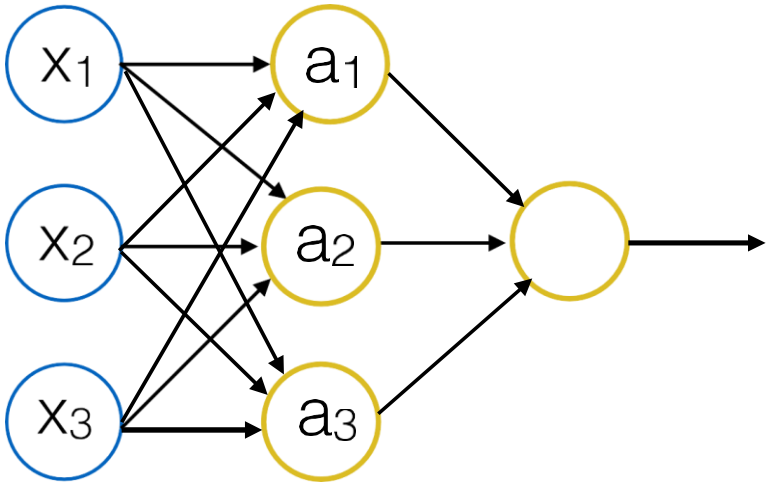
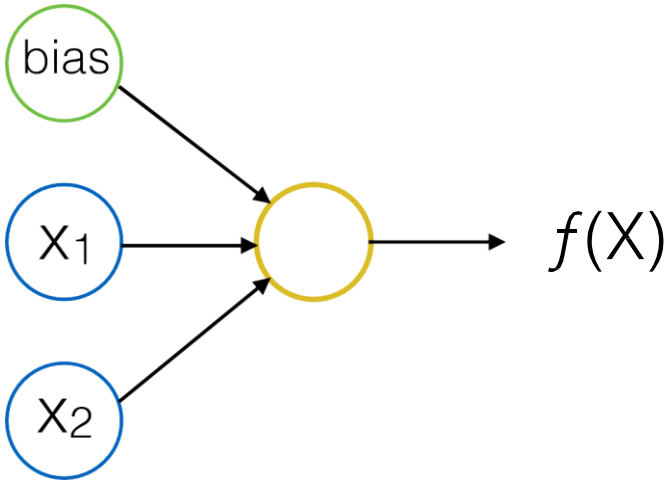
Neural Network

