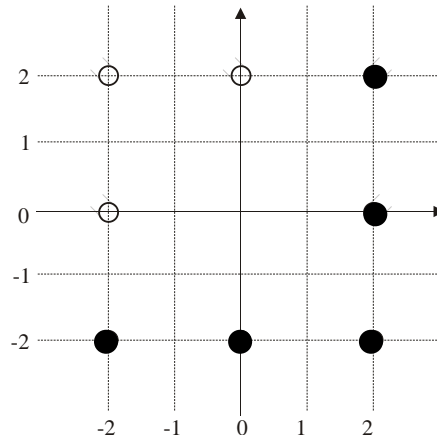


**Perceptron – classification boundary**

Consider the classification example shown in the following picture, where empty and filled circles correspond to two different classes.



Assume that a single-neuron perceptron is used to perform the classification. Its operation can be described by the following equation:

$$o = \Phi_{hlb}(\mathbf{w}^T \mathbf{x} + \theta),$$

where  $\Phi_{hlb}$  is bipolar hard-limiting activation function,  $\mathbf{x}$  is the input vector,  $\mathbf{w}$  is the weight vector, and  $\theta$  is bias. Which of the following sets of parameters will perform the desired classification?

Solution: This problem can be solved using slope and intercept form of line equation, as shown in the following table.

Weights and bias	$w_1$	$w_2$	$\theta$	$-w_1/w_2$	slope	$-\theta/w_2$	y-intercept
<input type="checkbox"/> $\mathbf{w}^T = [2, 2], \theta = -2$	2	2	-2	-1	\	1	1
<input type="checkbox"/> $\mathbf{w}^T = [0, 1], \theta = -1$	0	1	-1	0	-	1	1
<input type="checkbox"/> $\mathbf{w}^T = [2, 2], \theta = 2$	2	2	2	-1	\	-1	-1
<input type="checkbox"/> $\mathbf{w}^T = [-1, 1], \theta = 1$	-1	1	1	1	/	-1	-1
<input checked="" type="checkbox"/> $\mathbf{w}^T = [-2, 2], \theta = -2$	-2	2	-2	1	/	1	1