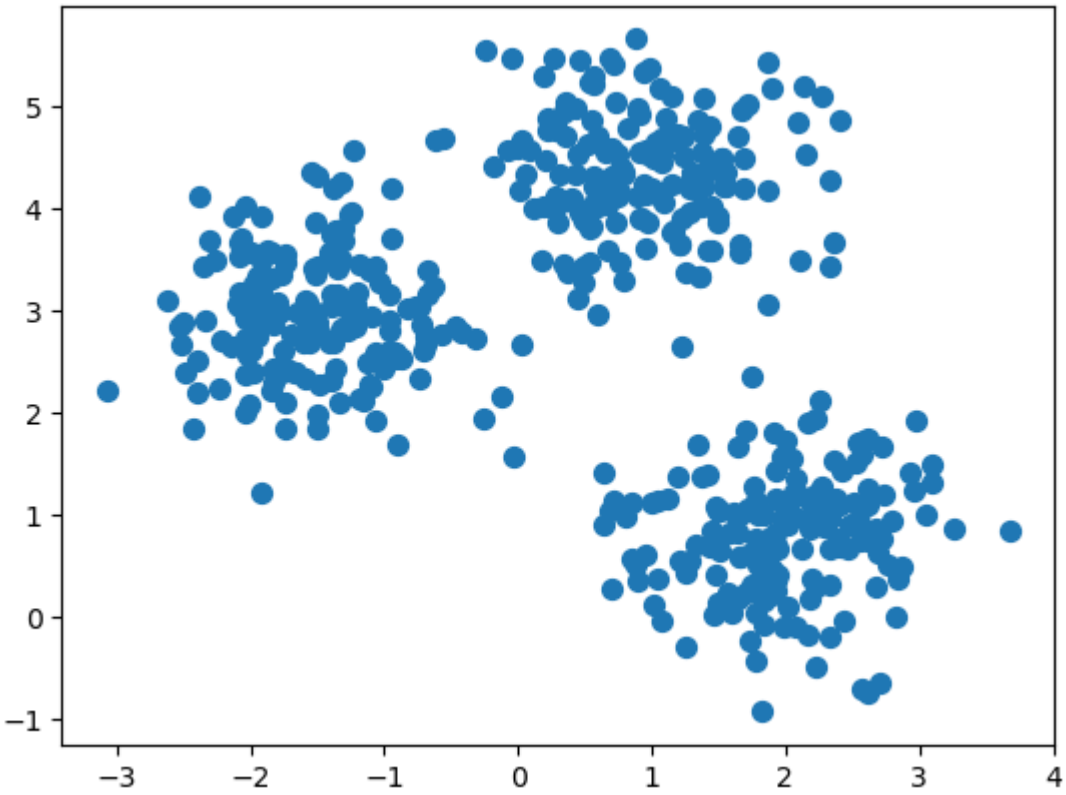
In [3]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

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

In [4]:
```
from sklearn.datasets import make_blobs
X, y_true = make_blobs(n_samples=500, centers=3,
                       cluster_std=0.60, random_state=0)
```

Step 2: Plot the distribution of the blobs

In [5]:
```
plt.scatter(X[:, 0], X[:, 1], s=50);
```



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

In [6]:
```
from sklearn.cluster import KMeans
kmeans = KMeans(n_clusters=4)
kmeans.fit(X)
y_kmeans = kmeans.predict(X)
```

```
C:\Users\Asus\anaconda3\envs\python-dscourse\lib\site-packages\sklearn\cluste
r\_kmeans.py:1412: FutureWarning: The default value of `n_init` will change f
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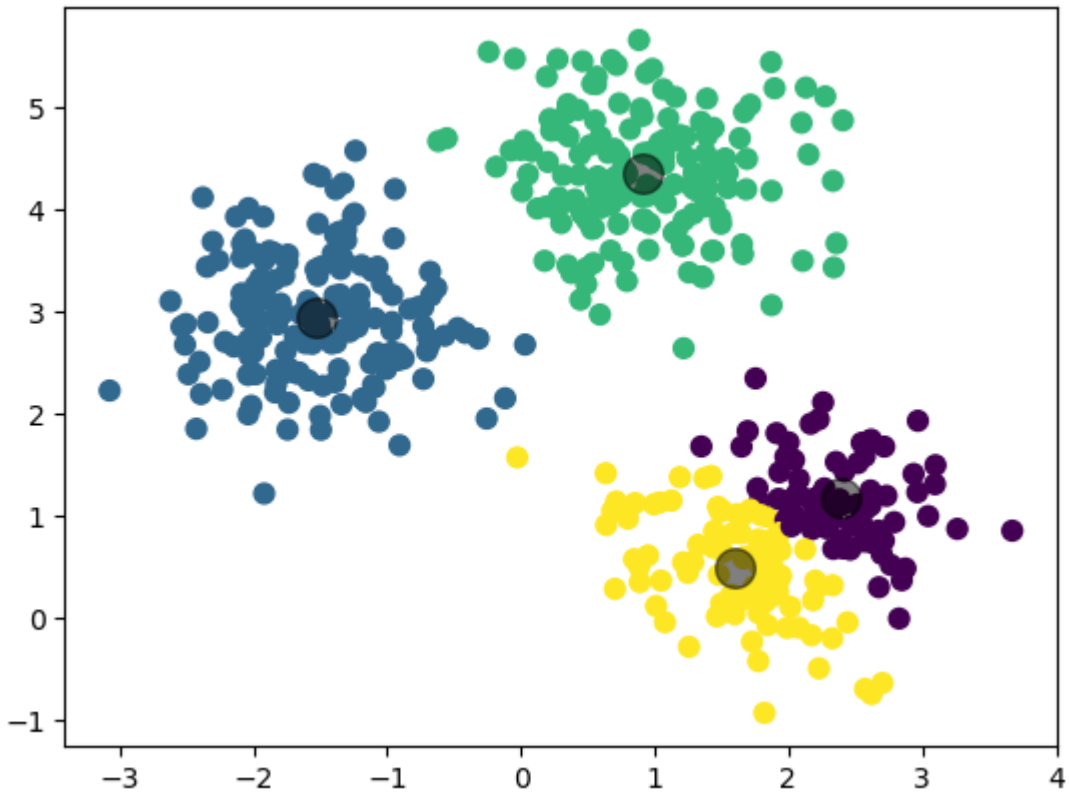
ows with MKL, when there are less chunks than available threads. You can avoi
d it by setting the environment variable OMP_NUM_THREADS=2.
  warnings.warn(
```

