CMPE-256 Assignment

Name: Sanjak Patel
ID 015945046

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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:

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

$P_2(A,C) = \sqrt{(2-3)^2 + (2-7)^2} = \sqrt{1^2+5^2} = 5.1$

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

$P_4(A,E) = \sqrt{(2-5)^2 + (2-5)^2} = \sqrt{3^2+3^2} = 4.24$

$P_5(A,F) = \sqrt{(2-5)^2 + (2-8)^2} = \sqrt{3^2+6^2} = 6.7$

$P_6(A,G) = \sqrt{(2-6)^2 + (2-6)^2} = \sqrt{4^2+4^2} = 5.65$

$P_7(A,H) = \sqrt{(2-7)^2 + (2-3)^2} = \sqrt{5^2+1^2} = 5.1$

$P(A,I) = \sqrt{(2-8)^2 + (2-4)^2} = \sqrt{6^2+2^2} = 6.3$

$P(A,J) = \sqrt{(2-10)^2 + (2-6)^2} = \sqrt{8^2+4^2} = 8.9$

$P(A,K) = \sqrt{(2-12)^2 + (2-8)^2} = \sqrt{10^2+6^2} = 11.66$

$P(B,C) = \sqrt{(2-3)^2 + (6-7)^2} = \sqrt{1^2+1^2} = 1.4$

$P(B,D) = \sqrt{(2-5)^2 + (6-2)^2} = \sqrt{3^2+4^2} = 5$

$P(B,E) = \sqrt{(2-5)^2 + (6-5)^2} = \sqrt{3^2+1^2} = 3.16$

$P(B,F) = \sqrt{(2-5)^2 + (6-8)^2} = \sqrt{3^2+2^2} = 3.6$

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

$P(B,H) = \sqrt{(2-7)^2 + (6-3)^2} = \sqrt{5^2+3^2} = 5.8$

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

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

$P(B,K) = \sqrt{(2-12)^2 + (6-8)^2} = \sqrt{10^2 + 2^2} = 10.2$

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

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

$P(C,F) = \sqrt{(3-5)^2 + (7-8)^2} = \sqrt{2^2 + 1^2} = 2.24$

$P(C,K) = \sqrt{(3-6)^2 + (7-6)^2} = \sqrt{3^2 + 1^2} = 3.16$

$P(C,H) = \sqrt{(3-7)^2 + (7-3)^2} = \sqrt{4^2 + 4^2} = 5.65$

$P(C,I) = \sqrt{(3-8)^2 + (7-4)^2} = \sqrt{5^2 + 3^2} = 5.83$

$P(C,J) = \sqrt{(3-10)^2 + (7-6)^2} = \sqrt{7^2 + 1^2} = 7.07$

$P(C,K) = \sqrt{(3-12)^2 + (7-8)^2} = \sqrt{9^2 + 1^2} = 9.1$

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

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

$P(D,G) = \sqrt{(5-6)^2 + (2-6)^2} = \sqrt{1^2 + 4^2} = 4.1$

$P(D,H) = \sqrt{(5-7)^2 + (2-3)^2} = \sqrt{2^2 + 1^2} = 2.23$

$P(D,F) = \sqrt{(5-8)^2 + (2-4)^2} = \sqrt{3^2 + 2^2} = 3.6$

$P(D,J) = \sqrt{(5-10)^2 + (2-6)^2} = \sqrt{5^2 + 4^2} = 6.4$

$P(D,K) = \sqrt{(5-12)^2 + (2-8)^2} = \sqrt{7^2 + 6^2} = 9.2$

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

$P(E,G) = \sqrt{(5-6)^2 + (5-6)^2} = \sqrt{1^2 + 1^2} = 1.41$

$P(E,H) = \sqrt{(5-7)^2 + (5-3)^2} = \sqrt{2^2 + 2^2} = 2.82$

$P(E,I) = \sqrt{(5-8)^2 + (5-4)^2} = \sqrt{3^2 + 1^2} = 3.16$

$P(E,J) = \sqrt{(5-10)^2 + (5-6)^2} = \sqrt{5^2 + 1^2} = 5.09$

$P(E,K) = \sqrt{(5-12)^2 + (5-8)^2} = \sqrt{7^2 + 3^2} = 7.61$

$P(F,G) = \sqrt{(5-6)^2 + (8-6)^2} = \sqrt{1^2 + 2^2} = 2.23$

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

$P(F,I) = \sqrt{(5-8)^2 + (8-4)^2} = \sqrt{3^2 + 4^2} = 5$

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

$P(F,R) = \sqrt{(5-12)^2 + (8-1)^2} = \sqrt{7^2} = 7$

$P(G,H) = \sqrt{(6-7)^2 + (6-3)^2} = \sqrt{1^2 + 3^2} = 3.16$

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

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

$P(G,K) = \sqrt{(6-12)^2 + (6-2)^2} = \sqrt{6^2 + 4^2} = 6.32$

$P(H,I) = \sqrt{(7-8)^2 + (3-4)^2} = \sqrt{1^2 + 1^2} = 1.41$

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

$P(H,K) = \sqrt{(7-12)^2 + (3-8)^2} = \sqrt{5^2 + 5^2} = 7.07$

$P(I,J) = \sqrt{(8-10)^2 + (4-6)^2} = \sqrt{2^2 + 2^2} = 2.82$

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

$P(J,K) = \sqrt{(10-12)^2 + (6-8)^2} = \sqrt{2^2 + 2^2} = 2.82$

⇒ Distance Matrix :-

	A	B	C	D	E	F	G	H	I	J	K
A	0										
B	4	0									
C	5.1	1.4	0								
D	3	5	5.4	0							
E	4.24	3.1	2.8	3	0						
F	6.7	3.6	2.2	6	3	0					
G	5.65	4	3.1	4.1	1.4	3.2	0				
H	5.09	5.83	5.6	2.2	2.8	5.3	3.16	0			
I	6.3	6.32	5.8	3.6	3.16	5	2.8	1.4	0		
J	8.9	8	7.1	6.4	5.1	5.38	4	4.2	2.8	0	
K	11.61	10.19	9	9.2	7.6	7	6.32	7.07	5.6	2.820	

⇒ Distance ~~Points~~ b/w B & C ~~are~~ is minimum, that's why merge them into one cluster

	A	(BC)	D	E	F	G	H	I	J	K
A	0									
(B,C)	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	5.09	5.65	2.8	2.82	5.4	3.1	0			
I	6.3	5.8	3.6	3.16	5	2.8	1.4	0		
J	8.9	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 G & E.

	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	5.33	0			
I	6.3	5.8	3.6	2.82	5	[1.41]	0		
J	8.9	4.8	6.4	4.2	5.38	4.39	2.82	0	
K	11.66	9.05	9.2	6.32	7	6.32	5.65	2.82	0

⇒ Merging points H & I.

	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 points BC & F.

	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	11.06	7	9.2	6.32	5.65	2.82	0

⇒ Merging points BCF & EG.

	A	BCFEG	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	2C.4	2.82	0	
K	11.66	6.32	9.2	5.65	2.82	0

⇒ Merging HI & D.

	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 BCEFG & DHI

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

⇒ Merging BCDEFGHI & J

	A	BCDEFGHIJ	K
A	0		
BCDEFGHIJ	3	0	
K	11.52	2.82	0

⇒ Merging K & BCDEFGHIJ.

	A	BCDEFGHIJK
A	0	
BCDEFGHIJK	3	0

⇒ Merging A & BCDEFGHIJK

	ABCDEFGHIJK
ABCDEFGHIJK	0