Introduction to K Means Clustering

Chapter 10 of
Introduction to Statistical Learning
By Gareth James, et al.

K Means Clustering

K Means Clustering is an unsupervised learning algorithm that will attempt to group similar clusters together in your data.
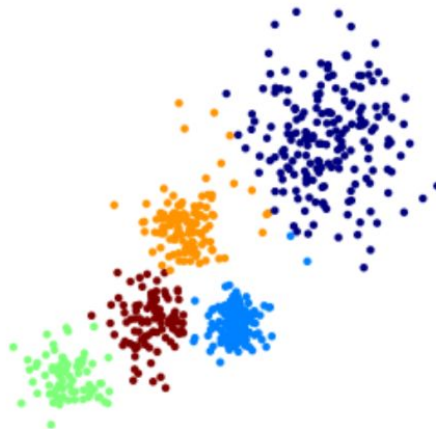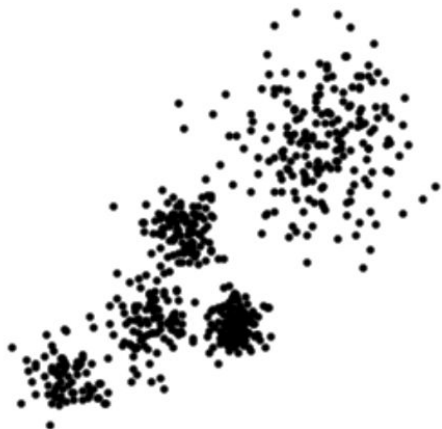
So what does a typical clustering problem look like?

- Cluster Similar Documents
- Cluster Customers based on Features
- Market Segmentation
- Identify similar physical groups

K Means Clustering

- The overall goal is to divide data into distinct groups such that observations within each group are similar

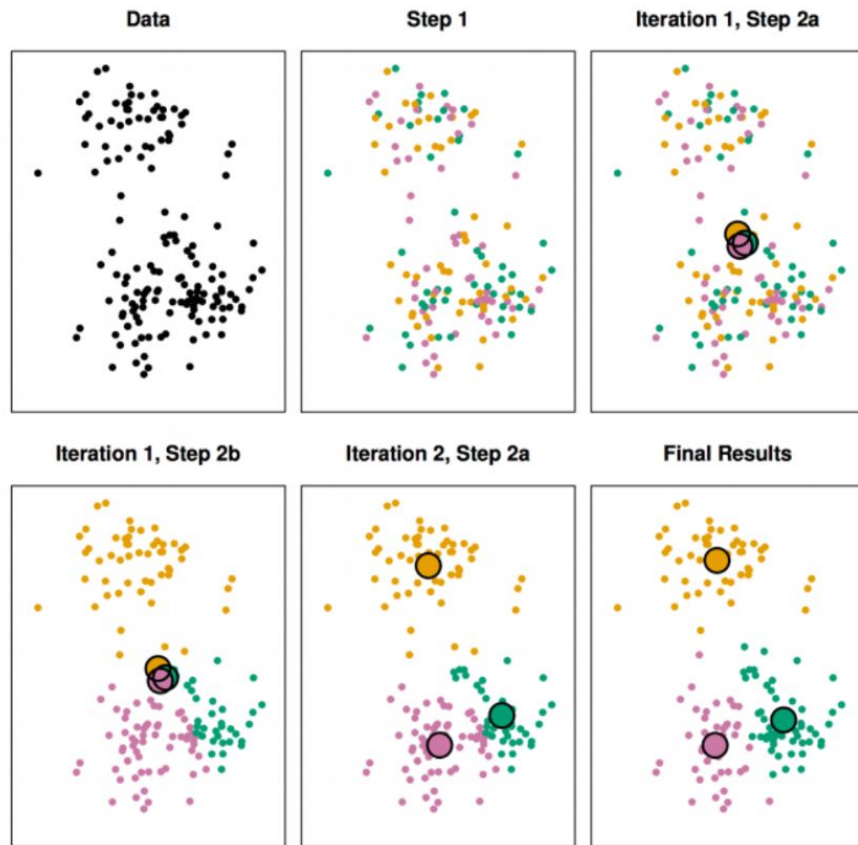minimize intracluster distance
maximize intercluster distance

PIERIAN DATA

K Means Clustering

The K Means Algorithm

- Choose a number of Clusters "K"
- Randomly assign each point to a cluster
- Until clusters stop changing, repeat the following:
  - For each cluster, compute the cluster centroid by taking the mean vector of points in the cluster
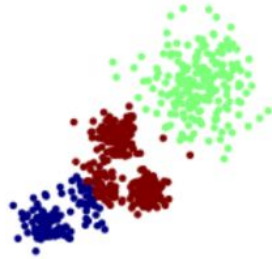 - Assign each data point to the cluster for which the centroid is the closest
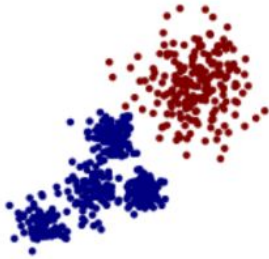
PIERIAN DATA

K Means Clustering

Data   Step 1   Iteration 1, Step 2a

Iteration 1, Step 2b   Iteration 2, Step 2a   Final Results

PIERIAN DATA

Choosing a K Value

Choosing a K Value

- There is no easy answer for choosing a "best" K value
- One way is the elbow method

First of all, compute the sum of squared error (SSE) for some values of k (for example 2, 4, 6, 8, etc.).

The SSE is defined as the sum of the squared distance between each member of the cluster and its centroid.

Choosing a K Value

If you plot k against the SSE, you will see that *the error decreases as k gets larger*; this is because when the number of clusters increases, they should be smaller, so distortion is also smaller.

The idea of the elbow method is to choose the k at which the SSE decreases abruptly.

This produces an "elbow effect" in the graph, as you can see in the following picture:

PIERIAN DATA

Choosing a K Value