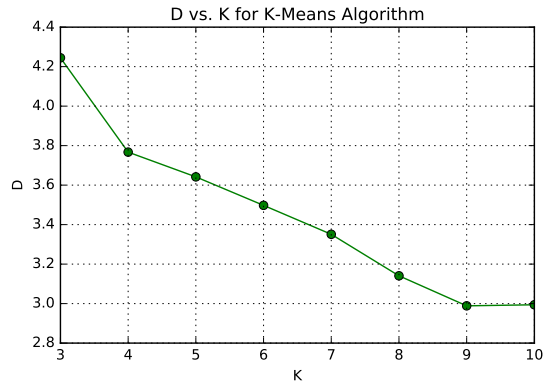
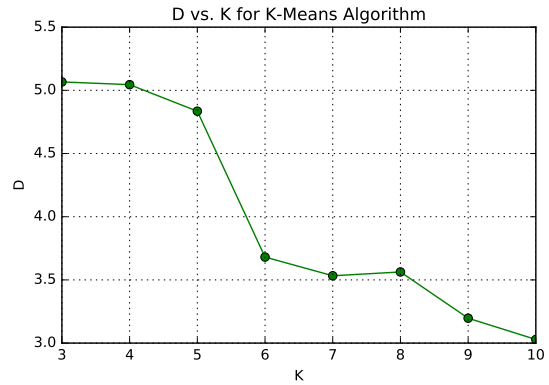


I. Lloyd's (K-means) Algorithm

1. In this part, the polynomial regression is conducted on the given dataset. The derivation is relatively simple, here we only give one simple version.



