TDT4300 Datawarehouse and datamining

Clustering

Assignment 3

Group: 99

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Submission date: March 3, 2021

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Task 1: KMeans

See attached file: *k_means_clustering.ipynb*

Task 2: Hierarchical Agglomerative Clustering (HAC)

a) Hierarchical Agglomerative Clustering is a bottom-up approach for hierarchial clustering. It works by starting with all points in their own clusters and then merge the clusters that are close to eachother.

MIN-link uses the minimum distance between a member of two clusters as the new distance
MAX-link uses the maximum distance between a member of two clusters as the new distance

b) Calculate the Euclidean distance between all data points, the distance is the same from A to B as from B to A:

	A	B	C	D	E
A		4.123106	4.123106	1	7.211103
B			7.071068	3.162278	7
C				4.472136	5.385165
D					6.708204
E					

Start with the MIN-link method: The smallest distance is from A to D, so we merge them.

	B	C	A, D	E
A, D	3.162278	4.123106	0	6.708204
B		7.071068	3.162278	7
C			4.123106	5.385165
E				

	A, D, B	C	E
A, D, B		4.123106	6.708204
C			7
E			

	A, D, B, C	E
A, D, B, C		6.708204
E		

Thus we have clustered all points.

For MAX-link we still choose the smallest value when clustering, but use the greatest distance when merging

	A	B	C	D	E
A		4.123106	4.123106	1	7.211103
B			7.071068	3.162278	7
C				4.472136	5.385165

D					6.708204
E					

We merge A and D

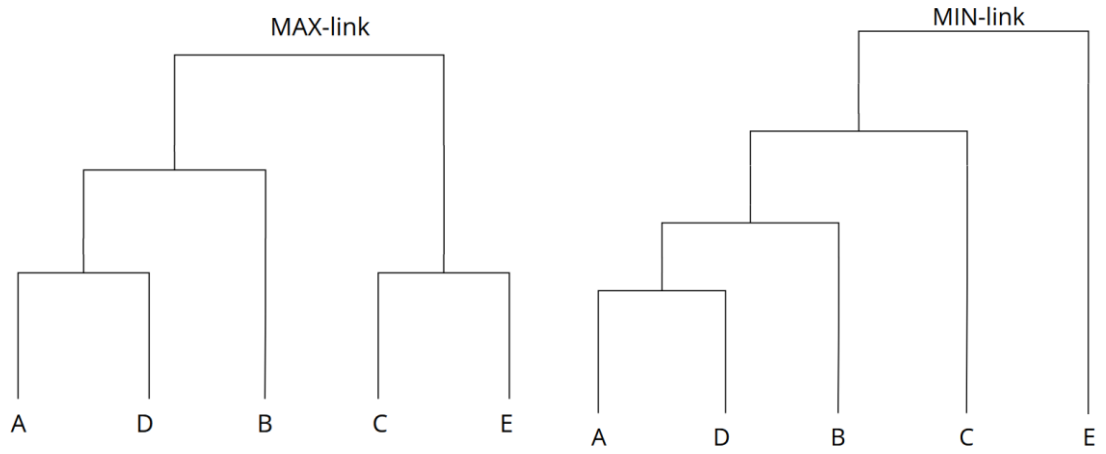
	A,D	B	C	E
A, D		4.123106	4.472136	7.211103
B			7.071068	7
C				5.385165
E				

We merge A, D with B

	A,D,B	C	E
A, D, B		7.071068	7.211103
C			5.385165
E			

The smallest is C to E and we merge those to:

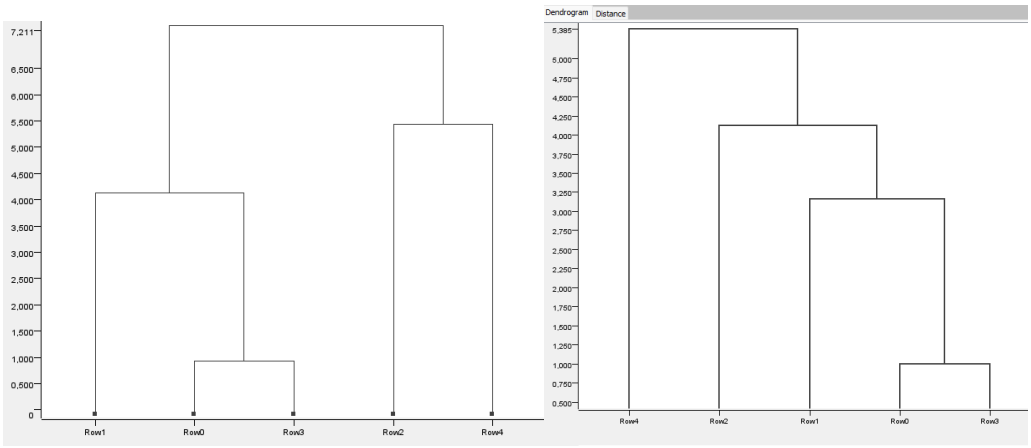
	A,D,B	C, E
A, D, B		7.211103
C, E		



Dendograms for MIN and MAX-link HAC

KNIME-workflow:

