Assignment

Casestudy

12) ~~common terms~~

A = 4, 80, 654, 80, 654, 80, 65

B = 6, 85, 726, 85, 726, 85, 72

C = 3, 70, 603, 70, 603, 70, 60

Ans :-

matrix $X = \begin{bmatrix} 4 & 80 & 654 \\ 6 & 85 & 726 \\ 3 & 70 & 603 \end{bmatrix}$

13, weights ⟶ 0.4, 0.3, 0.3

Student B ⟶ 6, 85, 726

Dot Products $= x_1 \cdot y_1 + x_2 \cdot y_2 + x_3 \cdot y_3$

$= (0.4 \times 6) + (0.3 \times 85) + (0.3 \times 726)$

$= 2.4 + 25.5 + 217.8$

$= 245.7$

14. ⟶

$$\begin{bmatrix} 0.4 \\ 0.3 \\ 0.3 \end{bmatrix} \times \begin{bmatrix} 4 & 80 & 654 \\ 6 & 85 & 726 \\ 3 & 70 & 603 \end{bmatrix}$$

Q14,

$$\begin{bmatrix} 4 & 80 & 654 \\ 6 & 85 & 726 \\ 3 & 70 & 603 \end{bmatrix} \times \begin{bmatrix} 0.4 \\ 0.3 \\ 0.3 \end{bmatrix}$$

1st $= 4 \times 0.4 + 80 \times 0.3 + 654 \times 0.3$

$= 1.6 + 24 + 196.2$

$= 221.8$

2nd $= 6 \times 0.4 + 85 \times 0.3 + 726 \times 0.3$

$= 2.4 + 25.5 + 217.8$

$= 245.7$

3rd $= 3 \times 0.4 + 70 \times 0.3 + 603 \times 0.3$

$= 1.2 + 21 + 180.9$

$= 203.1$

$$= \begin{bmatrix} 221.8 \\ 245.7 \\ 203.1 \end{bmatrix}$$

Q15 -

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 4 \\ 80 \\ 654 \end{bmatrix}$$

$= 2 \times 4 + 0 \times 80 + 0 \times 654$

$= 0 \times 4 + 1 \times 80 + 0 \times 654$

$= 0 \times 4 + 0 \times 80 + 1 \times 654$

$= \begin{bmatrix} 8 \\ 80 \\ 654 \end{bmatrix}$

$\begin{bmatrix} 4 & 80 & 654 \end{bmatrix} \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = 2 \begin{bmatrix} 8 & 80 & 654 \end{bmatrix}$

Q16, Normalization

$\begin{bmatrix} 4 & 6 & 3 \end{bmatrix}$

$x_{norm} = \frac{x - x_{min}}{x_{max} - x_{min}}$

min = 3
max = 6

$= \frac{4 - 3}{6 - 3} = 0.333$

$= \frac{6 - 3}{6 - 3} = 1$

$= \frac{3 - 3}{6 - 3} = 0$

$= [0.333, 1, 0]$

Q17 :—> Compute the Euclidean distance bw Student A and Student B from Q16

A

$$\sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$$

Std A = 4, 80, 654

Std B = 6 85 726

Distance b/w A and B $= \sqrt{(6-4)^2+(85-80)^2+(726-654)^2}$

$$= \sqrt{2^2+5^2+72^2}$$

$$= \sqrt{4+25+5184}$$

$$= \sqrt{5213}$$

$$= 72.204$$

Q18 - Matrix A is (5, 3)

matrix B (3, 1)

If matrix weight was (m, n)

(n, p)

then ans (m, p)

$= (5,3)\ (3,1)$

$= (5,1)$

Q19, = No of Students = 100

No of Passed = 60

$$\frac{60}{100} = 0.6$$

Q20, Attended Students = 50

Passed Students = 40

$$\frac{40}{50} = 0.8$$

Q21, A Stus has 70% chye of Passing what is the Probability that the Student fails

Percentage of Passing = 70% = 0.70

Probability of of fail = 1 - 0.70

= 0.30

Q22:- P(A) = 2, 4, 6

P(B) = 4, 5 6

a) P(A) = (2, 4 6) = 3/6 = 1/2

b) = P(B) = (4 5 6) = 3/6 = 1/2

c) P('A∩B) = (4, 6) = 2/6 = 1/3

d) $P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{1/3}{1/2} = \frac{2}{3}$