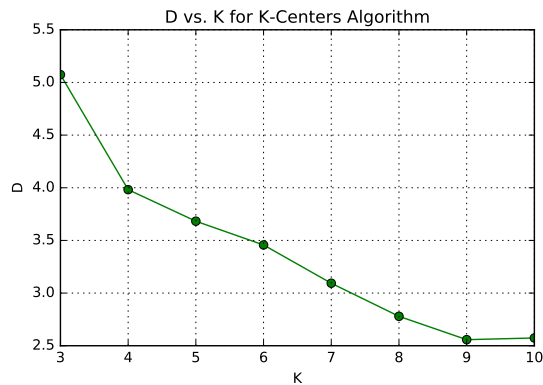
(a) clustering.txt



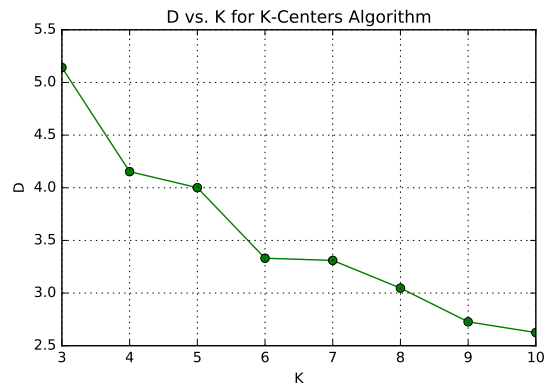
(b) bigClusteringData.txt

Figure 3: Change of Distortion versus Cluster Number K for K-Means Algorithm

II. Greedy K-centers Algorithm



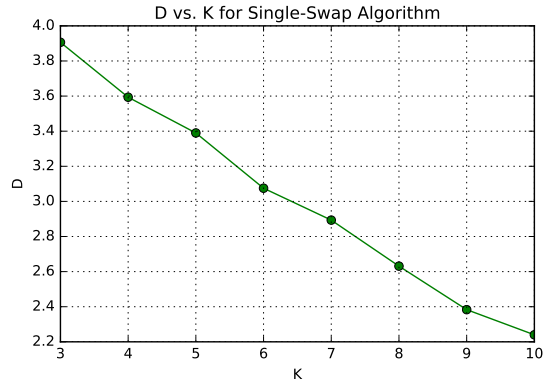
(a) clustering.txt



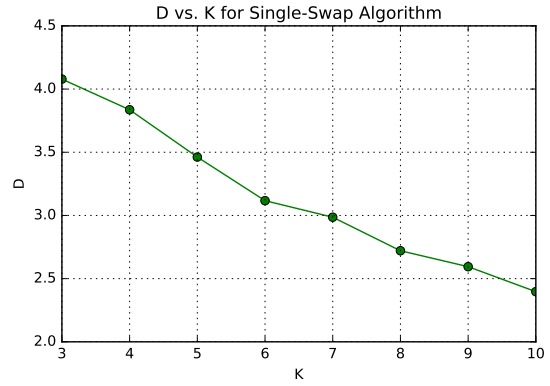
(b) bigClusteringData.txt

Figure 6: Change of Distortion versus Cluster Number K for K-Center Algorithm

III. Single-Swap Algorithm



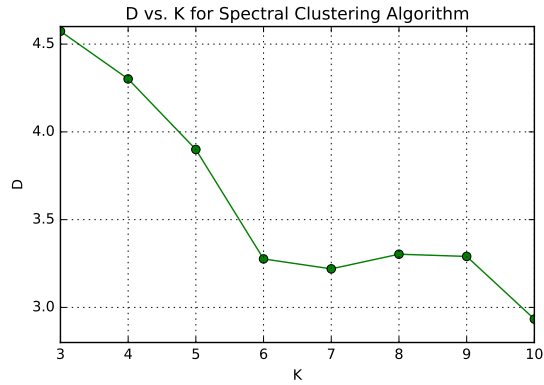
(a) clustering.txt



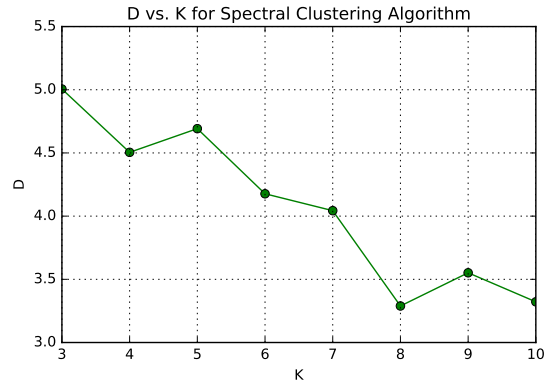
(b) bigClusteringData.txt

Figure 9: Change of Distortion versus Cluster Number K for Single-Swap Algorithm

IV. Spectral Clustering Algorithm



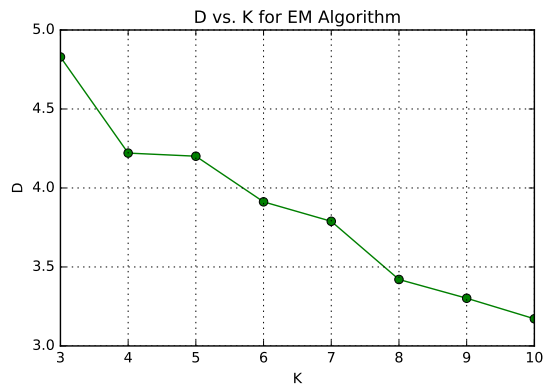
(a) clustering.txt



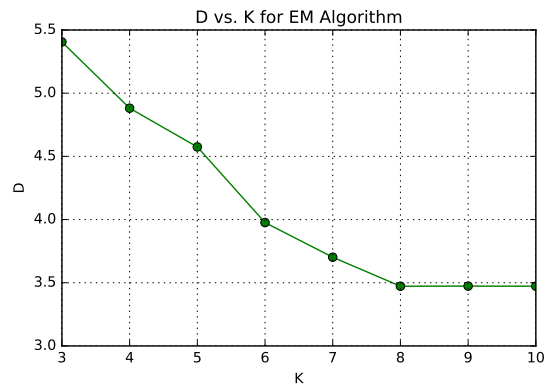
(b) bigClusteringData.txt

Figure 12: Change of Distortion versus Cluster Number K for Spectral Clustering

V. Expectation Maximization (EM) Algorithm



(a) clustering.txt



(b) bigClusteringData.txt

Figure 15: Change of Distortion versus Cluster Number K for EM Algorithm

```
1  
2 def polynomial_regression(x, y, degree, x_range):
```

