

## Single - Linkage - Clustering

Scenario:- You are a data analyst at a Sports Equipment Company, You've been given data on the Performance of 6-new athletic Shoes based on two-key Metrics. Agility Score high is better and Durability Score. Your goal is to Group Similar Shoes together to help with the marketing Strategies.

Data:-

Shoes	Agility Score (X)	Durability Score (Y)
A	2	8
B	3	7
C	6	4
D	7	5
E	9	2
F	8	3

Question: Use Single Linkage Clustering.

$$(A, B) = \sqrt{(2-3)^2 + (8-7)^2} = 1$$

$$(B, C) = \sqrt{(3-6)^2 + (7-4)^2} = 3$$

$$(C, D) = \sqrt{(6-7)^2 + (4-5)^2} = 1.41$$

$$(D, E) = \sqrt{(7-9)^2 + (5-2)^2} = 2.24$$

Solution:

	A	B	C	D	E	F
A	0	15.03	5.65	5.83	9.21	7.81
B	0	0	4.24	4.47	7.81	6.403
C	0	0	0	1.414	3.60	2.23
D	0	0	0	0	3.60	2.23
E	0	0	0	0	0	1.41
F	0	0	0	0	0	0

(A, B)

$$\sqrt{(3-2)^2 + (7-8)^2} = 15.03$$

(A, C)

$$\sqrt{(5-2)^2 + (4-8)^2} = 5.65$$

(A, D)

$$\sqrt{(7-2)^2 + (5-8)^2} = 5.83$$

(A, E)

$$\sqrt{(9-2)^2 + (2-8)^2} = 9.21$$

(A, F)

$$\sqrt{(8-2)^2 + (3-8)^2} = 7.81$$



(B<sub>1</sub>, C)

$$\sqrt{(6-3)^2 + (4-7)^2} = 4.24$$

(B<sub>1</sub>, D)

$$\sqrt{(7-3)^2 + (5-7)^2} = 4.47$$

(B<sub>1</sub>, E)

$$\sqrt{(9-3)^2 + (2-7)^2} = 7.81$$

(B<sub>1</sub>, F)

$$\sqrt{(8-3)^2 + (3-7)^2} = 6.403$$

(E<sub>1</sub>, F)

$$\sqrt{(8-9)^2 + (3-2)^2}$$

$$= 1.41$$

(C<sub>1</sub>, D)

$$\sqrt{(7-6)^2 + (5-4)^2} = 1.414$$

(C<sub>1</sub>, E)

$$\sqrt{(9-6)^2 + (2-4)^2} = 3.60$$

(C<sub>1</sub>, F)

$$\sqrt{(8-6)^2 + (3-4)^2} = 2.236$$

(D<sub>1</sub>, E)

$$\sqrt{(9-7)^2 + (2-5)^2} = 3.60$$

(D<sub>1</sub>, F)

$$\sqrt{(8-7)^2 + (3-5)^2} = 2.23$$

	A	B	C	D	E (0,0)
A	0	15.03	5.65	5.83	9.21
B	0	0	4.24	4.47	7.81
C	0	0	0	1.41	3.60
D	0	0	0	0	3.60
(E,F)	0	0	0	0	(0,0)

	A	B	(C,D)	(E,F)
A	0	15.03	5.65	9.21
B	0	0	4.25	7.81
(C,D)	0	0	0	3.60
(E,F)	0	0	0	(0,0)

	(A,B)	(C,D,E,F)
(A,B)	0	5.6B
(C,D,E,F)	0	0

$\sqrt{(A,B)}$