23) find x and y if possible such that

A) $\begin{bmatrix} 2x+y & 3 & 10 \\ y+1 & -2 & 0 \end{bmatrix} = \begin{bmatrix} 2 & 3 & 10 \\ 3 & -2 & 0 \end{bmatrix}$

$B = \begin{bmatrix} 6 & -4 & -6 & x-y \end{bmatrix} = -2\begin{bmatrix} -3 & 2 & 2x+2y & 13 \end{bmatrix}$

A) $2x+y = 2$ —— (1)

$y+1 = 3$ —— (2)

$y = 2$

$2x+2 = 2$

$2x = 0$

$x = 0$

B) $\begin{bmatrix} 6 & -4 & -6 & x-y \end{bmatrix} = -2\begin{bmatrix} -3 & 2 & 2x+2y & 13 \end{bmatrix}$

$= \begin{bmatrix} 6 & -4 & -6 & x-y \end{bmatrix} = \begin{bmatrix} 6 & -4 & -4x-4y & -26 \end{bmatrix}$

$x-y = -26$ —— (1)

$-4x-4y = -6$ (2)

$x = -26 + y$ (3)

3 - 2 $\Rightarrow$ $-4(-26+y) - 4y = -6$

$= 104 - 4y - 4y = -6$

$-8y = 104 - 8y = -6$

$-8y = -6 - 104$

$-8y = 110$

$8y = 110$

$y = \frac{110}{8}$ $y = 13.75$

$x - y = -26$

$x - 13.75 = -26$

$x = -26 + 13.75$

$x = -12.25$

24) A, B, D and E are matrices given by

$$A = \begin{bmatrix} -1 & 1 & -2 \\ 0 & -2 & 1 \end{bmatrix} \quad B = \begin{bmatrix} -1 & 2 & 0 \\ 0 & -3 & 4 \\ -1 & -2 & 3 \end{bmatrix}$$

$$D = \begin{bmatrix} -2 & 6 \\ -5 & 2 \end{bmatrix} \quad C = \begin{bmatrix} 3 \\ 5 \\ -11 \end{bmatrix} \quad F = \begin{bmatrix} -1 & 0 & 2 \\ -2 & -3 & 4 \\ 1 & 4 & -3 \end{bmatrix}$$

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AB — 2x3 , 3x3 — Possible (1st col = 2nd row)

BC — 3x3 , 1x5 — not

AD — 2x3 , 2x2 — not

EF — 3x1 , 3x3 — not

FE — 3x3 , 3x1 — Possible

$$AB = \begin{bmatrix} -1 & 1 & -2 \\ 0 & -2 & 1 \end{bmatrix}_{2\times3} \times \begin{bmatrix} -1 & 2 & 0 \\ 0 & -3 & 4 \\ -1 & -2 & 3 \end{bmatrix}$$

$-1 \times 1 + 1 \times 0 + -2 \times -1$

$= 1 + 0 + 2$

$= 3$

$-1 \times 2 + 1 \times -3 + -2 \times -2$

$-2 + -3 + 4$

$= -1$

$-1 \times 0 + 1 \times 4 \times -2 \times 3$

$= 0 + 4 + -6 = -2$

$-8 + 3$

$$\begin{bmatrix} 3 & -1 & -2 \\ -1 & 4 & -5 \end{bmatrix}$$

$$FE = \begin{bmatrix} -1 & 0 & 2 \\ -2 & -3 & 4 \\ 1 & 4 & -3 \end{bmatrix} \quad E = \begin{bmatrix} 3 \\ 5 \\ -11 \end{bmatrix}$$

$$-1 \times 3 + -22 = -28$$

$$-6 + -15 + 33 = 12$$

$$3 + 20 + 33 = 56$$

$$= \begin{bmatrix} -28 \\ 12 \\ 56 \end{bmatrix}$$

25) Given the matrix

find the eigenvalues and eigenvectors

$$A = \begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$$

$$\det(A - \lambda I) = 0$$

$$\begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix} - \lambda \times \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix} - \begin{bmatrix} \lambda & 0 \\ 0 & \lambda \end{bmatrix} = 0$$

$$\begin{bmatrix} 2-\lambda & 0 \\ 0 & 3-\lambda \end{bmatrix}$$

$$\lambda = 2 \quad \text{or} \quad \lambda = 3$$

Eigen values

for $\lambda = 2$

$$(A - \lambda I)\, x = 0$$

$$\begin{bmatrix} 2-2 & 0 \\ 0 & 3-2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$$\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$x_2 = 0$

