MIT2020029

Ques ⇒ 1)

X	Y	$X-\bar{X}$	$Y-\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$
2006	18	-2	-16.4	4	32.8
2007	25	-1	-9.4	1	9.4
2008	35	0	0.6	0	0
2009	43	1	8.6	1	8.6
2010	51	2	16.6	4	33.2
				10	84

Also ≡

$\bar{x} = 2008$, $\bar{y} = 34.4$

Also $y = bx + a$

$$b = \frac{(y-\bar{y})^2}{(x-\bar{x})^2} = 8.4$$

$$a = \bar{y} - b\bar{x} = 34.4 - (8.4 * 2008)$$

$$= -16832.8$$

(a) Line of regression :-

$$y = 8.4x - 16832.8$$

(b) Given Year = 2013

Sales ≡ $y = 8.4 * 2013 - 16832.8$

$$= 76.4$$

Ques⇒5)

Ans≡

(1) Single link clustering -: In this clustering, the similarity of their most similar members. The single-link merge criterion is local. We pay attention solely to the area where 2 clusters come closest to each other.

(2) Complete-link clustering -: the similarity of 2 clusters is the similarity of their most un-similar members.

Solution -:

	A	B	C	D	E
A	0	(1)	2	2	3
B		0	2	4	3
C			0	1	5
D				0	3
E					0

Avg link -:

Distance b/w A and B=1 is minimum we cluster A and B as C1.

We need to update the distance using the following formulae

$$\frac{d_A + d_B}{2}$$

	C1(A,B)	C	D	E
C1(A,B)	0	2	3	3
C		0	(1)	5
D			0	3
E				0

(3)

Distance C–D is minimum (1)

Hence 2nd cluster will be (C, D).

	C1(A,B)	C2(C,D)	E
C1(A,B)	0	2.5	3
C2(C,D)		0	4
E			0

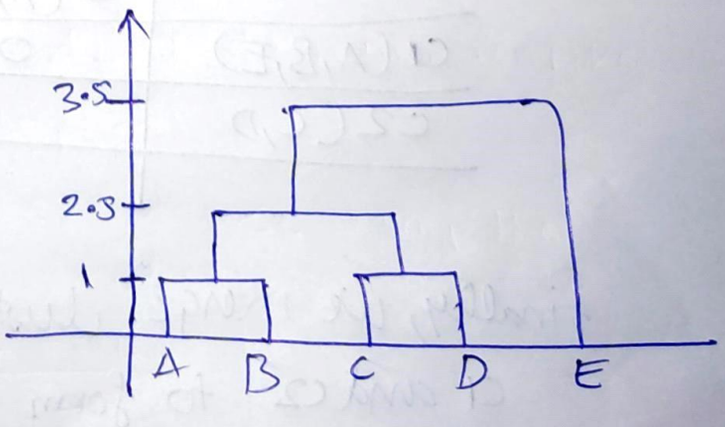
Distance b/w clusters (C1) and (C2) = (2.5) which is minimums. Hence, we merge

	C1(A,B,C,D)	E
C1(A,B,C,D)	0	3.5
E		0

Finally, we merge C1 with E to form 1 complete clusters. ///

C=(A,B,C,D,E)

(#) dendogram



(#) Complete Link :-

Distance b/w A and B is minimum = 1
• Hence we make cluster C1(A,B)

Update distance as max(d1, d2) :

	C1(A,B)	C	D	E
C1(A,B)	0	2	4	3
C		0	1	5
D			0	3
E				0

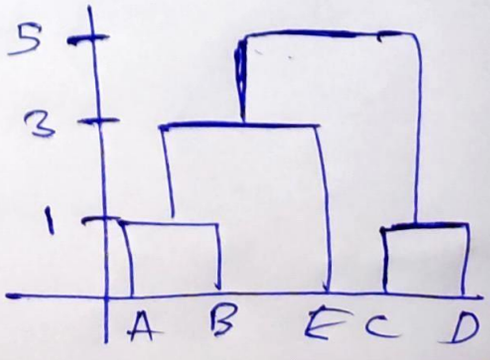
(#) Distance b/w C and D is minimum (=1). Hence two make another cluster C2(C,D).

	C1(A,B)	C2(C,D)	E
C1(A,B)	0	4	3
C2(C,D)		0	5
E			0

(#) Distance b/w C1 and E is minimum. Hence we cluster them together.