Listing 1: Python example

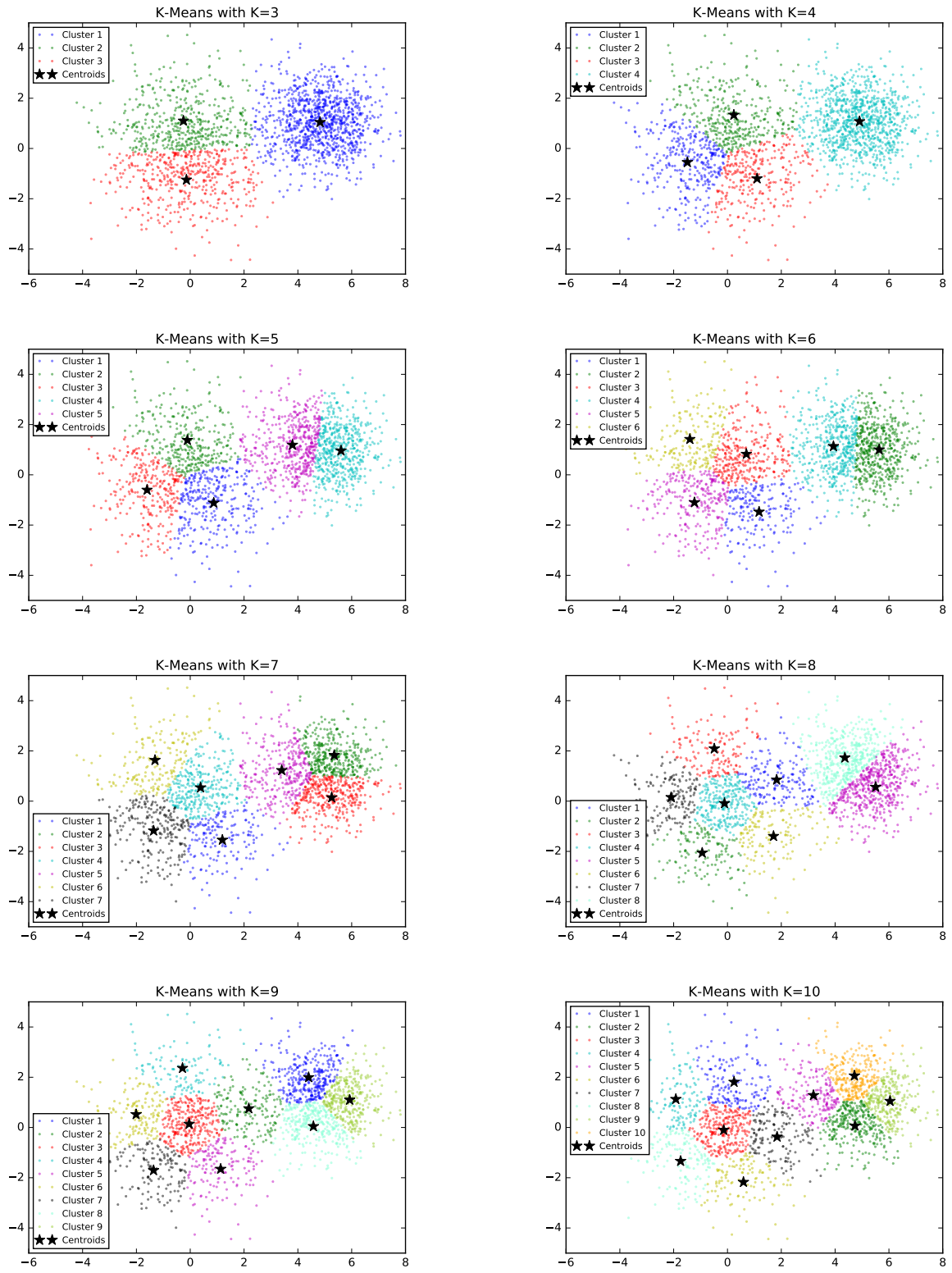


Figure 1: Clustering Result for clustering.txt with K-Means Algorithm

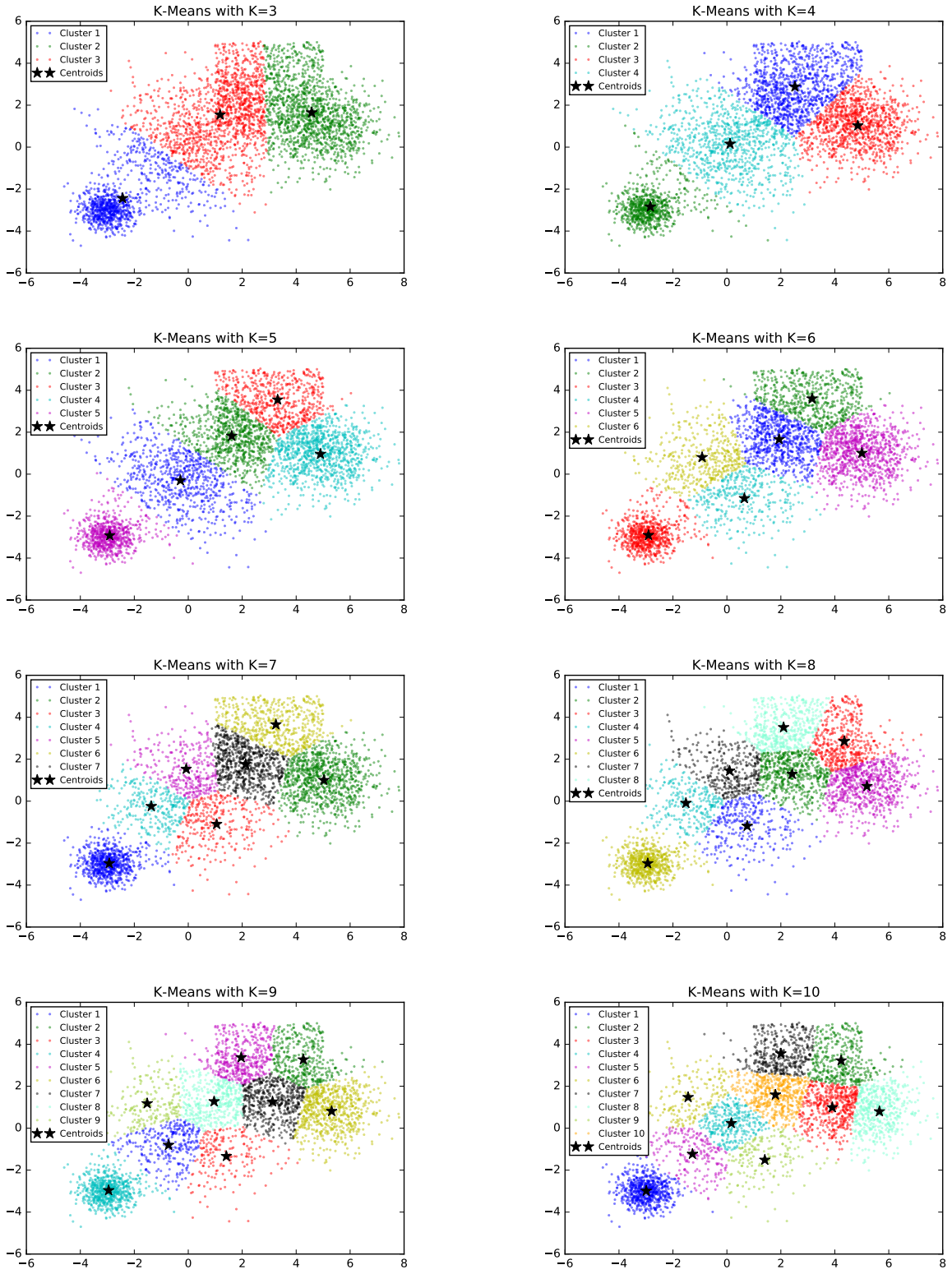


