



NOTE: For 'n' data points

$$x_1, x_2, \dots, x_n \in \mathbb{R}^D$$

obtain $D(n \times n)$ then proceed with it.

Ex 2

Complete Linkage

$$D = \begin{matrix} & \dots & (1) & (2) & (3) & (4) & (5) \\ \begin{matrix} (1) \\ (2) \\ (3) \\ (4) \\ (5) \end{matrix} & \left[\begin{array}{cccccc} 0 & & & & & \\ 9 & 0 & & & & \\ 3 & 7 & 0 & & & \\ 6 & 5 & 9 & 0 & & \\ 11 & 10 & 7 & 8 & 0 & \end{array} \right] \end{matrix}$$

Stage (1) Fuse (3) & (5) at level ②

$$(3, 5) \rightarrow 2 \quad \text{--- J}$$

Stage ② updation of new distance matrix

$$D = \begin{matrix} & & (3,5) & (1) & (2) & (4) \\ \begin{matrix} (3,5) \\ (1) \\ (2) \\ (4) \end{matrix} & \left[\begin{array}{cccc} 0 & & & \\ (1) & (11) & & \\ (2) & 10 & 9 & 0 \\ (4) & 9 & 6 & (5) \end{array} \right] \end{matrix}$$

$d((3,5), 1) \rightarrow (1,3), (1,5)$
 $(3, (11))$
 $d((3,5), 2) \rightarrow (2,3), (2,5)$
 $(7, (10))$
 $d((3,5), 4) \rightarrow (3,4), (4,5)$
 $(9, 0)$

Stage ③ $(2,4) \rightarrow 5$ merge $(2,4) \rightarrow 5$ — II

Stage ④ updating new distance matrix

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

$d((3,5), 2,4) \rightarrow ((3,5), 2), ((3,5), 4), (2,3), (2,4), (4,3), (4,5))$
 $d((2,4), 1) \rightarrow (1,2), (1,4), (2,1), (4,1)$

Stage ⑤ merge $(1, (2,4)) \rightarrow 9$ — III

Stage ⑥

$(3,5)$	$(3,5)$	$(1,2,4)$
$(1,2,4)$	9	0

$d((3,5), (1,2,4)) \rightarrow ((3,5), 1), ((3,5), 2), ((3,5), 4), (1,2), (2,4), (1,4), (2,1), (4,1))$
 ← Stage: updating new matrix.

Stage ⑦ merge $(3,5, (1,2,4)) \rightarrow 11$ — (IV)