	C1(A,B,E)	C2(C,D)
C1(A,B,E)	0	max(4,5) = 5
C2(C,D)		0

Finally, we merge clusters C1 and C2 to form the final cluster.
C = (A, B, E, C, D)



Ans ⇒ (2)

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(#) We have to apply FP Growth on Given data-

We need to convert this in Horizontal table-s

Transaction	itemset
T_1	A, B, T
T_2	A, C
T_3	A, S
T_4	A, B, C
T_5	B, S
T_6	A, S
T_7	B, S
T_8	A, B, S, T
T_9	A, B, S

For Frequency

A	7
B	6
C	2
S	6
T	2

After sorting

A	7
B	6
S	6
C	2
T	2

Now Frequent Pattern set, according to min support : {A:7, B:6, S:6, C:2, T:2}

ordered item set

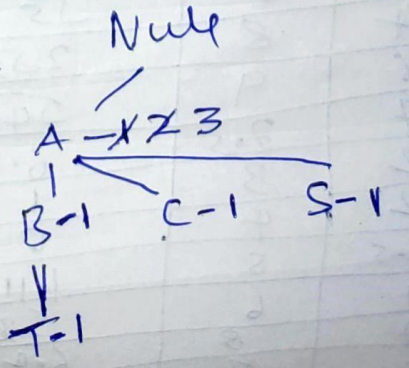
T_1	A, B, T
T_2	A, C
T_3	A, S
T_4	A, B, C
T_5	B, S
T_6	A, S
T_7	B, S
T_8	A, B, S, T
T_9	A, B, S

Now insert itemset in Tree

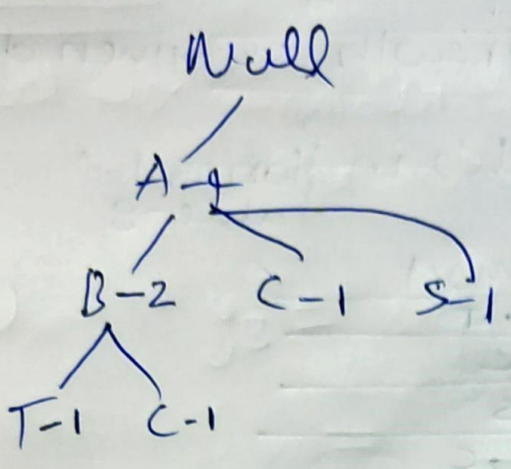
(1) {A, B, T}

(2) {A, C}

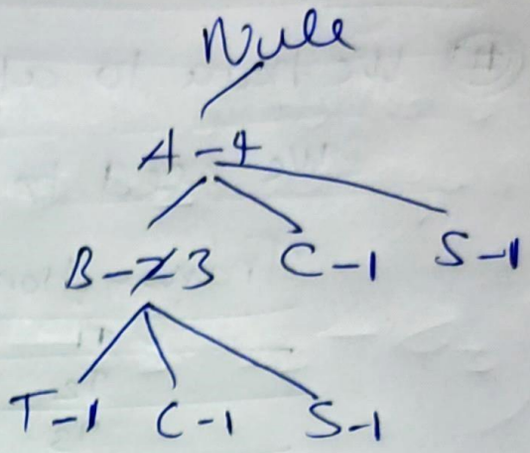
(3) {A, S}



④ {A, B, C}

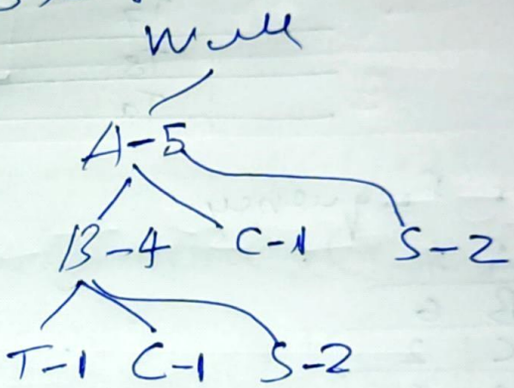


⑤ {B, S}



⑥ {A, S}

⑦ {B, S}



Ques ⇒ 3)

X = [1, 3, 2, 3, 4, 6, 7, 2, 2, 2.5, 7, 7, 7]
Y = [4, 4, 6, 6, 8, 9, 7.5, 3, 4, 5, 6, 8, 7]

minPoints = 3
Epsilon = 2.5

X	Y	Distance from (2,4)
1	4	1
3	4	1
2	6	2
3	6	$\sqrt{5}$
4	8	$2\sqrt{5}$
6	9	$\sqrt{41}$
7	7.5	6.1
2	3	1
2	4	0
2.5	5	1.11
7	6	5.38
7	8	6.4
7	7	5.83

(2,4) has the points (1,4), (3,4), (2,6), (3,6), (2,3), (2.5,5) at a distance less than epsilon.
(2,4) has 6 neighbouring points.

