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Knowledge Discovery in Databases

SS 2012

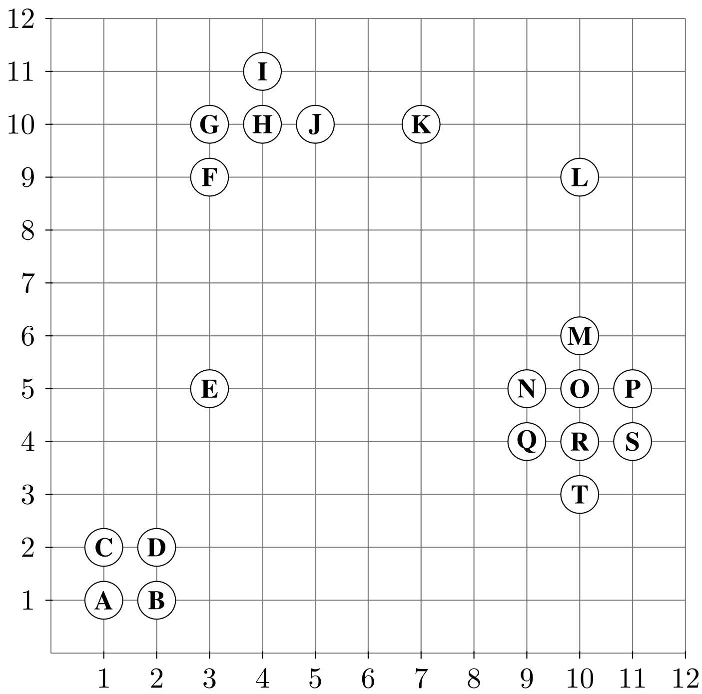
Übungsblatt 7: Cluster Analysis

Aufgabe 7-1 *PAM*

Show that the algorithm PAM (Partitioning Around Medoids, Kaufman and Rousseeuw, 1987) converges.

Aufgabe 7-2 *Hierarchical Clustering*

Given the following data set:



As distance function, use Manhattan Distance:

$$L_1(x, y) = |x_1 - y_1| + |x_2 - y_2|$$

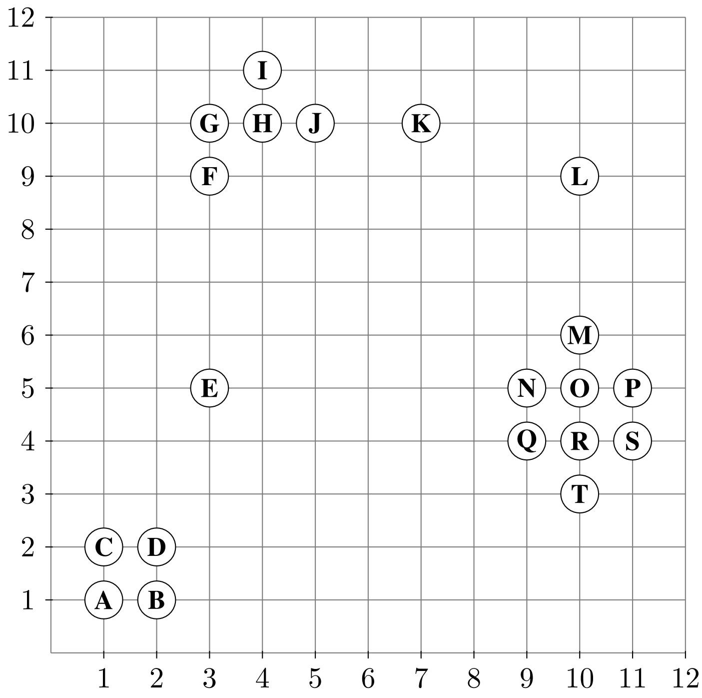
Compute two dendrograms for this data set. To compute the distance of sets of objects, use

- the single-link method
- the average-link method

Hint: with discrete distance values, nodes may have more than two children.

Aufgabe 7-3 *DBSCAN*

Given the following data set:



As distance function, use Manhattan Distance:

$$L_1(x, y) = |x_1 - y_1| + |x_2 - y_2|$$

Compute DBSCAN and indicate which points are core points, border points and noise points.

Use the following parameter settings:

- Radius $\varepsilon = 1.1$ and *minPts* $= 2$
- Radius $\varepsilon = 1.1$ and *minPts* $= 3$
- Radius $\varepsilon = 1.1$ and *minPts* $= 4$
- Radius $\varepsilon = 2.1$ and *minPts* $= 4$
- Radius $\varepsilon = 4.1$ and *minPts* $= 5$
- Radius $\varepsilon = 4.1$ and *minPts* $= 4$

When *minPts* $= 2$, what happens to border points?

What is the relationship of DBSCAN with *minPts* $= 2$ to single-linkage clustering? Why does DBSCAN run in $O(n^2)$ time while hierarchical clustering is usually denoted as $O(n^3)$? Why is this not a contradiction?