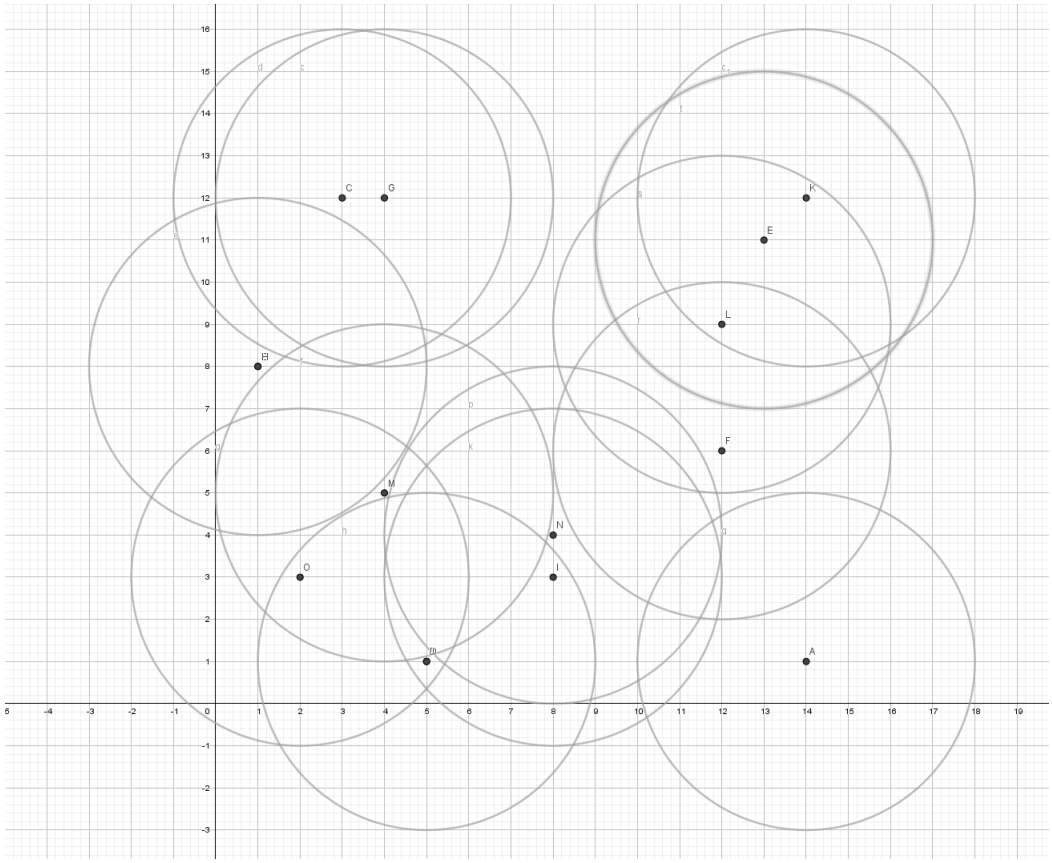
KNIME-SINGLE-linkage (MIN-linkage) and COMPLETE-linkage (MAX-linkage) output:



If we substitute the Row<number> with the input data, we see that these results correspond with we found by hand above.

Task 3: DBSCAN Clustering

I did the task in a plotting tool called GeoGebra because it was easy to visualize, and the task did not specify how to do the clustering. I plotted all the points and drew a circle with radius equal to the Eps=4. This resulted in the following plot:



For each point I then counted the number of points inside the point's circle. If the circle contains 3 or more points, I put a color on it. Else I remove the circle and the point remains black. This resulted in the following plot

