Exercise: Perceptron Classification

Data

$$\mathcal{D} = \left\{\left(x_1^{(i)}, x_2^{(i)}, y^{(i)}\right)\right\}_{i=1}^{N}$$
$$= \{ \ (\ 2, \quad 2, \quad 1),$$
$$(\ 2, \quad 0, \quad 1),$$
$$(\ 2, \ -2, \quad 1),$$
$$(-2, \ -3, \ -1),$$
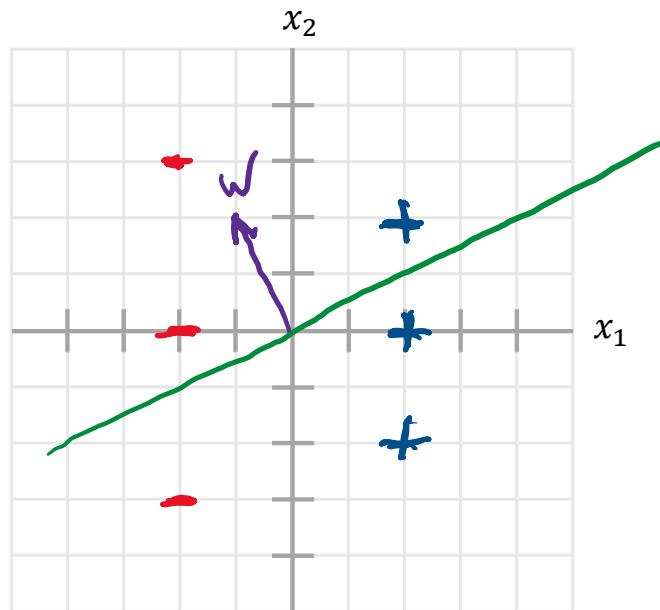$$(-2, \quad 0, \ -1),$$
$$(-2, \quad 3, \ -1)\}$$

Model

$$\hat{y} = h(\mathbf{x}) = sign(\mathbf{w}^T\mathbf{x} + b)$$

with parameters
$$w_1 = -1, \ w_2 = 2, \ b = 0$$

1) Plot the data in $\mathbb{R}^2$ with two different shapes for $y = 1$ and $y = -1$
2) Draw the decision boundary (all the points (x_1, x_2) where $\hat{y} = 0$)
3) Draw the vector $\mathbf{w}$

4) How many mistakes (errors) were made with this model on this dataset?

   4

5) What is the classification error rate for this model on this dataset?

   4/6

6) What is the classification accuracy for this model on this dataset?

   2/6

7) Fill in the confusion matrix below with the count of points in each category.

	$\hat{y} = 1$	$\hat{y} = -1$
$y = 1$	TP: 1	FN: 2
$y = -1$	FP: 2	TN: 1

TP: True positive
TN: True negative
FP: False positive
FN: False negative