Figure 2: Clustering Result for bigClusteringData.txt with K-Means Algorithm

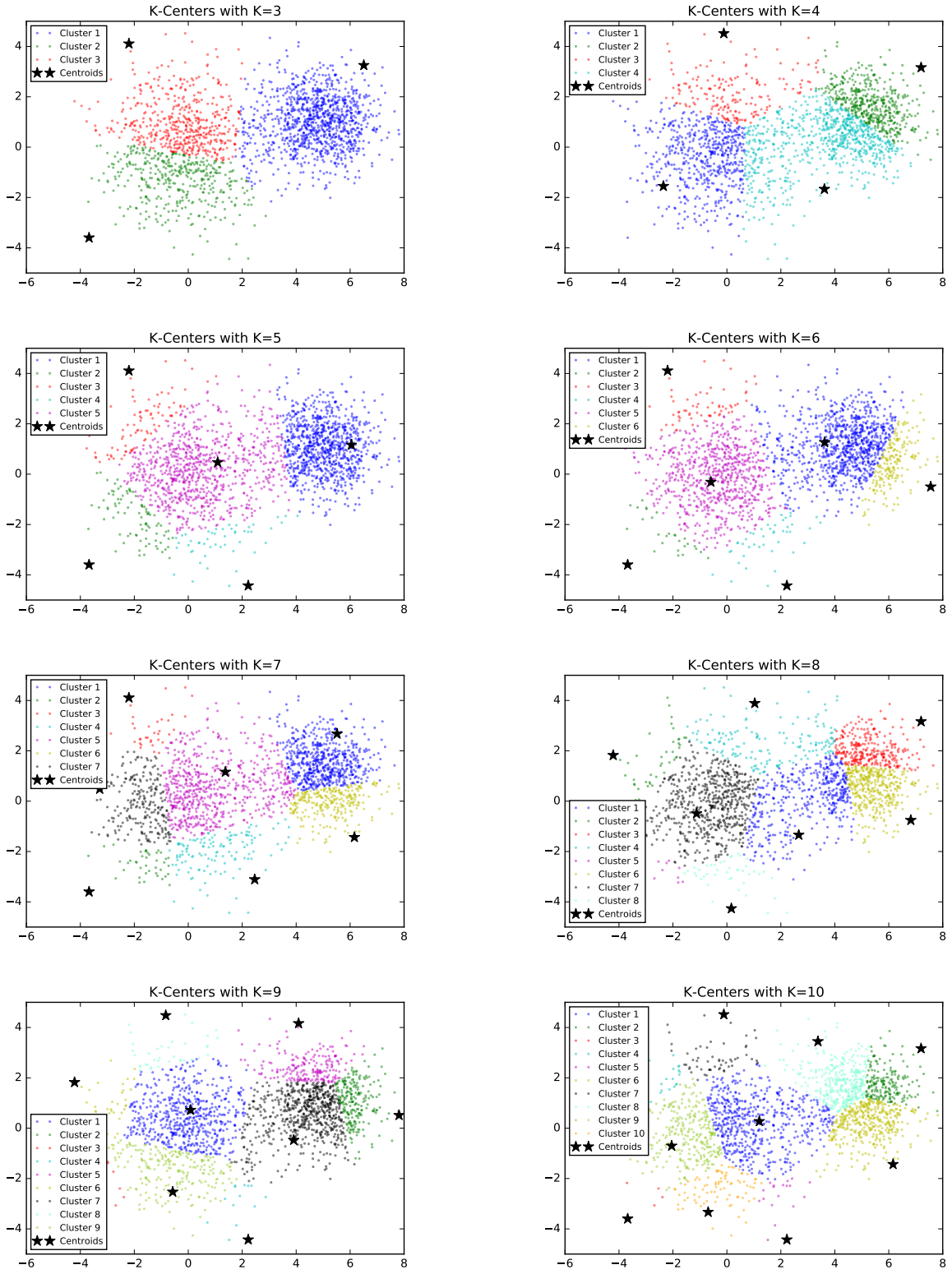


Figure 4: Clustering Result for clustering.txt with K-Center Algorithm

