Perceptron

Class 2 t=1
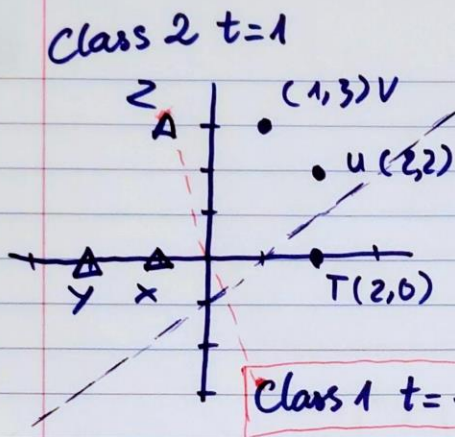

① η : learning rate 0.5

Class 1 : target = -1
$T = [2,0]^T$, $U = [2,2]^T$, $V = [1,3]^T$

Class 2 : target = 1
$X = [-1,0]^T$, $Y = [-2,0]^T$, $Z = [-1,2]^T$

$W_1 = -1$, $W_2 = +1$, $\theta = -1$

② $W_1 X_1 + W_2 X_2 - \theta = 0$ (a)

$(-1)X_1 + 1 X_2 * -(-1) = 0$

$X_2 = X_1 - 1$

③ U and V should be in class 1, target = -1

let use $U = [2,2]^T$ to update the line

$\Delta w = 2\eta \,(\text{target})\, x = 2 \cdot 0.5 (-1) \begin{bmatrix} 2 \\ 2 \end{bmatrix} = \begin{bmatrix} -2 \\ -2 \end{bmatrix}$

$\Rightarrow w^{t+1} = \Delta w + w = \begin{bmatrix} -2 \\ -2 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} -3 \\ -1 \end{bmatrix}$

$\overset{w_1}{}$ $\overset{w_2}{}$

$\Delta \theta = -2\eta \,(\text{target}) = -2(0.5) \cdot (-1) = 1$

$\theta^{t+1} = \Delta \theta + \theta = 1 - 1 = 0$

→ Apply new weights to (a)

$-3X_1 - 1X_2 - 0 = 0$

$X_2 = -3X_1$