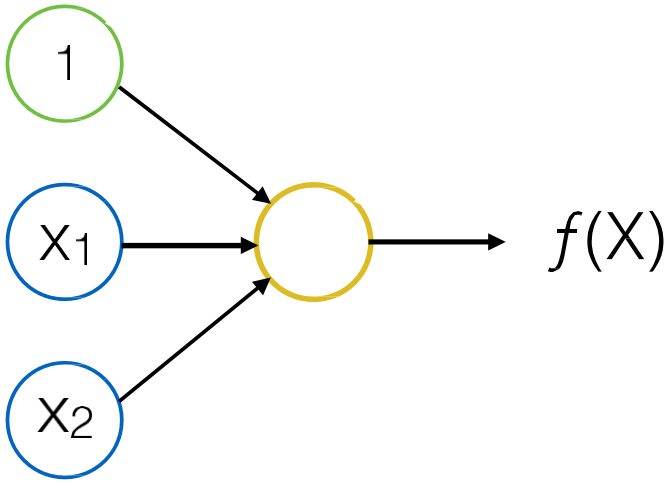
Neural Network



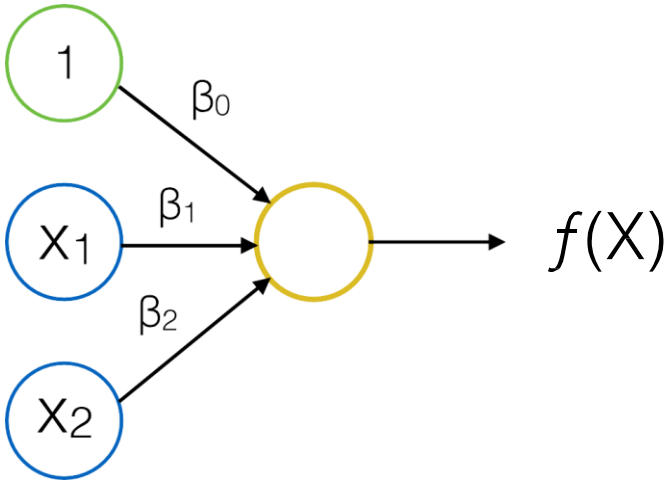
Perceptron



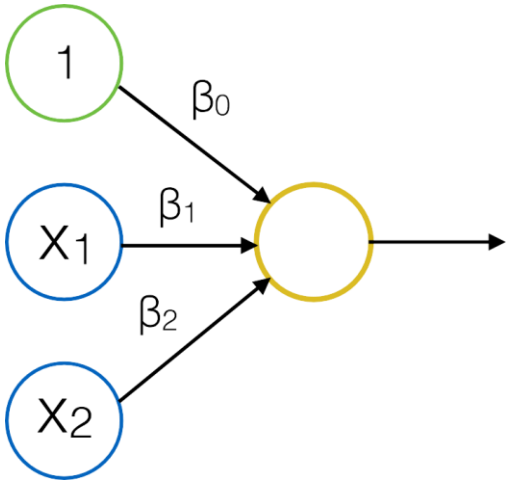
Perceptron



Perceptron



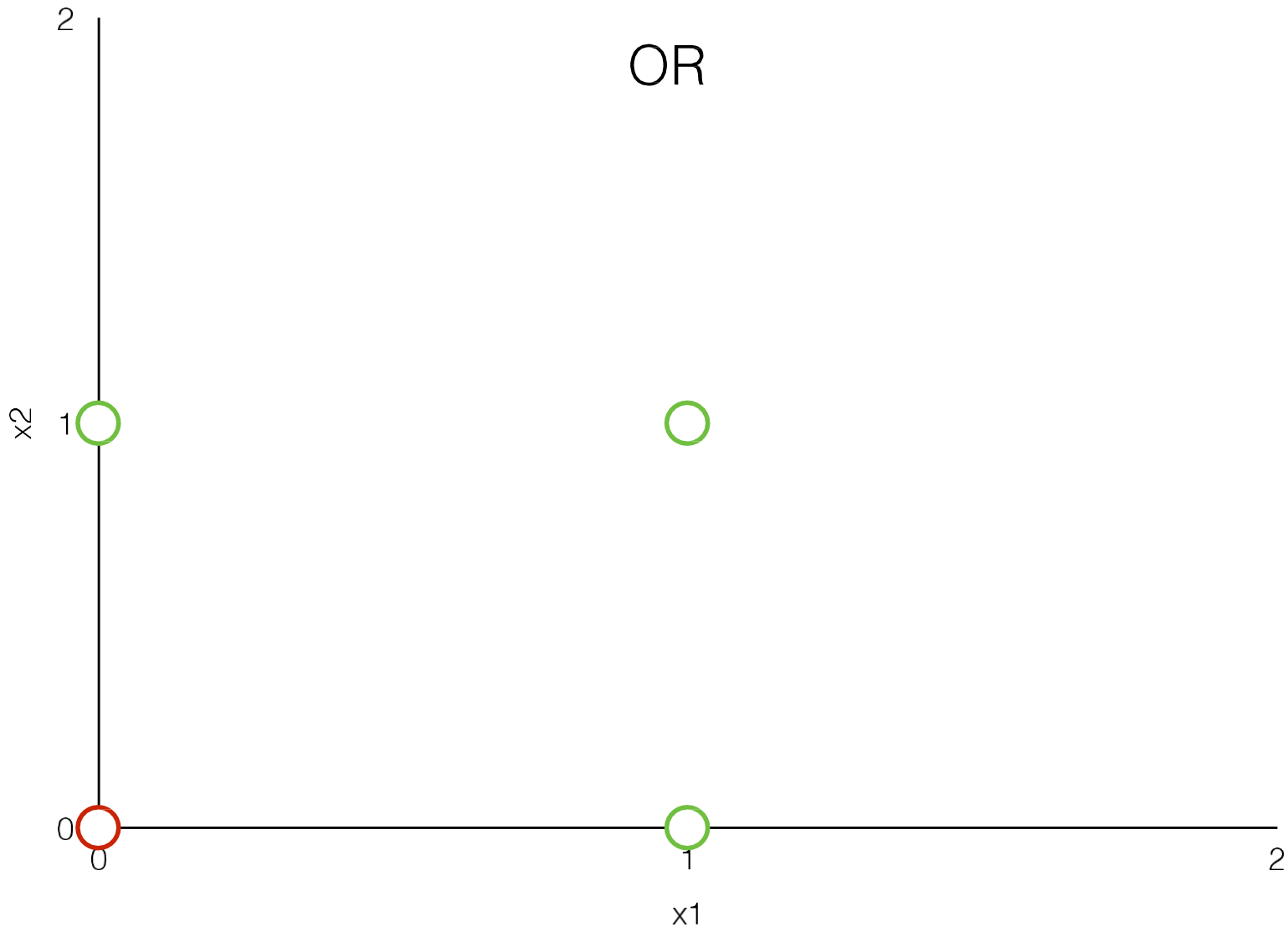
Perceptron



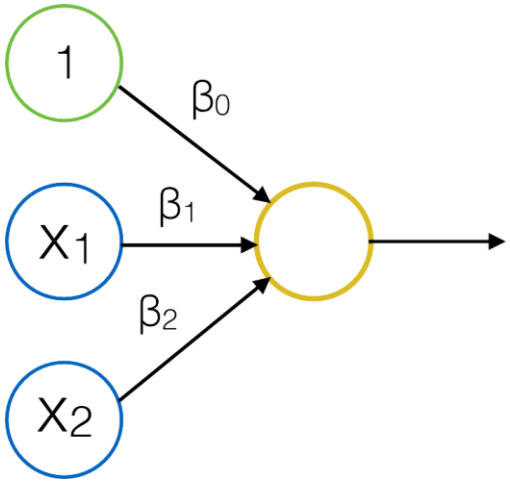
$$f(X) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$

OR

Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1


OR
2
x2
1
0
0
1
2
x1

Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1



$$f(X) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$

Activation Function: Threshold

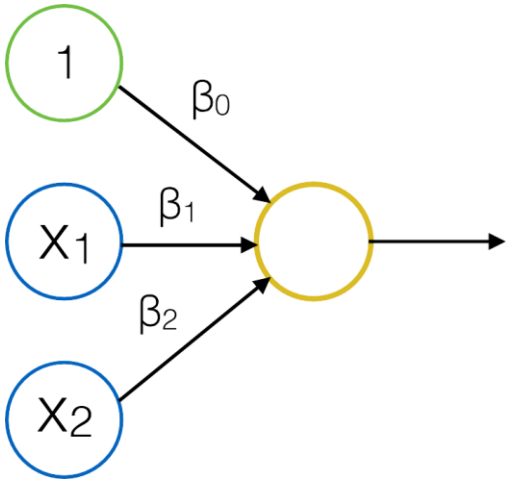
if $\beta_0 + \beta_1 x_1 + \beta_2 x_2 > 0$: 1

Else: 0

Update Rule:

