import matplotlib.pyplot as plt

from sklearn.cluster import KMeans

from sklearn.datasets import make\_blobs

# Step 1: Generate sample dataset

X, \_ = make\_blobs(n\_samples=300, centers=4, cluster\_std=0.60, random\_state=0)

# Step 2: Visualize the raw data (before clustering)

plt.figure(figsize=(12, 5))

plt.subplot(1, 2, 1)

plt.scatter(X[:, 0], X[:, 1], s=30, color='gray')

plt.title('Before K-Means Clustering')

plt.xlabel('Feature 1')

plt.ylabel('Feature 2')

# Step 3: Apply K-Means clustering

kmeans = KMeans(n\_clusters=4, random\_state=0)

kmeans.fit(X)

y\_kmeans = kmeans.predict(X)

# Step 4: Visualize the clustered data

plt.subplot(1, 2, 2)

plt.scatter(X[:, 0], X[:, 1], c=y\_kmeans, s=30, cmap='viridis') # color by cluster

centers = kmeans.cluster\_centers\_

plt.scatter(centers[:, 0], centers[:, 1], c='red', s=200, alpha=0.75, marker='X', label='Centroids')

plt.title('After K-Means Clustering')

plt.xlabel('Feature 1')

plt.ylabel('Feature 2')

plt.legend()

plt.tight\_layout()

plt.show()