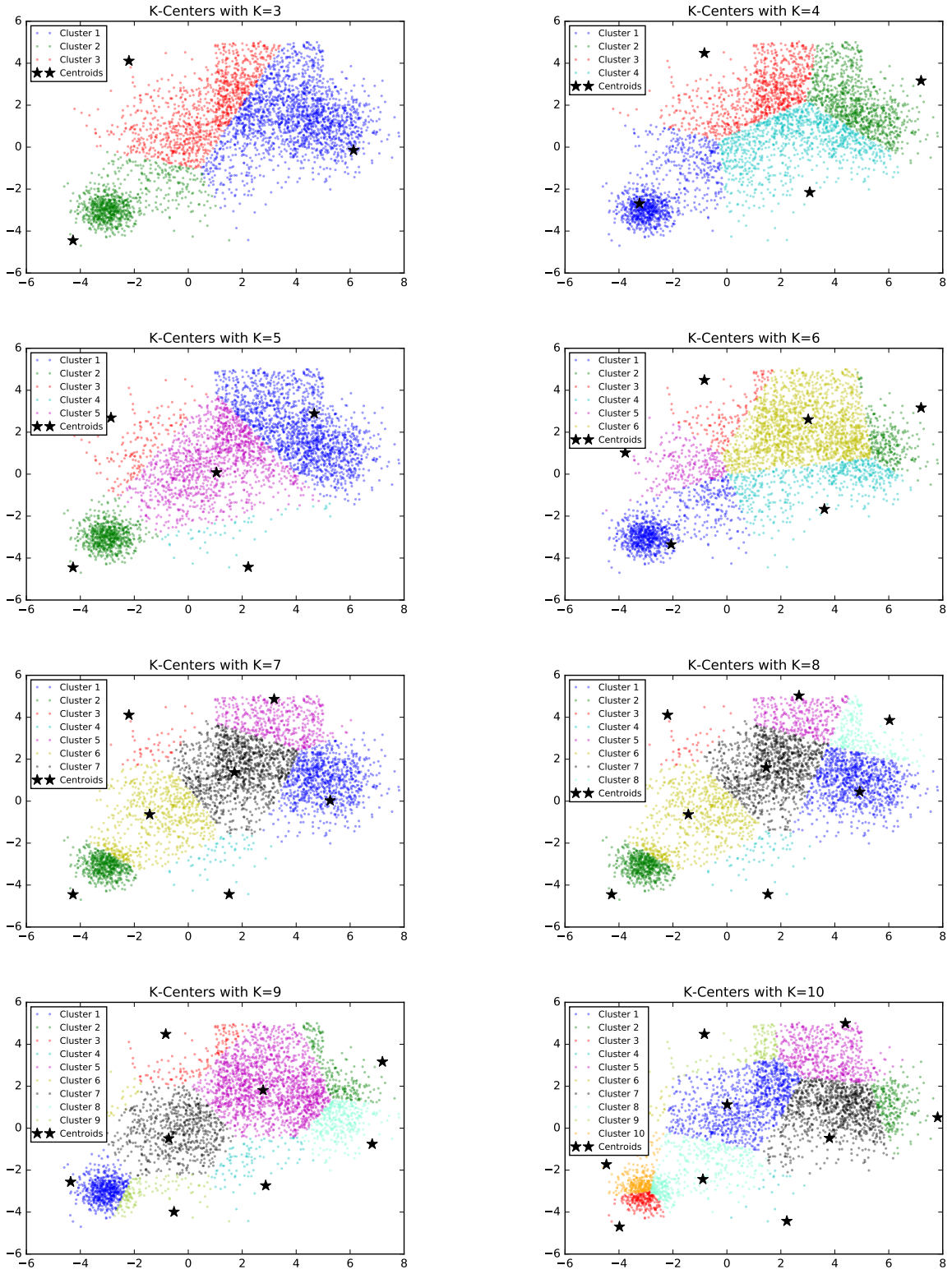


Figure 5: Clustering Result for bigClusteringData.txt with K-Center Algorithm

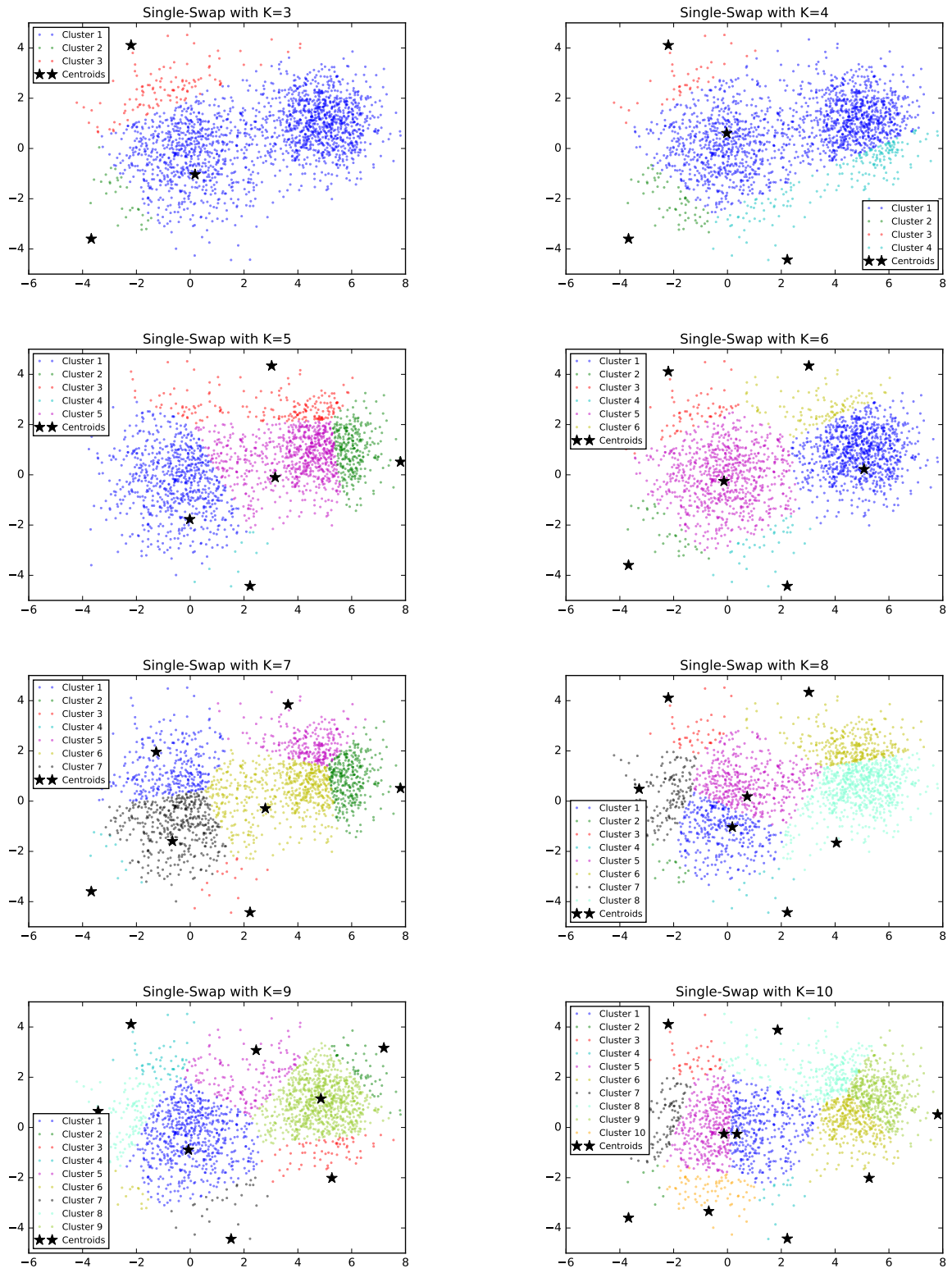


