Initialization of K-Means Clustering

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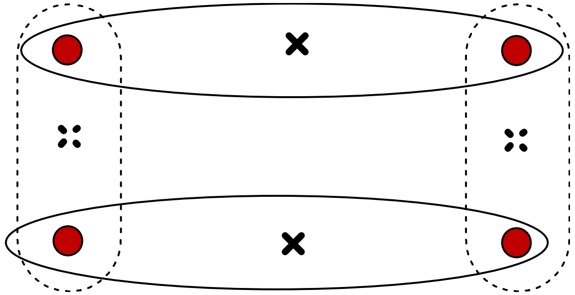
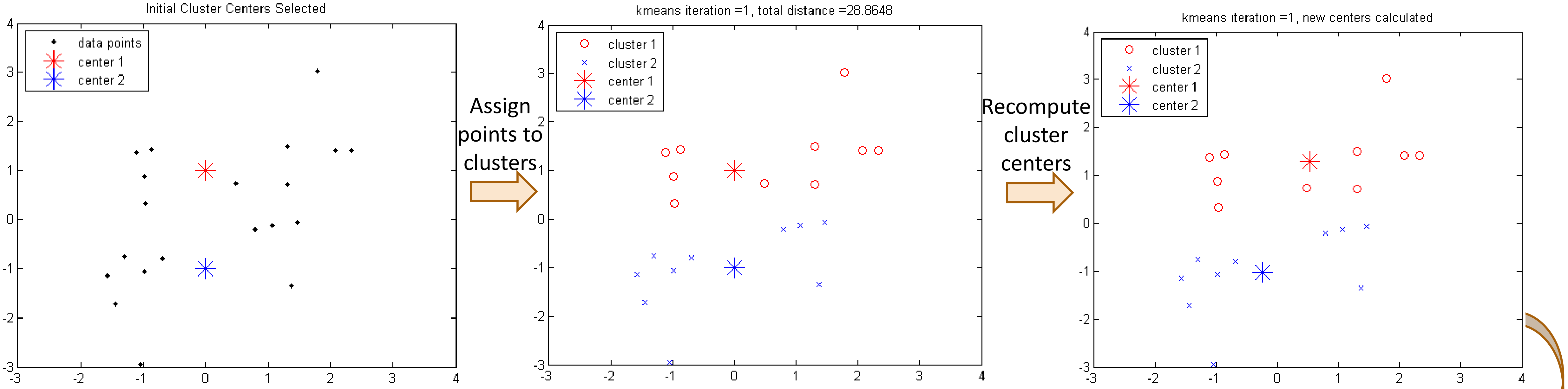


- Different initializations may generate rather different clustering results (some could be far from optimal)
- Original proposal (MacQueen'67): Select *K* seeds randomly
  - Need to run the algorithm multiple times using different seeds
- There are many methods proposed for better initialization of *k* seeds
  - ***K-Means++*** (Arthur & Vassilvitskii'07):
    - The first centroid is selected at random
    - The next centroid selected is the one that is farthest from the currently selected (selection is based on a weighted probability score)
    - The selection continues until *K* centroids are obtained

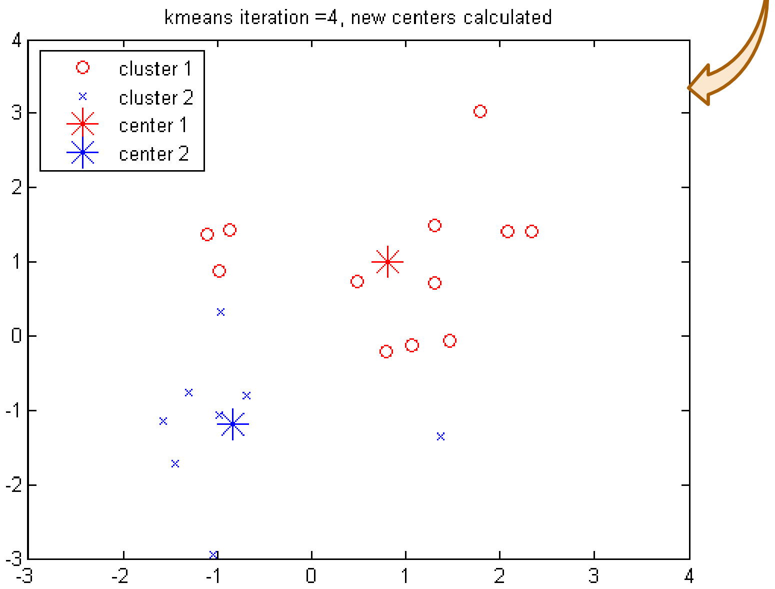
Example: Poor Initialization May Lead to Poor Clustering



Assign points to clusters

Recompute cluster centers

Another random selection of k centroids for the same data points



- Rerun of the *K-Means* using another random *K* seeds
- This run of *K*-Means generates a poor quality clustering