(2,4) is a core Point.

Doing similar calculation for all the other points we get. //

Points	Nieghbourhood Points
(1,4)	(2,3) (2,4) (3,4) (2,6) (2.5,5)
(2,4)	(1,4) (2,3) (3,4) (2,6) (3,6) (2.5,5)
(3,4)	(1,4) (2,4) (2,3) (2,6) (3,6) (2.5,5)
(2,3)	(1,4) (2,4) (3,4) (2.5,5)
(2,6)	(3,6) (2.5,5) (1,4) (2,4) (3,4)
(3,6)	(4,8) (2,6) (2.5,5) (3,4) (2,4)
(4,8)	(6,9) (3,6)
(6,9)	(7,8) (7,8) (7,7) (7,7.5)
(7,8)	(6,9)
7,7.5	(6,9) (7,7) (7,7.5)
7,7	(6,9) (7,8) (7,7.5) (7,6)
7,6	(7,8) (7,7) (7,7.5)

{(1,4) (2,4) (3,4) (2,3) (2,6) (3,6) (4,8) (6,9) (7,8) (7,7.5) (7,7) (7,6)} ≡ cluster (1)

(#) All the points belongs in 1 cluster. There are no noise (or) outlier points (4,8) is a border point.

(#) All points other than (4,8) are core points.

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Ques:6)

Let us consider the desired output to be 0 when the inputs x_1 and x_2 are equal = 1

(i) $$y_3 = sig(x_1 w_{13} + x_2 w_{23} - \theta_3)$$

$$= \frac{1}{1+e^{-(1*.5 + 1*.4 - 1*.8)}}$$

$$\equiv .5250$$

(ii) $$y_4 = sig(x_1 w_{14} + x_2 w_{24} - \theta_4)$$

$$\equiv \frac{1}{1+e^{-(1*.9 + 1*0.4 - 1*0.8)}}$$

$$\equiv .8808$$

Now calculating the output of neuron 5,

$$y_5 = sig(y_3 w_{35} + y_4 w_{45} - \theta_5)$$

$$\equiv \frac{1}{1+e^{-(-.52*1.2 + .8808*1 - 1*.3)}}$$

$$\equiv .5097$$

then error obtained, $i_5 = t_5 - y_5 \equiv 0 - 0.5097$

$$\equiv -0.5097.$$

Where t_5 is target value

To update the wieghts and threshold value in all networks.
we propogate the error backwards. //

Calculating error Gradient for neuron (5)

$$\equiv \delta_5 = y_5(1-y_5)\, e_5$$

$$\equiv .5097(1-.5097)(-.5097)$$

$$\boxed{\equiv -0.1274}$$

Change in wieghts :-

$$\Delta w_{35} = \alpha \cdot y_3 \cdot \delta_5 - 0.1 * .5250 * (-.1275)$$

$$\boxed{\equiv -.0067}$$

$$\Delta w_{45} = \alpha \cdot y_4 \cdot \delta_4 \cdot \delta_5 \equiv \boxed{-0.0112}$$

$$\boxed{\Delta \theta_5 \equiv -0.017}$$

Gradient for neuron :- 3, 4

$$\boxed{\delta_3 = 0.0381} \qquad \boxed{\delta_4 = -0.0147}$$

Determing the wieghts correction :-

$$\Delta w_{13} = .1 * 1 * 0.381 \equiv 0.0038$$

$$\Delta w_{23} \equiv //// \equiv 0.0038$$

$$\Delta \theta_3 \equiv // \equiv -0.0038$$

$$\Delta w_{14} \quad (.1 * -1) * (-0.147) \equiv -0.0015$$

$$\Delta w_{24} \quad (.1 * -1) * (-.0147) \equiv 0.0015$$

$$\Delta \theta_4 \equiv .1 * (-1) * (-0.0147) = 0.0015$$