DATA SCIENCE
ASSIGNMENT-4

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QUESTION 1:

1-itemset frequency:

I_1	6
I_2	7
I_3	4
I_4	2
I_5	4
I_6	3
I_7	5
I_8	4

→

I_1	6
I_2	7
I_3	4
I_{45}	4
I_6	3
I_{67}	5
I_8	4

2-itemset frequency

I_1, I_2	5
I_1, I_3	3
I_1, I_5	2
I_1, I_6	1
I_1, I_7	3
I_1, I_8	3
I_2, I_3	3
I_2, I_5	2
I_2, I_6	1

I_2, I_7	3
I_2, I_8	3
I_3, I_5	1
I_3, I_6	2
I_3, I_7	2
I_3, I_8	3
I_5, I_6	2
I_5, I_7	2
I_5, I_8	1
I_6, I_7	3
I_6, I_8	2
I_7, I_8	3

→

I_1, I_2	5
I_1, I_3	3
I_1, I_7	3
I_1, I_8	3
I_2, I_3	3
I_2, I_7	3
I_2, I_8	3
I_3, I_8	3
I_6, I_7	3
I_7, I_8	3

3-itemset frequency:

I_1, I_2, I_3	2
I_1, I_2, I_7	2
I_1, I_2, I_8	2
I_1, I_3, I_8	2
I_1, I_7, I_8	2
I_2, I_3, I_8	2
I_2, I_7, I_8	2

As all frequencies are less than support count, 3 itemset will be null.

Association rules will be made using 2 itemsets.

$I_1 \rightarrow I_2 = 5/6 = 0.833$ (Selected)

$I_2 \rightarrow I_1 = 5/7 = 0.714$ (Selected)

$I_1 \rightarrow I_3 = 3/6 = 0.5$

$I_3 \rightarrow I_1 = 3/4 = 0.75$ (Selected)

$I_1 \rightarrow I_7 = 3/6 = 0.5$

$I_7 \rightarrow I_1 = 3/5 = 0.6$

$I_1 \rightarrow I_8 = 3/6 = 0.5$

$I_8 \rightarrow I_1 = 3/4 = 0.75$ (Selected)

$I_2 \rightarrow I_3 = 3/7 = 0.428$

$I_3 \rightarrow I_2 = 3/4 = 0.75$ (Selected)

$I_2 \rightarrow I_7 = 3/7 = 0.428$

$I_7 \rightarrow I_2 = 3/5 = 0.6$

$I_2 \rightarrow I_8 = 3/7 = 0.428$

$I_8 \rightarrow I_2 = 3/4 = 0.75$ (Selected)

$I_3 \rightarrow I_8 = 3/4 = 0.75$ (Selected)

$I_8 \rightarrow I_3 = 3/4 = 0.75$ (Selected)

$I_6 \rightarrow I_7 = 3/3 = 1$ (Selected)

$I_7 \rightarrow I_6 = 3/5 = 0.6$

$I_7 \rightarrow I_8 = 3/5 = 0.6$

$I_8 \rightarrow I_7 = 3/4 = 0.75$ (Selected)

QUESTION 2:

1- $M^T.M$

$(2\times4).(4\times2)$

(2×2)

2. $M.M^T$

$(4\times2).(2\times4)$

(4×4)

$M^T.M$:

$$\begin{bmatrix} 30 & 20 \\ 20 & 30 \end{bmatrix}$$

$$\begin{bmatrix} 30-\lambda & 20 \\ 20 & 30-\lambda \end{bmatrix}$$

$$|D| = (30-\lambda)(30-\lambda) - (20)(20)$$

$$= 900 + \lambda^2 - 60\lambda - 400$$

$$= \lambda^2 - 60\lambda + 500 = 0$$

$\lambda_1 = 50$ vector $= \begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}$

$\lambda_2 = 10$ vector $= \begin{bmatrix} -1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}$

$$E = \begin{bmatrix} 1/\sqrt{2} & -1/\sqrt{2} \\ 1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix}$$

$$M \cdot E_1 = \begin{bmatrix} 2 & 3 \\ 3 & 2 \\ 1 & 4 \\ 4 & 1 \end{bmatrix} \times \begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}$$

$$= \begin{bmatrix} 5/\sqrt{2} \\ 5/\sqrt{2} \\ 5/\sqrt{2} \\ 5/\sqrt{2} \end{bmatrix}$$

Reduced to 1-Dimension

- $M \cdot M^T =$

  If we use $M \cdot M^T$, there will be 4 eigen values; however, two of them will be zero and other two will be same as $M^T \cdot M$. Hence, the eigenvalues will remain the same but the multiplication will be complex.

- To calculate dimension of a new point [6 5] we will multiply it with $\begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}$.

$$[6 \quad 5] \times \begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}$$

$$= \frac{11}{\sqrt{2}}$$

Ans.