

# The Perceptron

The simplest binary, linear classifier

Rosenblatt, 1957

TRAIN

**x**

1	0	0	0	1
0	1	0	1	0
0	0	1	0	0
0	1	0	1	0
1	0	0	0	1

target = +1

target = -1

**w**

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

2	0	0	0	2
0	2	0	2	0
0	0	2	0	0
0	2	0	2	0
2	0	0	0	2

0	-2	-2	-2	0
-2	2	0	2	-2
-2	0	2	0	-2
-2	2	0	2	-2
0	-2	-2	-2	0

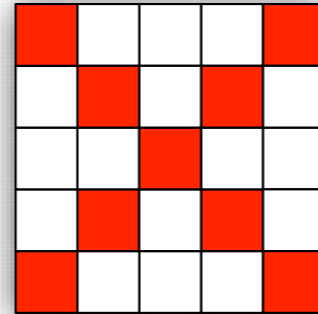
$$\text{sum} = w_1x_1 + w_2x_2 + \dots + w_{25}x_{25}$$

$$\text{guess} = \begin{cases} +1 & \text{if sum} > 0 \\ -1 & \text{if sum} \leq 0 \end{cases}$$

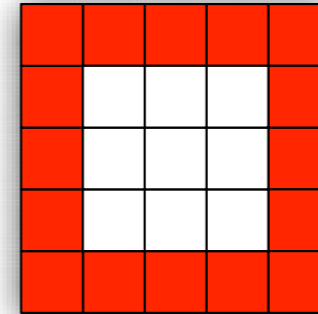
$$w_j = w_j + (\text{target} - \text{guess}) x_j \quad \forall i$$

TRAIN  
x

1	0	0	0	1
0	1	0	1	0
0	0	1	0	0
0	1	0	1	0
1	0	0	0	1



target = +1



target = -1

w

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

2	0	0	0	2
0	2	0	2	0
0	0	2	0	0
0	2	0	2	0
2	0	0	0	2

0	-2	-2	-2	0
-2	2	0	2	-2
-2	0	2	0	-2
-2	2	0	2	-2
0	-2	-2	-2	0

TEST

