

$$1) A' = \{(x_1, 0.8), (x_2, 20.7), (x_3, 0.6), (x_4, 0.5), (x_5, 0.9)\}$$

$$x_1 = 0.8 > 0.7$$

$$x_2 = 20.7 > 0.7$$

$$x_3 = 0.6 < 0.7$$

$$x_4 = 0.5 < 0.7$$

$$x_5 = 0.9 > 0.7$$

$$\{x_1, x_2, x_5\}$$

=

Hence P output (P)

$$2) x=0, \mu(x)=0 \rightarrow \text{no robots required} \Rightarrow \text{no output}$$

$$x=2, \mu(x)=0.7 \rightarrow \text{some robots required}$$

$$x=4, \mu(x)=0.7$$

$$x=6, \mu(x)=0 \rightarrow \text{no robots required}$$

$$\text{P.S.} = 1 + 2 + 4 + 6 = 13 \rightarrow \text{Total output} = \frac{(2.07) + (4.07)}{0.7 + 0.7} = \frac{1.4 + 2.8}{1.4} = \frac{4.2}{1.4} = 3.07$$

→ Inputs : [1, 2, 5]

weights : [4, 5, 6]

weighted sum = (1.4) + (2.5) + (3.6) → 9.5

$$= 4 + 10 + 8 = 32$$

$$\text{output} = 32 \times 3 = 96.$$

q1 in answer - question of 3rd, 2nd

$$J \times I =$$

$$\rightarrow \{J \times 2\}, \{2 \times 8\}$$

Q)

correct answer : 57
FH1010011149A

$i = 252$

i/p Size = 28×28 , kernel size = 7×7 stride = 1.
 $\{ (0,0,0), (0,0,1), (0,0,2) \}$

O/P size : i/p size = kernel size
 $\frac{i-p}{s} + 1 = \frac{28-7}{7} + 1 = 3$

stride.

$i-p+s-1 = 28-7+1 = 22$

$i-p+s-1 = 28-7+1 = 22$

22×22 o/p = 2^4

$\{ (x, y) \}$

Q) Height & width.

Mension = Input dimension - Filter size + 2 * Pad
 $\frac{C_o = (C_i)(H_i)}{S+2} = \frac{(63)(55)}{7+2} = 50$

Stride + 2

$C_o = (C_i)(H_i) = 50$

Output weight = $(63 - 7 + 2 \times 0) / 2 + 1 = 29$
 $\frac{C_o \times C_w}{S+2} = \frac{50 \times 55}{7+2} = 29 \times 29 \times 32$

\therefore

Q) i/p player = 6 neurons

$[3, 2, 1] : \text{conv}_1$

$[1, 2, 1] : \text{dilayer}$

O/p layer = 2 neurons $(3, 1) + (0, 1) = 2$ neurons

weight b/w i/p & hidden layer

$DW = E \times S \times C = 2 \times 6 \times 5$

Rows = no. of neurons - neuron in i/p

$= 5 \times 6$

$= [2 \times 5], [5 \times 6]$

$$Q) \text{ Output } S_1 = \left(\frac{n+2p}{3} \right) \times \left(\frac{n+2p-4}{3} + 1 \right)$$

W + 2 * 2 * 2 = 12

$$\begin{matrix} n=5 \\ P=1 \quad s=1 \end{matrix} = \left(\frac{s+2(1)-7}{1} + 1 \right) \times \left(\frac{s+2(1)-7}{1} + 1 \right)$$

W + 2 * 2 * 2 = 12

$$= 1 \times 1$$

gut tuboif w deo

$$= 12$$

Q)

$$\begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} \xrightarrow{\text{Section} - 3} W$$

bottom plivip extra (1)

$$\begin{matrix} S_1 & S_2 & S_3 & S_4 \\ (0,1,2) & (1,2) & (0,1) & \text{start} \end{matrix}$$

$$\begin{matrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 2 & 0 \\ 1 & 0 & 0 & 1 \end{matrix}$$

0.5 = bias

$$w_1 = \frac{(1,2,0) + (2,0,1)}{0.5 \times 4} = \frac{0}{1.5} = 0$$

$$\text{Hebb. rule: } w = \sum_{t=1}^n t \cdot s$$

for Pattern 1: $S_1 = [1, 0, 1, 0]$ t = [1, 0] 10 entries

$$w_1 = t_1 \times s_1 = \begin{bmatrix} 1,0,0 \\ 0,1,0 \end{bmatrix} \times \begin{bmatrix} 1,0,1 \\ 0,1,0 \\ 1,0,0 \end{bmatrix} = \begin{bmatrix} 1,0,1 \\ 0,0,0 \end{bmatrix}$$

for Pattern 2: $S_2 = [1, 0, 0, 1, 0]$ t = [1, 0]

$$w_2 = t_2 \times s_2 = \begin{bmatrix} 1,1,0 \\ 0,1,0 \end{bmatrix} \times \begin{bmatrix} 1,0,1,1 \\ 0,1,0,0 \\ 0,0,0,1 \end{bmatrix} = \begin{bmatrix} 1,0,0,1 \\ 0,0,0,0 \end{bmatrix}$$

for Pattern 3: $S_3 = [1, 1, 0, 0]$ t₃ = [0, 1]

$$w_3 = t_3 \times s_3 = \begin{bmatrix} 0,1 \\ 1,1 \end{bmatrix} \times \begin{bmatrix} 0,1,0,0,0,0 \\ 1,1,1,0,1,0 \end{bmatrix} = \begin{bmatrix} 0,0,0,0 \\ 1,1,0,0 \end{bmatrix}$$