$x_1 = k$

$$x = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

for $\lambda = 3$

$$\begin{bmatrix} 2-3 & 0 \\ 0 & 3-3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$x_1 = 0 \qquad x = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$x_2 = k$

15, given matrix =

$$B = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} \quad [A - \lambda I] = 0$$

$$\begin{bmatrix} 4-\lambda & 1 \\ 2 & 3-\lambda \end{bmatrix} = 0$$

$$= (4-\lambda)(3-\lambda) - (1)(2)$$

$$= 12 - 4\lambda - 3\lambda + \lambda^2 - 2$$

$$= \lambda^2 - 7\lambda + 10$$

$\therefore \lambda = 5 \quad$ or $\lambda = 2$

(b) $A = \begin{bmatrix} -2 & 1 \\ 12 & -3 \end{bmatrix}$

eigenvalue = $\det(A - \lambda I) = 0$

$$\begin{bmatrix} -2-\lambda & 1 \\ 12 & -3-\lambda \end{bmatrix} = 0$$

$$(-2-\lambda)(-3-\lambda) - (1)(12) = 0$$

$$6 + 2\lambda + 3\lambda + \lambda^2 - 12 = 0$$

$$\lambda^2 - 5\lambda - 6 = 0$$

$$\lambda = 1 \quad \text{or} \quad \lambda_2 = -6$$

for $\lambda_1 = 1$

$$(A - \lambda I)\, x = 0$$

$$\begin{bmatrix} -2-1 & 1 \\ 12 & -3-1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -3 & 1 \\ 12 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$-3x_1 + x_2 = 0$$

$$x_2 = 3x_1$$

let $x_1 = 1$

$$x_2 = 3$$

$$x = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$$

for $\lambda_2 = -6$

$$\begin{bmatrix} -2-(-6) & 1 \\ 12 & -3-(-6) \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$4x + x_2 = 0 \quad x_2 = 4x_1$

let $x_1 = 0 \Rightarrow x_2 = 1$

$$x = \begin{bmatrix} 1 \\ -4 \end{bmatrix}$$

17 e-commerce site

i) $(4 \times 3 + 2 \times 1 + 1 \times 0)$

$= 12 + 2 = 14$

ii) is 3rd

$(4 \times 1 + 4 \times 3 + 1 \times 2)$

$= 4 + 6 + 2$

$= 12$

match = Product A = 14

18) A logistic company models

weight vector weights $(N) = \begin{bmatrix} 0.5 \\ 1.2 \\ -0.8 \end{bmatrix}$

Deriving location matrix

$$M = \begin{bmatrix} 10 & 0.5 & 0.6 \\ 15 & 0.8 & 0.3 \\ 8 & 0.3 & 0.9 \end{bmatrix}$$

$= 10 \times 0.5 + (0.5)(1.2) + (0.6)(0.8)$

$= 5 + 0.6 - 0.48$

$= 5.12$

$= (15 * 0.5) + (0.8 \times 12) + (0.3)(-0.8)$

$= 7.5 * 0.96 - 0.24$

$= 7.22$

$(8)(0.5) + (0.3)(1.2) + (0.9)(-0.8)$

$= 4 + 0.36 - 0.72$

$= 3.64$

Product delivery time $\begin{bmatrix} 5.12 \\ 8.22 \\ 3.64 \end{bmatrix}$

14, Climat

$P(\text{Cloudy} / \text{Rainy}) = \frac{25}{30}$

$P(\text{Cloudy}) = \frac{40}{100}$

~~P(Rain)~~ $P(R/C) = \frac{P(C/R)\,P(R)}{P(C)}$

$= \frac{(25/30)(30/100)}{40/100} = \frac{25}{40} = 0.625$

20, ~~tos~~ telecome

customer = 3, 1, 123

weight for Prediction model = [1.5, 2, 0, 0.3]

Churn score = $1.5 \times 3 + 2.0 \times 1 + (-0.3) \times 12$

$= 4.5 + 2 - 3.6$

$= 2.9$

21, a) P(Study > 5 hours)

$\frac{50}{100} = 0.5$

b, P(Pass)

$= \frac{70}{100} = 0.7$

c, P(Pass / study > 5)

$= B \frac{(40/100)}{50/100}$

$= 0.8$