Figure 7: Clustering Result for clustering.txt with Single-Swap Algorithm

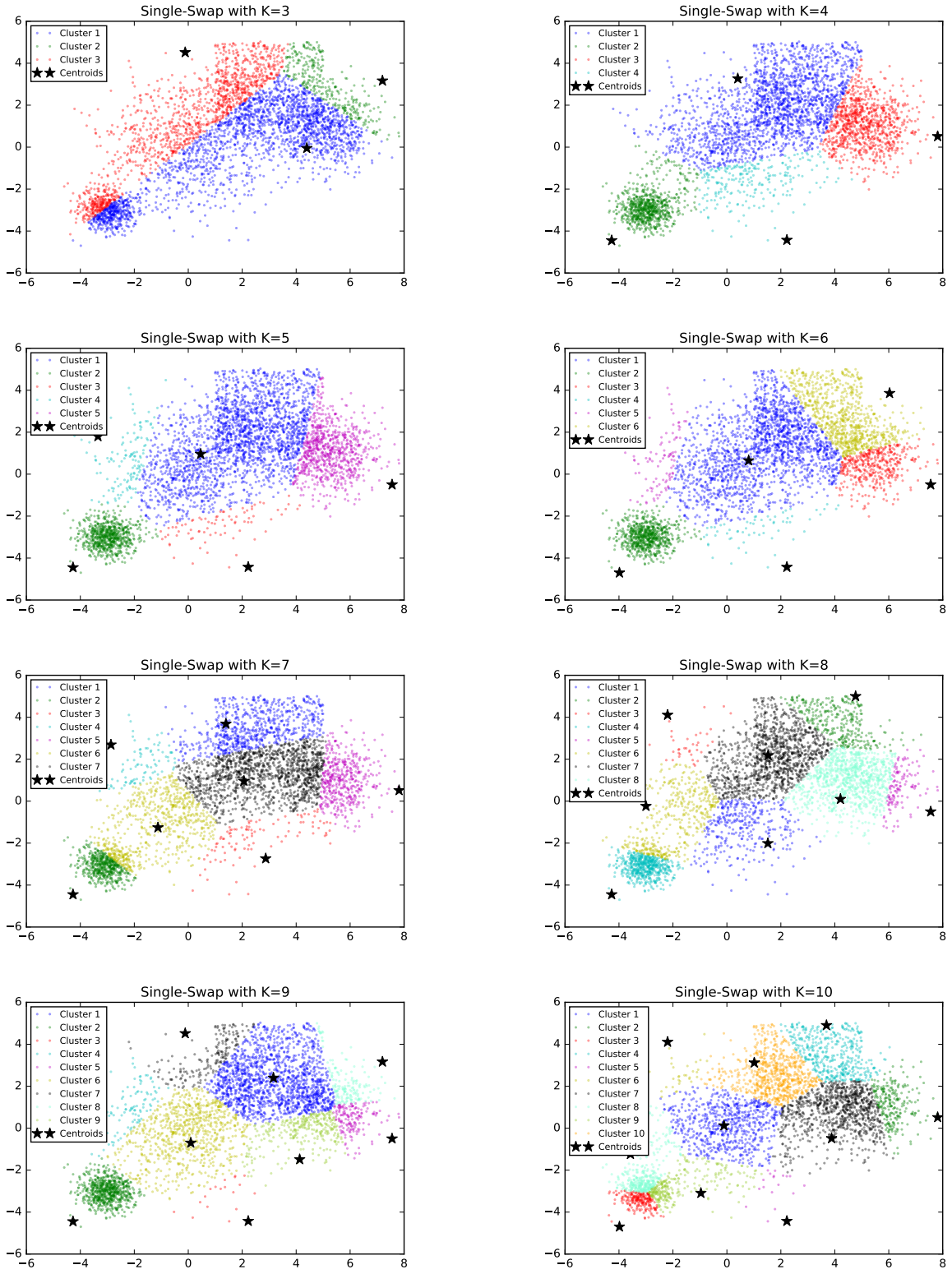


Figure 8: Clustering Result for `bigClusteringData.txt` with Single-Swap Algorithm

