Lab Sheet 06: Clustering Techniques - Example Code for K-Means

Step 1: Introduction to Clustering

1.1 Background:

Briefly explain the concept of clustering in machine learning and discuss its applications.

1.2 Types of Clustering Algorithms:

Introduce various clustering algorithms: K-Means, Hierarchical Clustering, DBSCAN.

Step 2: Implementation

2.1 K-Means Clustering:

```
# Import necessary libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn.datasets import make_blobs

# Generate a sample dataset
X, _ = make_blobs(n_samples=300, centers=4, random_state=42)

# Visualize the dataset
plt.scatter(X[:, 0], X[:, 1], s=50)
plt.title("Generated Data for K-Means Clustering")
plt.show()

# Implement K-Means clustering
kmeans = KMeans(n_clusters=4)
kmeans.fit(X)
```

```
# Get cluster centers and labels
centers = kmeans.cluster_centers_
labels = kmeans.labels_

# Visualize the clustered data
plt.scatter(X[:, 0], X[:, 1], c=labels, s=50, cmap='viridis')
plt.scatter(centers[:, 0], centers[:, 1], c='red', marker='X', s=200, alpha=0.75)
plt.title("K-Means Clustering Result")
plt.show()
```

2.2 Hierarchical Clustering and 2.3 DBSCAN: Provide similar code snippets for Hierarchical Clustering and DBSCAN.

Assignment 1: Algorithm Implementation and Visualization

Task:

1. Implement Hierarchical Clustering and DBSCAN algorithms using the provided examples for K-Means as a reference.
2. Use a suitable dataset or generate one to apply each algorithm.
3. Visualize the results of Hierarchical Clustering and DBSCAN alongside K-Means for comparison.
4. Write a brief summary comparing the visualizations and discussing the strengths and weaknesses of each algorithm.