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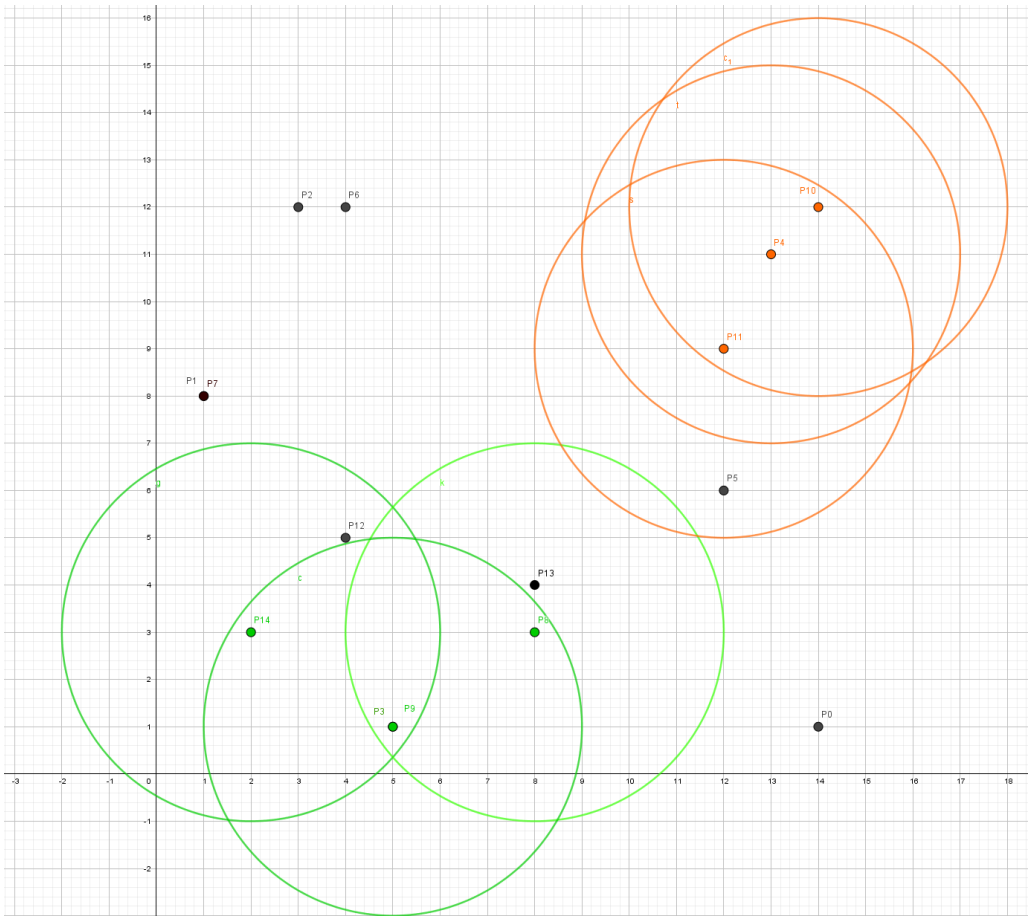
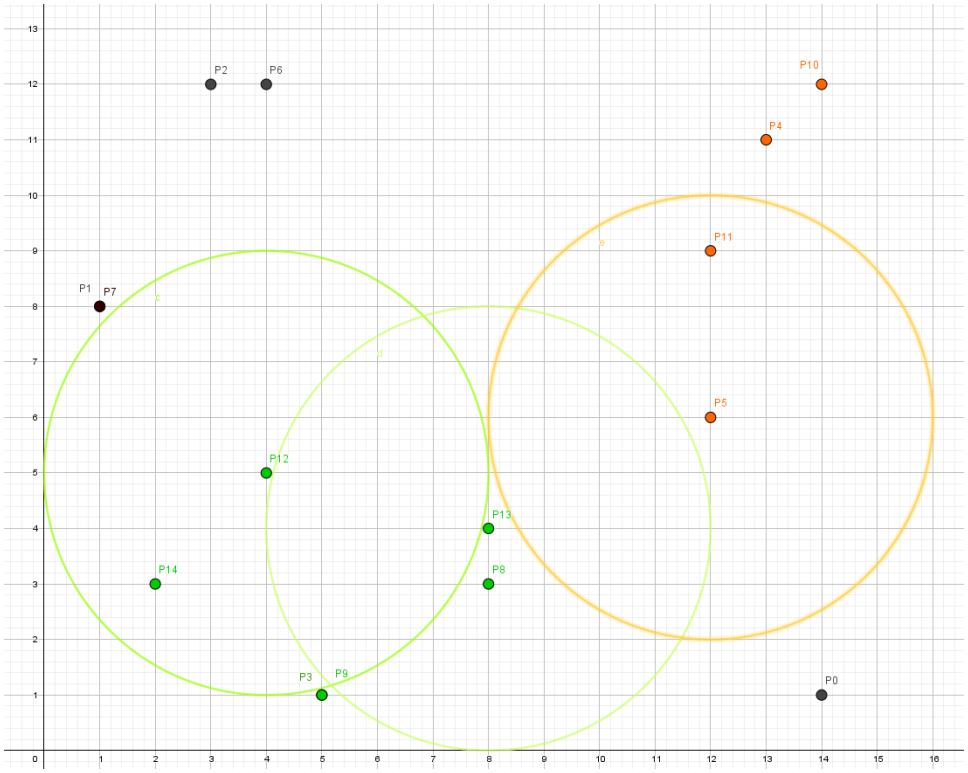