Pattern 4: $S_4 = \begin{bmatrix} 0 & 0 & 1 & 1 \end{bmatrix}$ $t_4 = \begin{bmatrix} 0 & -1 \end{bmatrix}$ (12 marks)

$$w_4 = t_4 \times S_4 = \begin{bmatrix} 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

$$W = w_1 + w_2 + w_3 + w_4$$

$$= \begin{bmatrix} 2 & 0 & 1 & 1 \end{bmatrix}$$

Outer Product rule.

$$= W = \sum_{i=1}^n t_i \times s_i$$

$$W = \begin{bmatrix} 2 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

Q1) Centre gravity Method

to 3 triangle Points Me $(1,0) (3,1) (5,1)$

$$\text{Area} \cong \frac{1}{2} \times 2.4 \times 2.5$$

$$\text{Centroid} = 3.33$$

$$COG = \frac{\int x \cdot u(x) dx}{\int u(x) dx} = \frac{(A_1 x_1) + (A_2 x_2)}{A_1 + A_2} = 3.17$$

$$COG = \frac{\sum (c_i \cdot A_i) / (6 \cdot A)}{2 \cdot A_1 + A_2} = \frac{(3.2) + (3.33 + 2.55)}{2 \cdot 2.25} = 3.17$$

Centra of target area Method

$$(2.5 \text{ Area}) / 2.5 = 1.25$$

$$x_{C_2} = 3.33$$

$$COG \approx 3.17$$

$$COG \approx 3.13$$

$$CLA \approx 3.33$$

$$CLA = \frac{1.25}{2.25} = 0.56$$

Q) Given

$A = \{(x_1, 0), (x_2, 0.3), (x_3, 0.4), (x_4, 0.5), (x_5, 0.8), (x_6, 1)\}$

Support: $\{x \in A | u(x) > 0\}$

$$u(x_1) = 0, u(x_3) = 0$$

$$(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, x_{12})$$

Core: $\{x \in A | u(x) = 1\}$

$$u(x_6) = u(x_7) = u(x_8) = u(x_9) = 1$$

$$= (x_6, x_7, x_8, x_9)$$

Crossover Points: $\{x \in A | u(x) = 0.5\}$

$$u(x_4) = 0.5 \rightarrow u(x_1) = 0.5$$

$$(x_4, x_1)$$

Alpha cut for $\alpha = 0.3 : \sum_{x \in A} u(x) = \alpha$

$$(x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11})$$

Strong Alpha cut for $\alpha = 0.4 : \sum_{x \in A} u(x) = \alpha$

$$u(x) > 0.4$$

$$(x_6, x_7, x_8, x_9, x_{10})$$

Boundary: $\{x \in A | 0 < u(x) < 1\}$

$$0 < u(x) < 1$$

$$(x_2, x_3, x_4, x_5, x_{10}, x_{11}, x_{12})$$

Normality: $u(x) = 1$

$$u(x_6) = u(x_7) = u(x_8) = u(x_9) = 1$$

Scalar cardinality

$$\{(1, \text{ax}), (8, \text{bx}), (2, \text{cx}), \dots, \sum_{x \in A} \mu(x) = 1\} : A$$

$$\{(0, \text{ax}), (\text{com}, \text{bx}), (5, \text{cx}), (1, \text{dx}), (1, \text{ex}), (1, \text{fx})\} : B$$
$$= 0 + 0.3 + 0.4 + 0.5 + 0.8 + 1 + 1 + 1 + 0.7 + 0.5$$

$$0.2 + 0$$

$$\{0.5(\text{f}, \text{u}), \text{A} \rightarrow \text{B}\} \leq 1.0098$$

$$0 = (8x) \text{ u}, \quad 0 = (1, \text{r}) \text{ u}$$
$$= 7.3$$

Relative cardinality $\leq \frac{\text{Scalar cardinality}}{\text{No. of elements}}$

$$\{1 = (1) \text{ u}, \text{A} \rightarrow \text{B}\} : 3, 00$$
$$= \frac{7.3}{3}$$

$$1 = (1, \text{u}) = (0.3) \text{ u}, \quad (0, \text{u}) = (0) \text{ u},$$

$$= 0.5615$$

$$(20 = (1) \text{ u}, \text{A} \rightarrow \text{B}) \Rightarrow \text{error removed}$$

$$20 = (1, \text{u}) \cancel{20 = (0.8) \text{ u}}$$

$$\{1, \text{u}, \text{N/A}\}$$

$$\{x = (0) \text{ u}, \text{A} \rightarrow \text{B}\} \quad \text{e.g. } x = \text{rd}, \text{ u} \rightarrow \text{rd}$$

$$(x, \text{u}, \text{N/A}, \text{rd}, \text{u} \rightarrow \text{rd}, \text{u} \rightarrow \text{rd}, \text{u} \rightarrow \text{rd})$$

$\{x = (0) \text{ u}, \text{A} \rightarrow \text{B}\} : \mu(x) = 0$ not necessarily possible

$$\mu(0) = 1 \text{ u}$$

$$(0, \text{u}, \text{N/A}, \text{rd}, \text{u} \rightarrow \text{rd})$$

$$\{1, 0, (0) \text{ u}, \text{A} \rightarrow \text{B}\} \text{ removed}$$
$$\rightarrow (0) \text{ u} \rightarrow 0$$

$$(0, \text{u}, \text{N/A}, \text{rd}, \text{u} \rightarrow \text{rd}, \text{u} \rightarrow \text{rd})$$

$$x = (0) \text{ u} : \text{utilized, old}$$

$$x = (0) \text{ u} = (0.8) \text{ u}$$