

## Complete Linkage [ Farthest Neighbour / Maximum Distance]:

Find out the Maximum distance points from both of the groups and then find out the Minimum from both of the groups.

Lets work on example on Complete Linkage method

The distance matrix is given by as follows.

	1	2	3	4	5
1	0				
2	9	0			
3	3	7	0		
4	6	5	9	0	
5	11	10	2	8	0

Let's assume that we already calculated distance from some data set and above are those values. Assuming that each individual observation is a cluster point. Now we are reducing to minimum clusters.

**Step 1:** Take out the minimum distance from all the above points.  $\Rightarrow d(5,3) = 2$ .

Now, I will form (5,3) in to one group and rest of the observations are separate clusters as 1,2,4

Distance between 1 and (3,5)

$\Rightarrow (1,3)$  and  $(1,5)$

$\Rightarrow \text{Max}(3, 11)$

	(3,5)	1	2	4
(3,5)	0			
1	11	0		
2	10	9	0	
4	9	6	5	0

Distance between 2 and (3,5)  $\Rightarrow (2,3)$  and  $(2,5) \Rightarrow \text{Max}(7, 10) = 10$

Distance between 4 and (3,5)  $\Rightarrow (4,3)$  and  $(4,5) \Rightarrow \text{Max}(9, 8) = 9$

**Step 2:** Take out the minimum distance from all the above points.  $\Rightarrow d(2,4) = 5$ .

Now, I will form (5,3) in to one group and (2,4) in to one group rest of the observations are separate clusters as (1)

	(3,5)	(2,4)	(1)
(3,5)	0		
(2,4)	10	0	
(1)	11	9	0

Distance between (2,4) and (3,5)  $\Rightarrow$  Distance between {(2) and (3,5)} {(4) and (3,5)}  
 $\Rightarrow \text{Max}(10, 9) = 10$

Distance between 1 and (2,4)  $\Rightarrow$  (1,2) and (1,4)  $\Rightarrow \text{Max}(9, 9) = 9$

**Step 3:** Take out the minimum distance from all the above points.  $\Rightarrow d(1,2,4) = 9$ .

Now, I will form (5,3) in to one group and (1,2,4) in to one group.

	(3,5)	(1,2,4)
(3,5)	0	
(1,2,4)	11	0

Distance between (1,2,4) and (3,5)  $\Rightarrow$  Distance between {(1) and (3,5)} {(2) and (3,5)} {(4) and (3,5)}  
 $\Rightarrow \text{Max}(11, 10) = 11$