Step 4: Plot the blobs with the found centers

In [7]:
```
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);
```



Additional/Optional:

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

In [ ]:
```
```

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

In [ ]:
```
```

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
from sklearn.ensemble import RandomForestClassifier
from sklearn import datasets
from sklearn.model_selection import train_test_split
from sklearn.feature_selection import SelectFromModel
from sklearn.metrics import accuracy_score
iris = datasets.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
```

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]:
```
wcss = []  # Within-cluster sum of squares (inertia) for different K values

# Define a range of K values to try
k_values = range(1, 11)

for k in k_values:
    kmeans = KMeans(n_clusters=k, init='k-means++', random_state=42)
    kmeans.fit(X)
    wcss.append(kmeans.inertia_)
```

```
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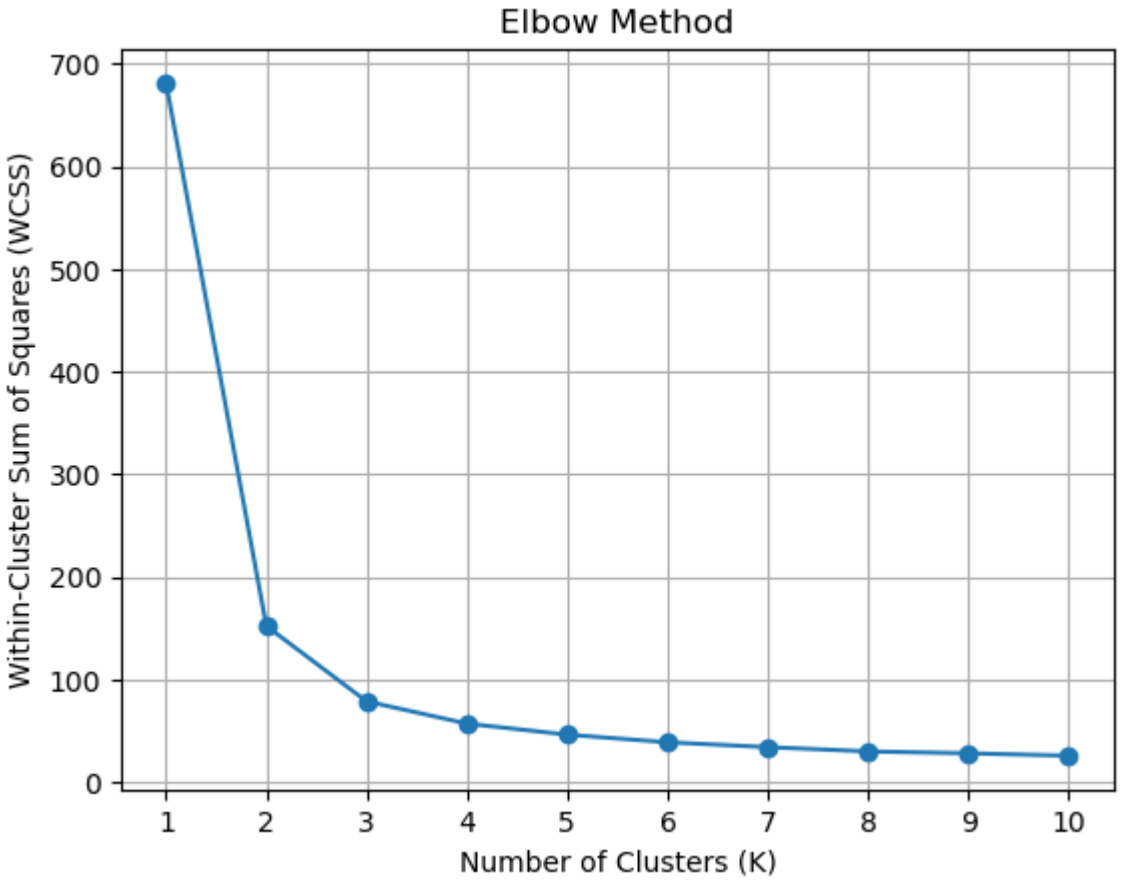
d it by setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```