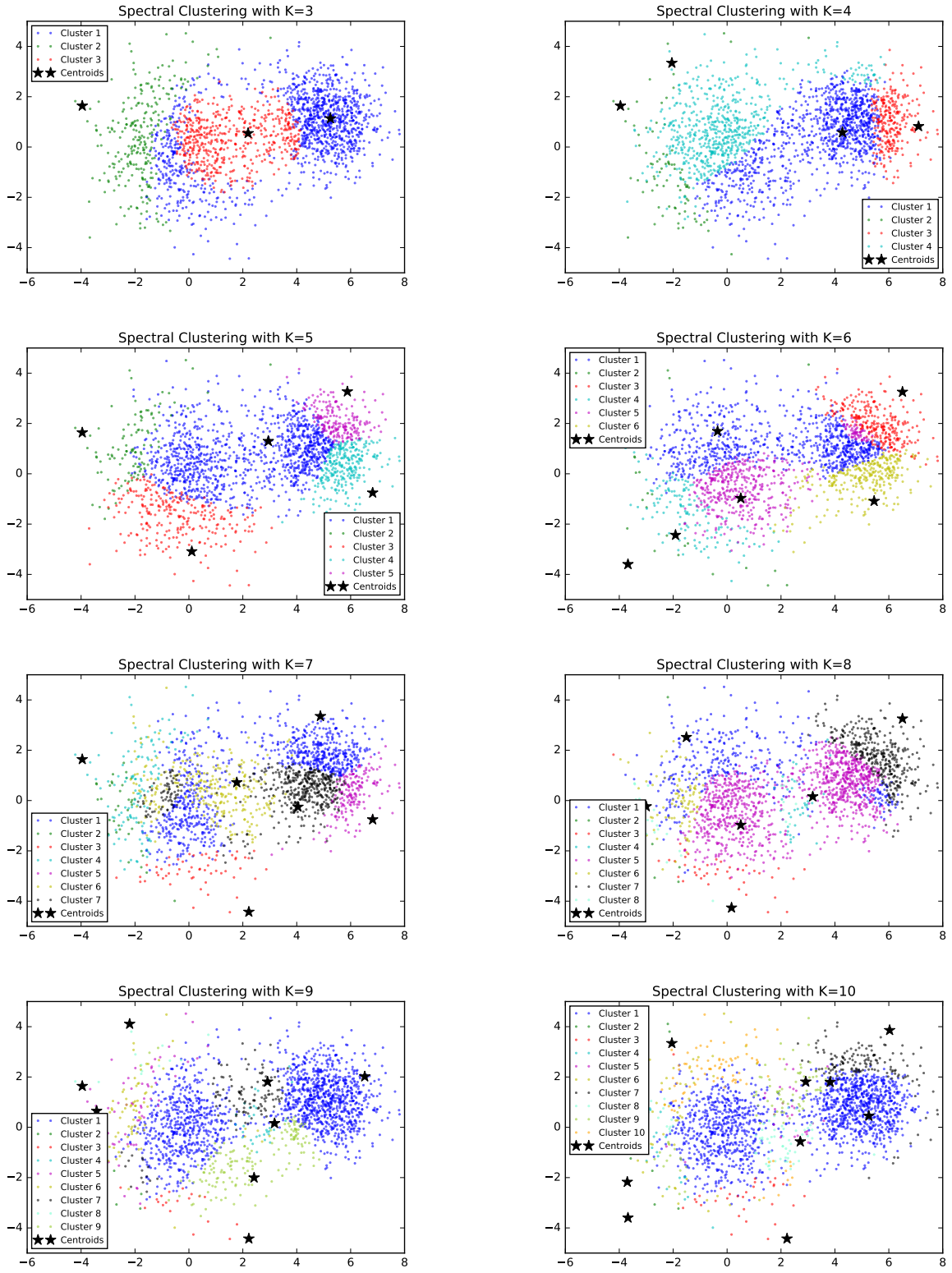


Figure 10: Clustering Result for clustering.txt with Spectral Clustering

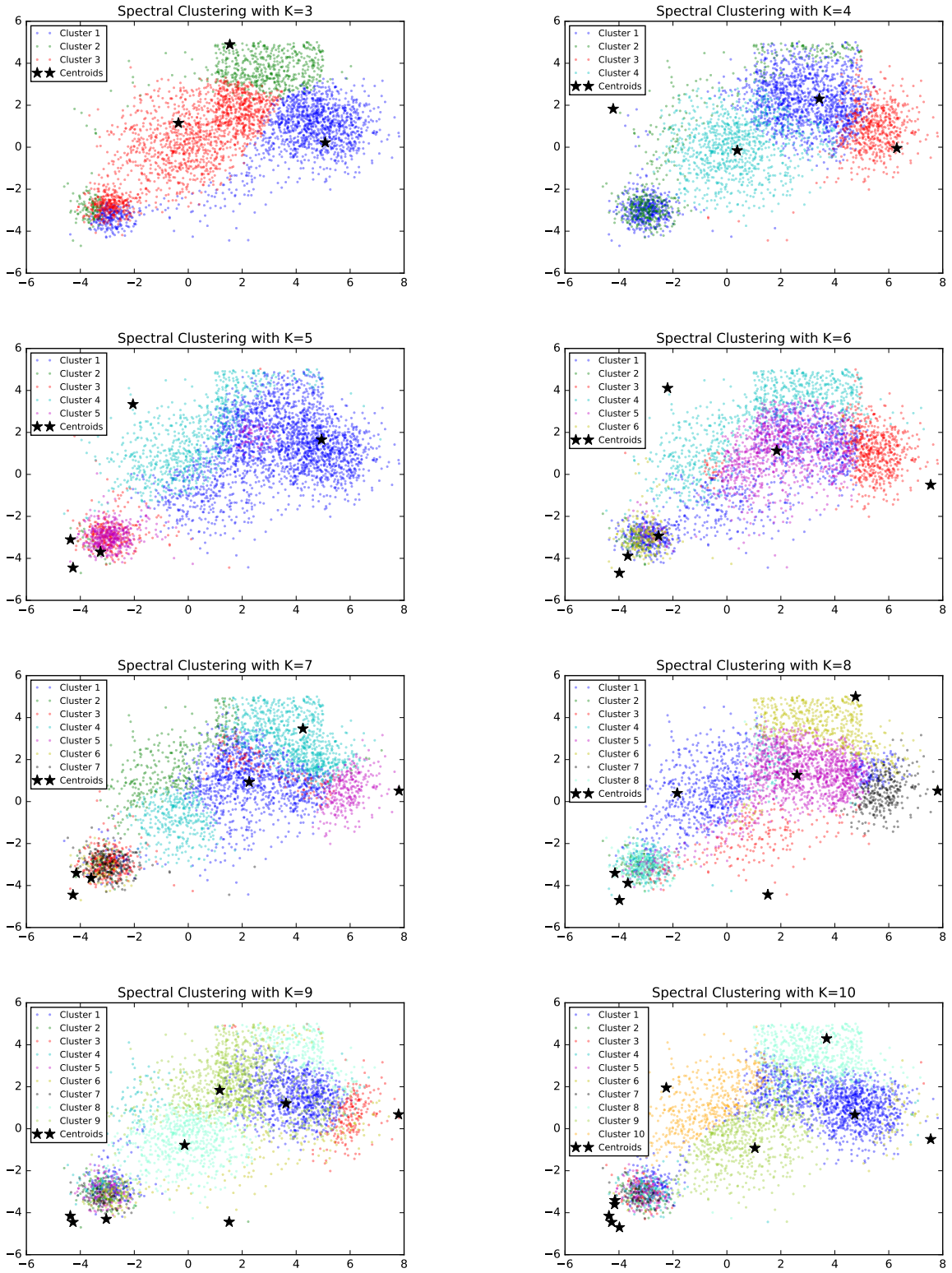


Figure 11: Clustering Result for bigClusteringData.txt with Spectral Clustering