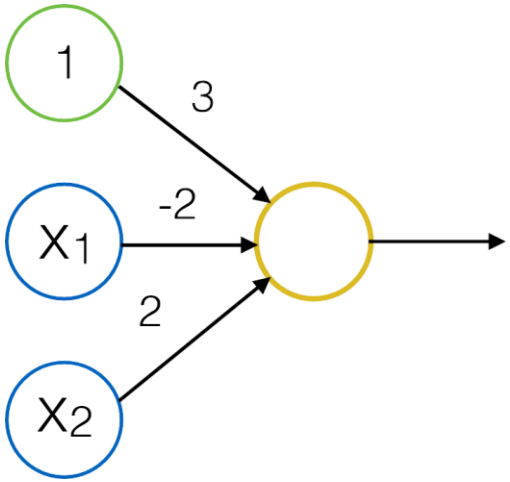
updated weight_i = weight_i - (output - target) * input_i

Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1



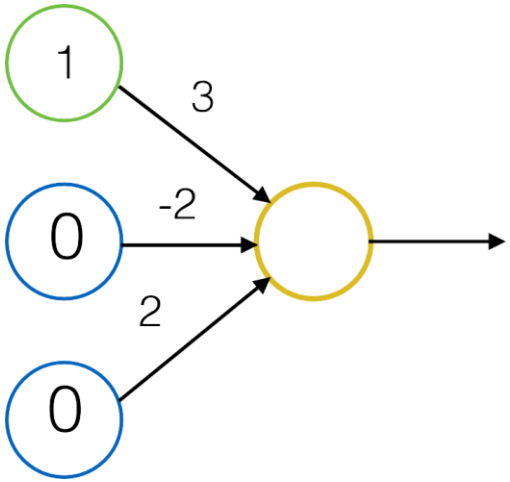
$$f(X) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$

Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1



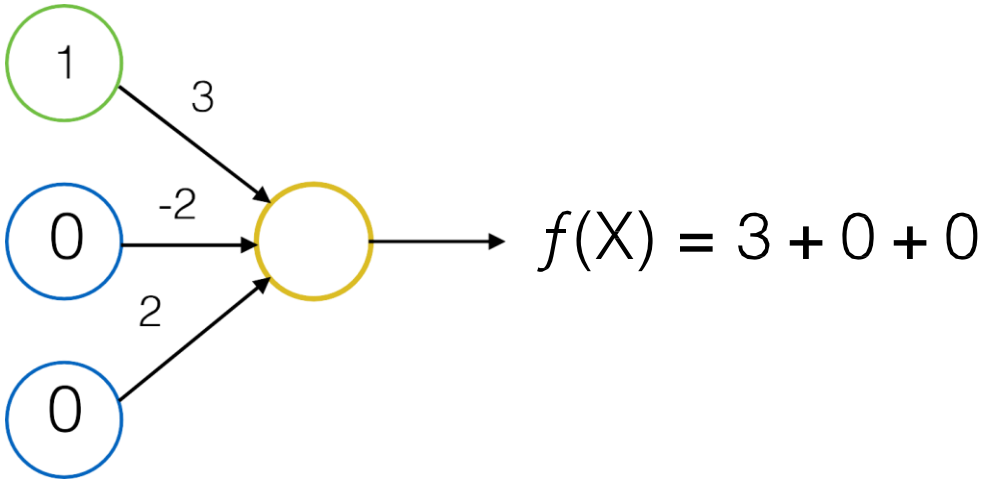
$$f(X) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$

Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1

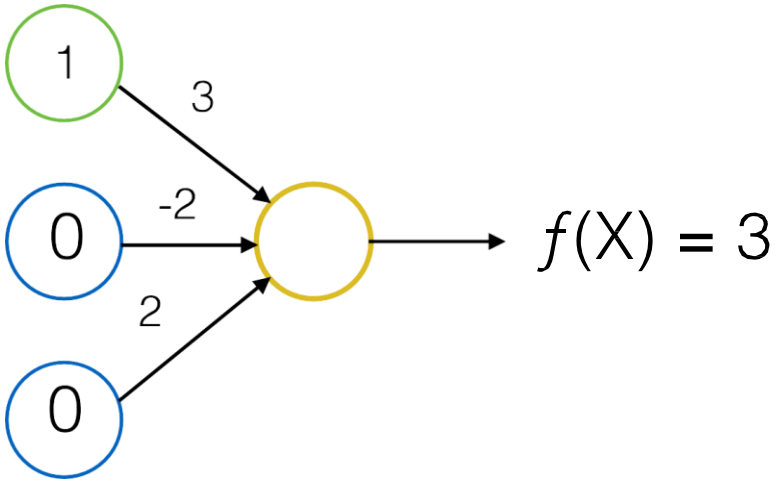


$$f(X) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$

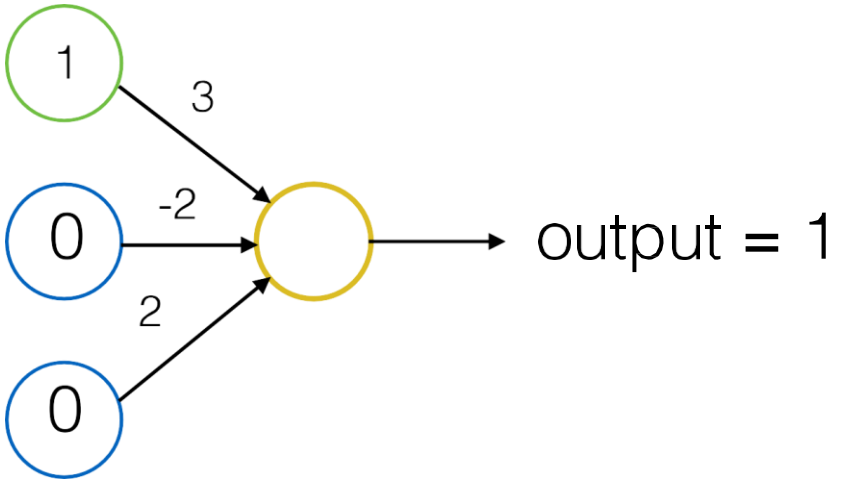
Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1



Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1



Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1



weights: 3, -2, 2

input: 1, 0, 0

output: 1

target: 0

$$\text{updated weight}_0 = \text{weight}_0 - (\text{output} - \text{target}) * \text{input}_0$$

$$\text{updated weight}_1 = \text{weight}_1 - (\text{output} - \text{target}) * \text{input}_1$$

$$\text{updated weight}_2 = \text{weight}_2 - (\text{output} - \text{target}) * \text{input}_2$$

weights: 3, -2, 2

input: 1, 0, 0

output: 1

target: 0

$$\text{updated weight}_0 = 3 - (\text{output} - \text{target}) * \text{input}_0$$

$$\text{updated weight}_1 = -2 - (\text{output} - \text{target}) * \text{input}_1$$

$$\text{updated weight}_2 = 2 - (\text{output} - \text{target}) * \text{input}_2$$

