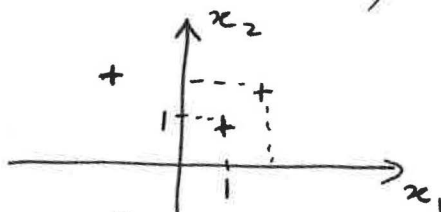


Given the data

$$\left(\begin{bmatrix} 1 \\ 1 \end{bmatrix}, 1\right), \left(\begin{bmatrix} 2 \\ 2 \end{bmatrix}, 1\right), \left(\begin{bmatrix} 2 \\ -1 \end{bmatrix}, 1\right), \left(\begin{bmatrix} -1 \\ -1 \end{bmatrix}, -1\right)$$



Start

$$w = \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \quad x = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \quad y = 1$$

$$w_{\text{new}} \leftarrow w + yx = \begin{bmatrix} 1 \\ 1 \end{bmatrix} = w_{\text{new}}$$

$$x = \begin{bmatrix} 2 \\ 2 \end{bmatrix}, \quad y = 1$$

$$y(w^T x) = 1 \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 2 \end{bmatrix} = 4 \stackrel{?}{<} 0$$

Do nothing.

because $\begin{bmatrix} 2 \\ 2 \end{bmatrix}$ is correctly classified.

$$\text{sign}(w^T x) \geq 0.$$

$$x = \begin{bmatrix} 2 \\ -1 \end{bmatrix}, \quad y = 1$$

$$y(w^T x) = 1 \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ -1 \end{bmatrix} = 1 \stackrel{?}{<} 0$$

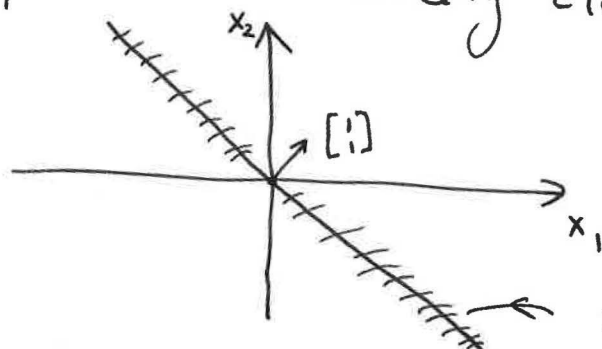
Do nothing.

$$x = \begin{bmatrix} -1 \\ -1 \end{bmatrix}, \quad y = -1$$

$$y(w^T x) = -1 \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} -1 \\ -1 \end{bmatrix} = 2 \stackrel{?}{<} 0$$

Do nothing.

All data points are correctly classified by



So stop.

$$x_1 + x_2 = 0$$