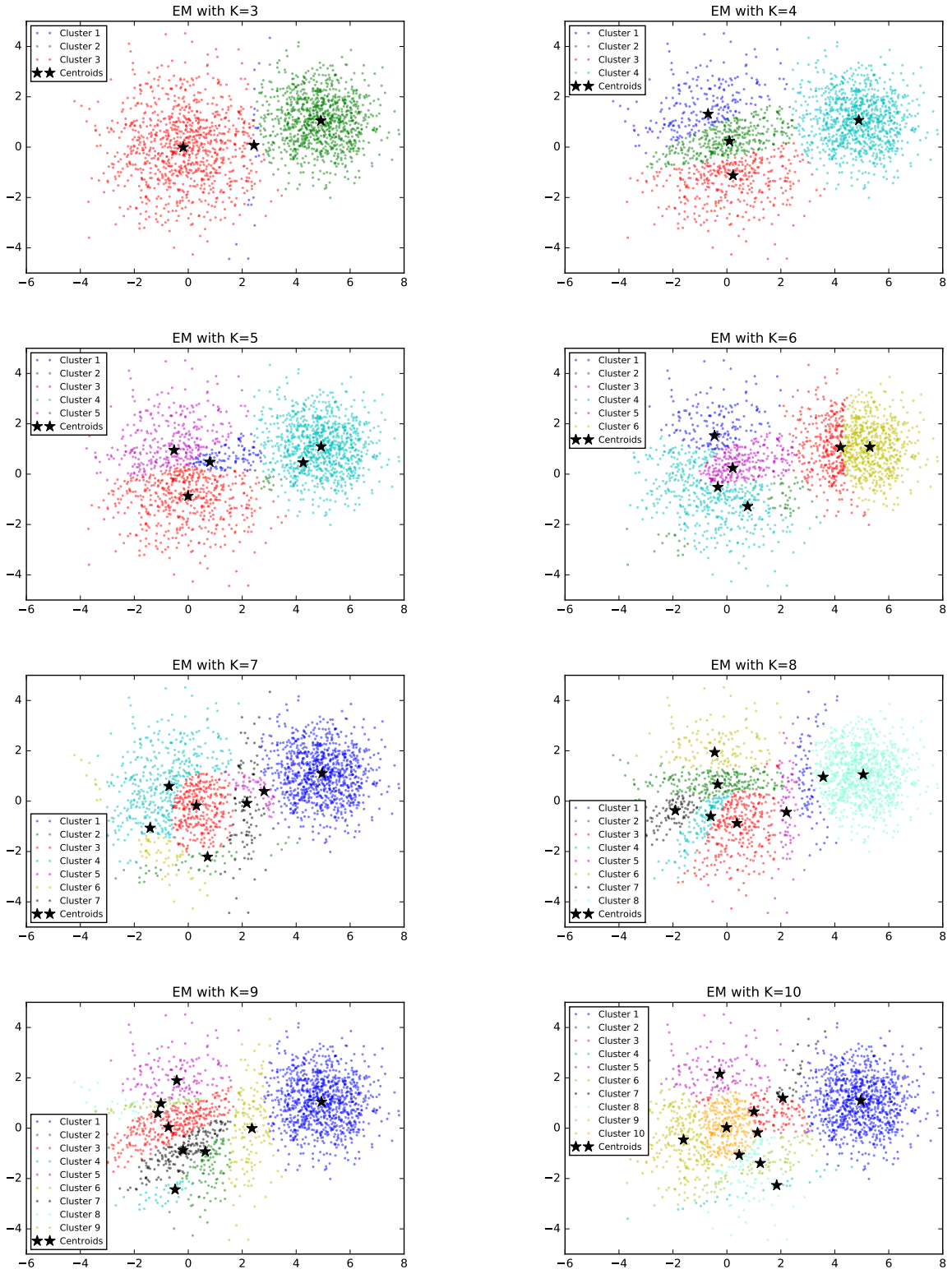


Figure 13: Clustering Result for clustering.txt with EM Algorithm

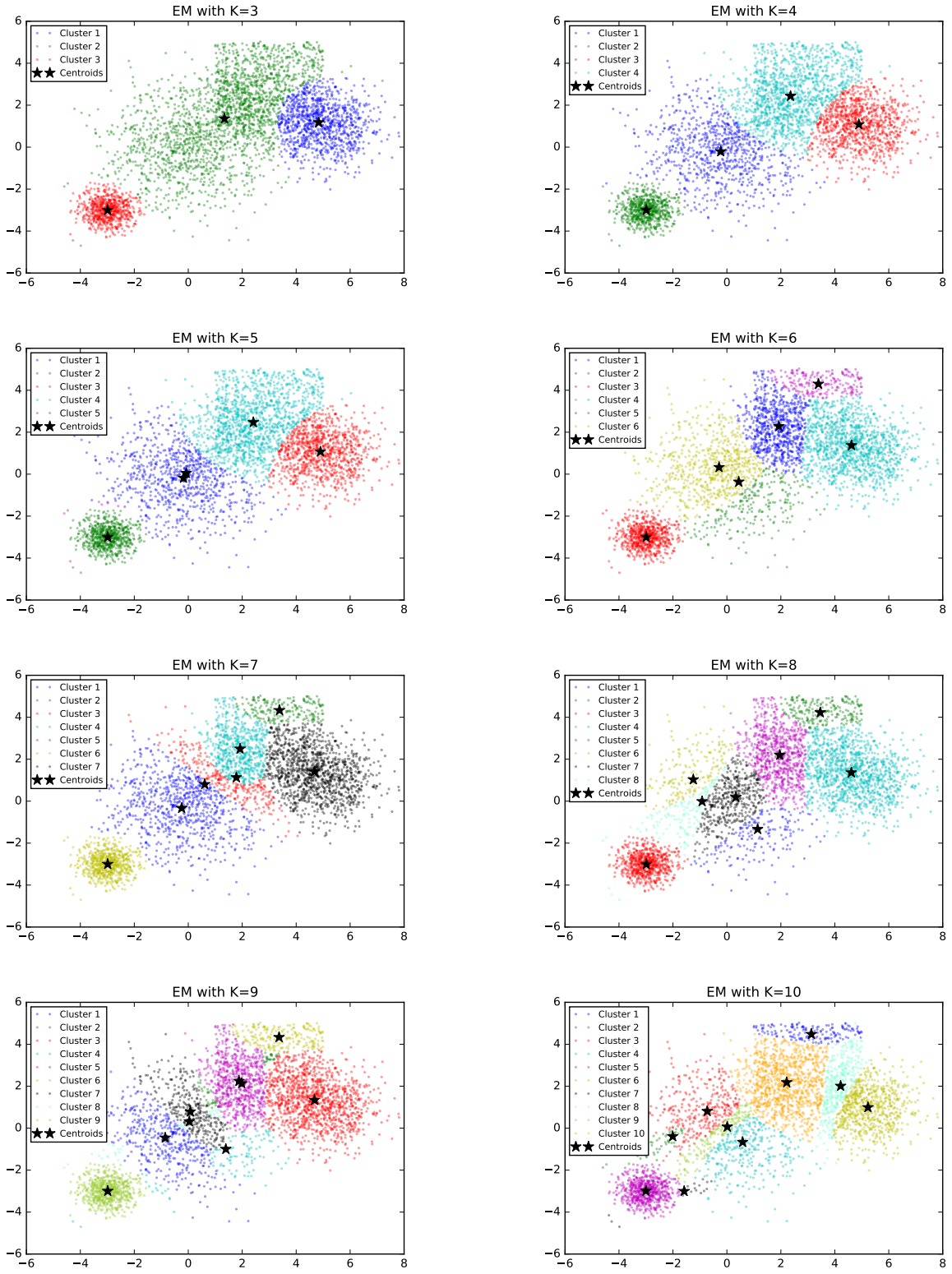


Figure 14: Clustering Result for bigClusteringData.txt with EM Algorithm