weights: 3, -2, 2

input: 1, 0, 0

output: 1

target: 0

$$\text{updated weight}_0 = 3 - (1 - \text{target}) * \text{input}_0$$

$$\text{updated weight}_1 = -2 - (1 - \text{target}) * \text{input}_1$$

$$\text{updated weight}_2 = 2 - (1 - \text{target}) * \text{input}_2$$

weights: 3, -2, 2

input: 1, 0, 0

output: 1

target: 0

$$\text{updated weight}_0 = 3 - (1 - 0) * \text{input}_0$$

$$\text{updated weight}_1 = -2 - (1 - 0) * \text{input}_1$$

$$\text{updated weight}_2 = 2 - (1 - 0) * \text{input}_2$$

weights: 3, -2, 2

input: 1, 0, 0

output: 1

target: 0

$$\text{updated weight}_0 = 3 - (1 - 0) * 1$$

$$\text{updated weight}_1 = -2 - (1 - 0) * 0$$

$$\text{updated weight}_2 = 2 - (1 - 0) * 0$$

weights: 3, -2, 2

input: 1, 0, 0

output: 1

target: 0

updated $weight_0$ = 3 -1

updated $weight_1$ = -2 - 0

updated $weight_2$ = 2 - 0

weights: 3, -2, 2

input: 1, 0, 0

output: 1

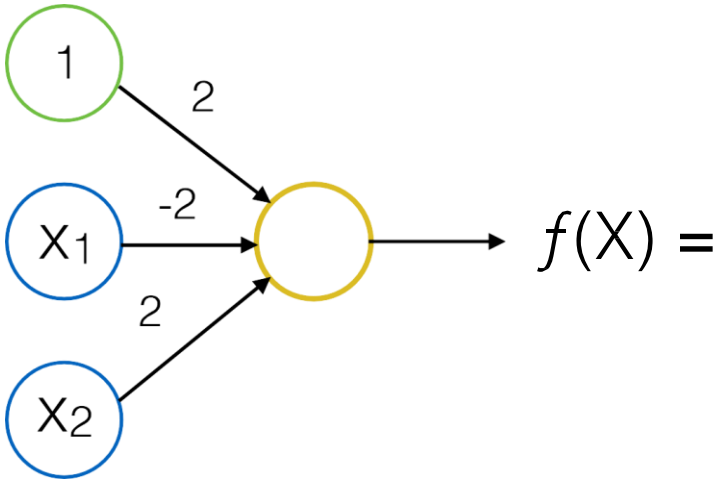
target: 0

updated $weight_0$ = 2

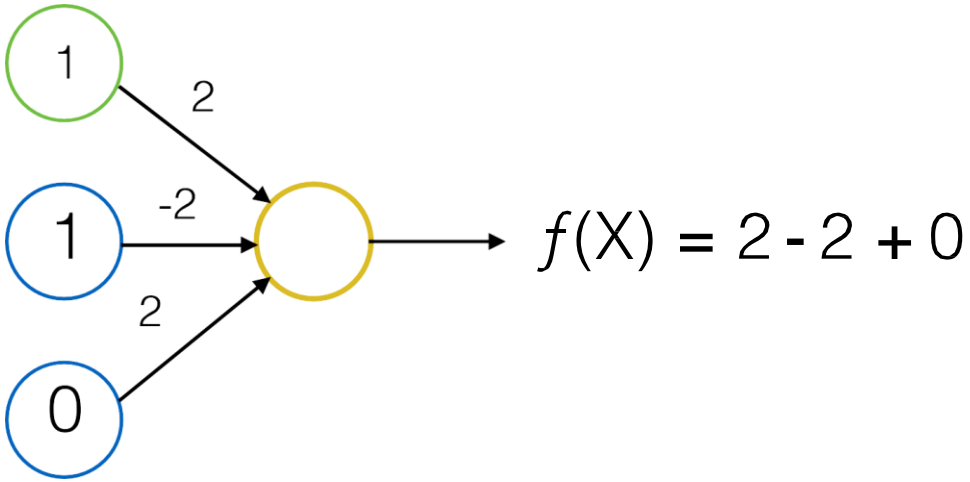
updated $weight_1$ = -2

updated $weight_2$ = 2

Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1

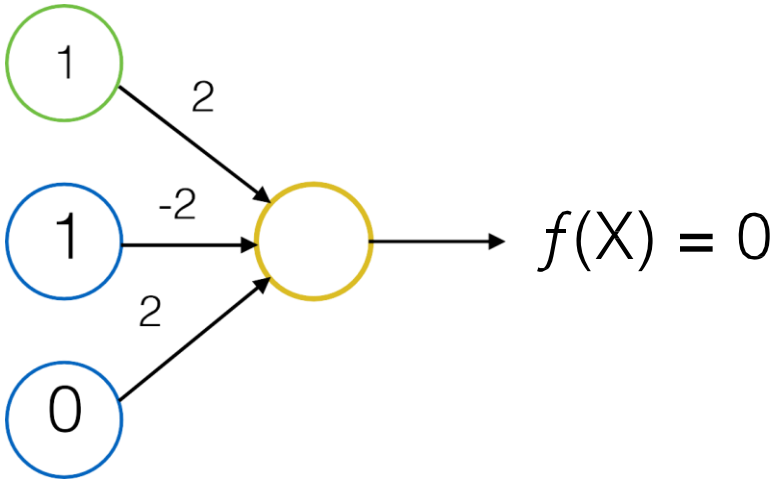


Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1

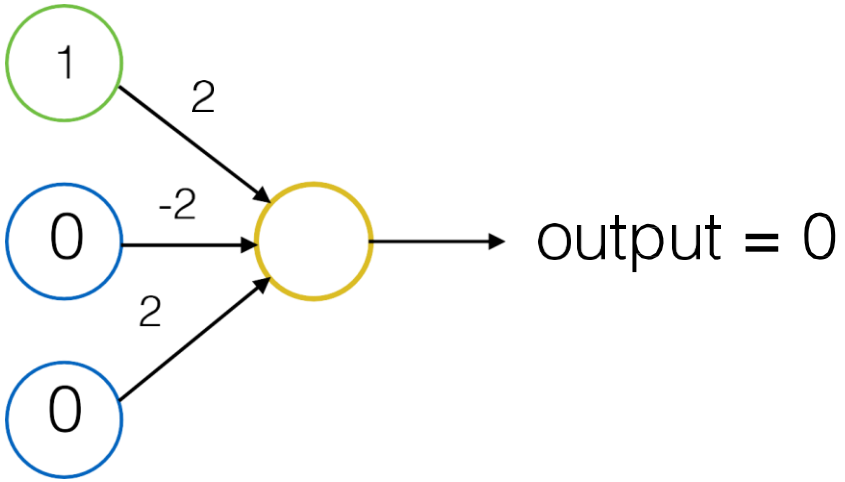