The points colored green, and orange is core points of two different clusters. We then must mark the border points:



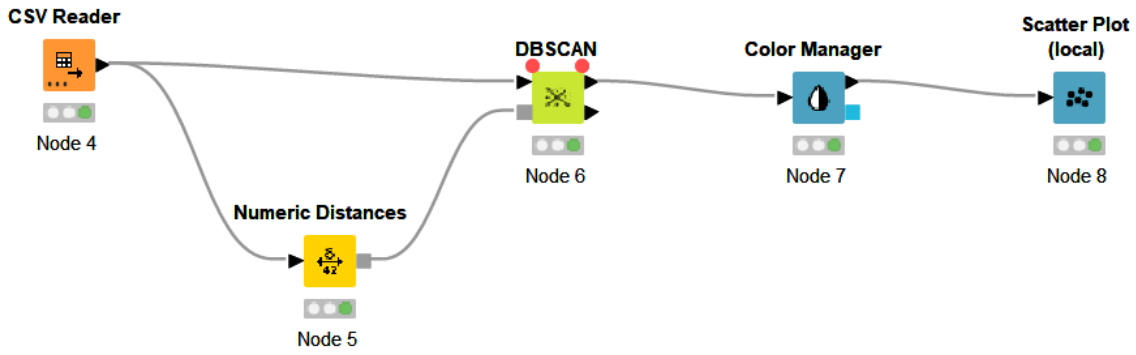
The border points are the points within a core points eps, but it does not satisfy minPts = 3.

The points colored black are thus noise points.

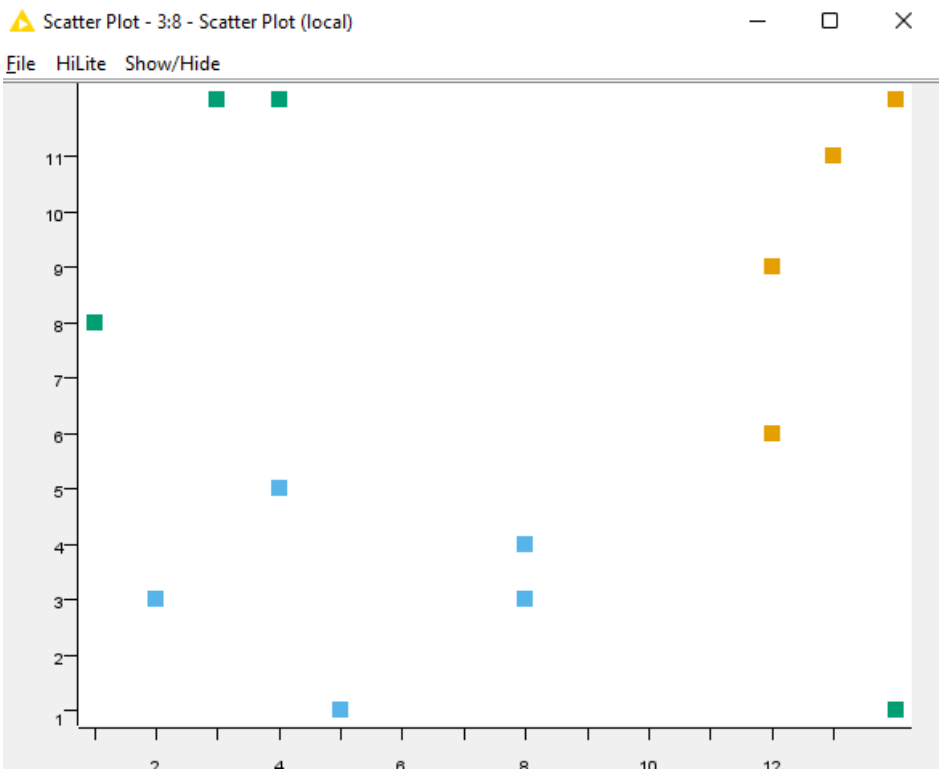
Now we have final two clusters, one marked with green, and the other with orange.

b)

KNIME workflow:



Output:



This verifies our results in 3a.