WS #18 - hierarchical clustering

Monday, November 25, 2024

Your Name: _____

Names of people you worked with: _____

Name one tradition around this week's time off that you grew up with. Will you do it this year?

Task:

Consider the distances between the following observations:

	A	B	C	D	E
A	0				
B	0.2	0			
C	0.6	0.5	0		
D	1	0.9	0.4	0	
E	0.9	0.8	0.5	0.3	0

Start with all objects in separate "clusters" (i.e., start with 5 clusters), by merging (complete linkage) one pair of clusters at a time, provide each clustering for $k = 5, 4, 3, 2, 1$.

Solution:

$k = 4$: Link A and B to get – (AB), C, D, E

$k = 3$: Link D and E to get – (AB), C, (DE)

$$d_{(AB)C} = \max(d_{AC}, d_{BC}) = 0.6 \tag{1}$$
$$d_{(AB)D} = \max(d_{AD}, d_{BD}) = 1.0 \tag{2}$$
$$d_{(AB)E} = \max(d_{AE}, d_{BE}) = 0.9 \tag{3}$$
$$\tag{4}$$

	AB	C	D	E
AB	0			
C	0.6	0		
D	1.0	0.4	0	
E	0.9	0.5	0.3	0

Link D and E!

$k = 2$: Link C with (DE) to get – (AB), (CDE)

$$d_{(AB)C} = 0.6 \tag{5}$$
$$d_{(AB)(DE)} = \max(d_{AD}, d_{BD}, d_{AE}, d_{BE}) = 1.0 \tag{6}$$
$$d_{(DE)C} = \max(d_{CD}, d_{CE}) = 0.5 \tag{7}$$
$$\tag{8}$$

	AB	C	DE
AB	0		
C	0.6	0	
DE	1.0	0.5	0

Link C with (DE)!

$k = 1$: Link all to get – (ABCDE)

$$d_{(AB)(CDE)} = d_{AD} = 1 \tag{9}$$