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

In [11]:
```
plt.plot(k_values, wcss, marker='o')
plt.title('Elbow Method')
plt.xlabel('Number of Clusters (K)')
plt.ylabel('Within-Cluster Sum of Squares (WCSS)')
plt.xticks(k_values)
plt.grid()
plt.show()
```



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

In [16]:
```
best_k = 2

# Perform k-Means clustering with the chosen K value
kmeans = KMeans(n_clusters=best_k, init='k-means++', random_state=42)
kmeans.fit(X)

# Get cluster assignments for each data point
labels = kmeans.labels_

# Visualize the clusters by plotting the data points with different colors for
plt.scatter(X[labels == 0, 0], X[labels == 0, 1], s=50, c='red', label='Cluste
plt.scatter(X[labels == 1, 0], X[labels == 1, 1], s=50, c='blue', label='Clust

# Plotting the cluster centers
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s=20
plt.title('k-Means Clustering with K=3')
plt.xlabel('Feature 1')
plt.ylabel('Feature 2')
plt.legend()
plt.grid()
plt.show()
```

```
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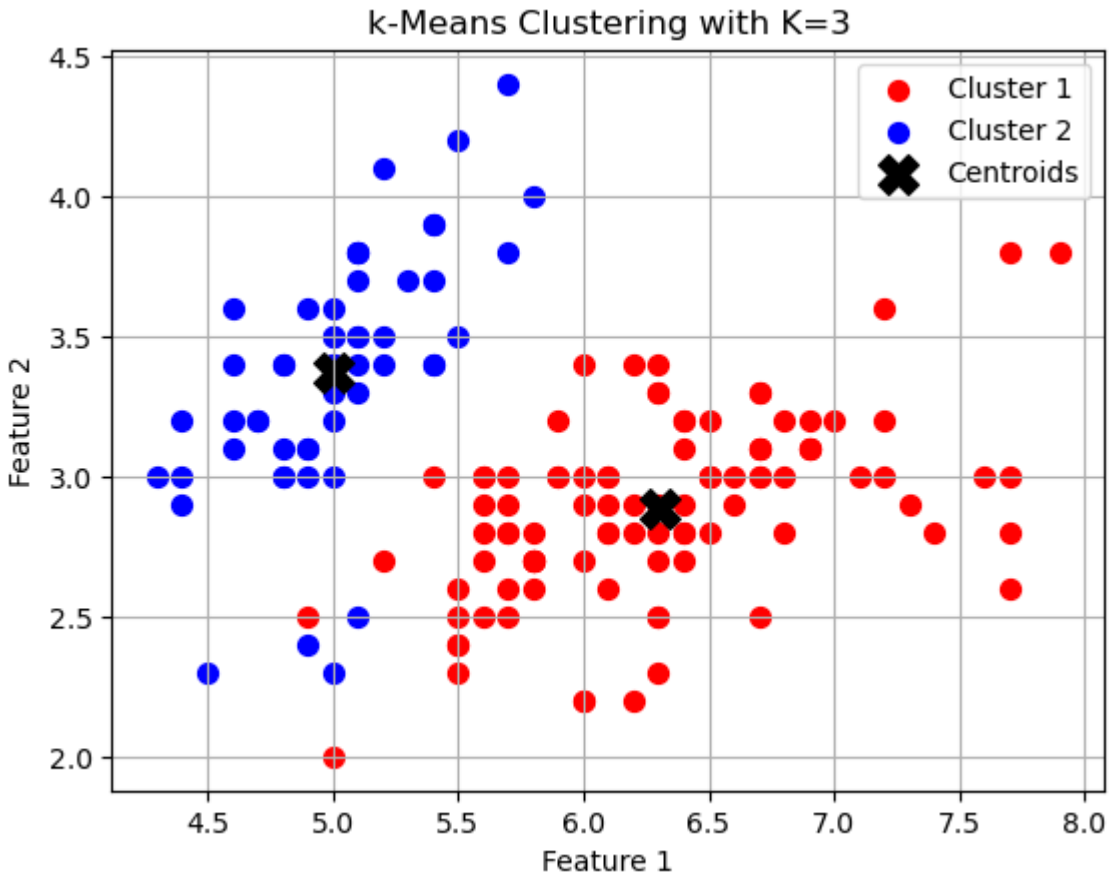

Step 6: Visualize the clusters. Name the clusters accordingly, and also plot the centriods.

In [ ]:

Additional/Optional:

Step 7: Plot the actual and Predicted side by side

In [ ]: