Rajvi Shah
015523313

Single link clustering

* Data points

Points	X	Y
A	2	2
B	2	6
C	3	7
D	5	2
E	5	5
F	5	8
G	6	6
H	7	3
I	8	4
J	10	6
K	12	8

* Euclidean Distance

$P_1(A,B) = \sqrt{(2-2)^2 + (2-6)^2} = 4$

$P_2(A,C) = \sqrt{(2-3)^2 + (2-7)^2} = 5.1$

$P_3(A,D) = \sqrt{(2-5)^2 + (2-2)^2} = 3$

$P_4(A,E) = \sqrt{(2-5)^2 + (2-5)^2} = 4.24$

$P_5(A,F) = \sqrt{(2-5)^2 + (2-8)^2} = 6.7$

$P_6(A,G) = \sqrt{(2-6)^2 + (2-6)^2} = 5.65$

$P_7(A,H) = \sqrt{(2-7)^2 + (2-3)^2} = 5.1$

$P_8(A,I) = \sqrt{(2-8)^2 + (2-4)^2} = 6.3$

$P_9(A,J) = \sqrt{(2-10)^2 + (2-6)^2} = 8.9$

$P_{10}(A,K) = \sqrt{(2-12)^2 + (2-8)^2} = 11.66$

$P_{11}(B, C) = \sqrt{(2-3)^2 + (6-7)^2}$
$= 1.4$

$P_{12}(B, D) = \sqrt{(2-5)^2 + (6-2)^2} = 5$

$P_{13}(B, E) = \sqrt{(2-5)^2 + (6-5)^2} = 3.16$

$P_{14}(B, F) = \sqrt{(2-5)^2 + (6-8)^2} = 3.6$

$P_{15}(B, G) = \sqrt{(2-6)^2 + (6-6)^2} = 4$

$P_{16}(B, H) = \sqrt{(2-7)^2 + (6-3)^2} = 5.8$

$P_{17}(B, I) = \sqrt{(2-8)^2 + (6-4)^2} = 6.3$

$P_{18}(B, J) = \sqrt{(2-10)^2 + (6-6)^2} = 8$

$P_{19}(B, K) = \sqrt{(2-12)^2 + (6-6)^2} = 10.2$

$P_{20}(C, D) = \sqrt{(3-5)^2 + (7-2)^2} = 5.38$

$P_{21}(C, E) = \sqrt{(3-5)^2 + (7-5)^2} = 2.82$

$P_{22}(C, F) = \sqrt{(3-5)^2 + (7-8)^2} = 2.24$

$P_{23}(C, G) = \sqrt{(3-6)^2 + (7-6)^2} = 3.16$

$P_{24}(C, H) = \sqrt{(3-7) + (7-3)^2} = 5.65$

$P_{25}(C, I) = \sqrt{(3-8)^2 + (7-4)^2} = 5.83$

$P_{26}(C, J) = \sqrt{(3-10)^2 + (7-6)^2} = 7.07$

$P_{27}(C, K) = \sqrt{(3-12)^2 + (7-8)^2} = 9.1$

$P_{28}(D, E) = \sqrt{(5-5)^2 + (2-5)^2} = 3$

$P_{29}(D, F) = \sqrt{(5-5)^2 + (2-8)^2} = 6$

$P_{30}(D, G) = \sqrt{(5-6)^2 + (2-6)^2} = 4.1$

$P(D, H) = \sqrt{(5-7)^2 + (2-3)^2} = 2.23$

$P(D, I) = \sqrt{(5-8)^2 + (2-4)^2} = 3.6$

$P(D, J) = \sqrt{(5-10)^2 + (2-6)^2} = 6.4$

$P(D, K) = \sqrt{(5-12)^2 + (2-8)^2} = 9.2$

$P(E, F) = \sqrt{(5-5)^2 + (5-8)^2} = 3$

$P(E,G) = \sqrt{(5-6)^2 + (5-6)^2} = 1.41$

$P(E,H) = \sqrt{(5-7)^2 + (5-7)^2} = 2.82$

$P(E,I) = \sqrt{(5-8)^2 + (5-4)^2} = 3.16$

$P(E,J) = \sqrt{(5-10)^2 + (5-6)^2} = 5.09$

$P(E,K) = \sqrt{(5-12)^2 + (5-8)^2} = 7.61$

$P(F,G) = \sqrt{(5-6)^2 + (8-6)^2} = 2.23$

$P(F,H) = \sqrt{(5-7)^2 + (8-3)^2} = 5.38$

$P(F,I) = \sqrt{(5-8)^2 + (8-4)^2} = 5$

$P(F,J) = \sqrt{(5-10)^2 + (8-6)^2} = 5.38$

$P(F,K) = \sqrt{(5-12)^2 + (8-8)^2} = 7$

$P(G,H) = \sqrt{(6-7)^2 + (6-3)^2} = 3.16$

$P(G,I) = \sqrt{(6-8)^2 + (6-4)} = 2.82$

$P(G,J) = \sqrt{(6-10)^2 + (6-6)^2} = 4$

$P(G,K) = \sqrt{(6-12)^2 + (6-8)^2} = 6.32$

$P(H,I) = \sqrt{(7-8)^2 + (3-4)^2} = 1.41$

$P(H,J) = \sqrt{(7-10)^2 + (3-6)^2} = 4.24$

$P(H,K) = \sqrt{(7-12)^2 + (3-8)^2} = 7.07$

$P(I,J) = \sqrt{(8-10)^2 + (4-6)^2} = 2.828$

$P(I,K) = \sqrt{(8-12)^2 + (4-8)^2} = 5.66$

$P(J,K) = \sqrt{(10-12)^2 + (6-8)^2} = 2.828$

Distance Matrix:

	A	B	C	D	E	F	G	H	I	J	K
A	0	4	5.09	3	4.24	6.7	5.65	5.09	6.32	8.9	11.66
B	4	0	1.4	5	3.16	3.6	4	5.8	6.3	8	10.19
C	5.1	1.4	0	5.3	2.8	2.2	3.16	5.65	5.8	7.07	9.05
D	3	5	5.4	0	3	6	4.1	2.2	3.6	6.4	9.21
E	4.24	3.1	2.8	3	0	3	1.4	2.8	3.1	5.09	7.61
F	6.7	3.6	2.2	6	3	0	2.2	5.4	5	5.38	7
G	5.65	4	3.1	4.1	1.4	2.2	0	3.2	2.8	4	6.32
H	5.09	5.83	5.6	2.2	2.8	5.3	3.16	0	1.4	4.26	7.07
I	6.3	6.32	5.8	3.6	3.16	5	2.8	1.4	0	2.82	5.62
J	8.9	8	7.1	6.4	5.1	5.38	4	4.2	2.8	0	2.82
K	11.66	10.19	9	9.2	7.6	7	6.324	7.07	5.6	2.82	0

* Merging points B & C as they have the minimum distance

	A	BC	D	E	F	G	H	I	J	K
A	0									
BC	4	0								
D	3	5	0							
E	4.24	2.8	3	0						
F	6.7	2.2	6	3	0					
G	5.65	3.16	4.1	1.4	2.2	0				
H	6.3	5.65	2.8	2.82	5.4	3.1	0			
I	8.9	5.8	3.6	3.16	5	2.8	1.4	0		
J	5.09	4.8	6.4	5.09	5.4	4	4.2	2.8	0	
K	11.66	9.05	9.2	7.6	7	6.3	7.1	5.65	2.82	0

* Merging points ~~H & E~~ E & G

	A	BC	D	EG	F	H	I	J	K
A	0								
BC	4	0							
D	3	5	0						
EG	4.24	2.82	3	0					
F	6.7	2.2	6	2.23	0				
H	5.09	5.65	2.23	2.82	5.38	0			
I	6.3	5.8	3.6	4.2	5	4.41	0		
J	8.9	4.8	6.4	2.82	5.36	4.29	2.82	0	
K	11.66	9.05	9.2	6.32	7	6.32	5.65	2.82	0

* Merging H & I points.

	A	BC	D	EG	F	HI	J	K
A	0							
BC	4	0						
D	3	5	0					
EG	4.24	2.82	3	0				
F	6.7	2.23	6	2.23	0			
HI	5.09	5.65	2.23	2.82	5	0		
J	8.9	4.8	6.4	4.2	5.38	2.82	0	
K	11.66	9.05	9.2	6.32	7	5.65	2.82	0

* Merging BC & F points.

	A	BCF	D	EG	HI	J	K
A	0						
BCF	4	0					
D	3	5	0				
EG	4.24	2.23	3	0			
HI	5.09	5	2.23	2.82	0		
J	8.9	4.8	6.4	4.2	2.82	0	
K	11.66	7	9.2	6.32	5.65	2.82	0

* Merging B C F & E G

	A	BCEFG	D	HI	J	K
A	0					
BCEFG	4	0				
D	3	3	0			
HI	5.09	2.82	2.23	0		
J	8.9	4.2	6.4	2.82	0	
K	11.66	6.32	9.2	5.65	2.82	0

* Merging D & H I

	A	BCEFG	DHI	J	K
A	0				
BCEFG	4	0			
DHI	3	2.82	0		
J	8.9	4	2.82	0	
K	11.66	6.32	5.65	2.82	0

* Merging B C E F G & D H I

	A	BCEFGDHI	J	K
A	0	~~BCDEFGHI~~		
BCDEFGHI	3	0		
J	8.9	2.82	0	
K	11.66	5.65	2.82	0

* Merging BCEDFGHI & J

	A	BCDEFGHIJ	K
A	0		
BCDEFGHIJ	3	0	
K	11.66	2.82	0

* Merging BCEDFGHIJ & K

	A	BCDEFGHIJK
A	0	
BCDEFGHIJK	3	0