$f(X) = 2 - 2 + 0$

Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1



Feature 1	Feature 2	Target
0	0	0
1	0	1
0	1	1
1	1	1



weights: 2, -2, 2

input: 1, 1, 0

output: 0

target: 1

$$\text{updated weight}_0 = \text{weight}_0 - (\text{output} - \text{target}) * \text{input}_0$$

$$\text{updated weight}_1 = \text{weight}_1 - (\text{output} - \text{target}) * \text{input}_1$$

$$\text{updated weight}_2 = \text{weight}_2 - (\text{output} - \text{target}) * \text{input}_2$$

weights: 2, -2, 2

input: 1, 1, 0

output: 0

target: 1

$$\text{updated weight}_0 = 2 - (\text{output} - \text{target}) * \text{input}_0$$

$$\text{updated weight}_1 = -2 - (\text{output} - \text{target}) * \text{input}_1$$

$$\text{updated weight}_2 = 2 - (\text{output} - \text{target}) * \text{input}_2$$

weights: 2, -2, 2

input: 1, 1, 0

output: 0

target: 1

$$\text{updated weight}_0 = 2 - (0 - \text{target}) * \text{input}_0$$

$$\text{updated weight}_1 = -2 - (0 - \text{target}) * \text{input}_1$$

$$\text{updated weight}_2 = 2 - (0 - \text{target}) * \text{input}_2$$

weights: 2, -2, 2

input: 1, 1, 0

output: 0

target: 1

$$\text{updated weight}_0 = 2 - (0 - 1) * \text{input}_0$$

$$\text{updated weight}_1 = -2 - (0 - 1) * \text{input}_1$$

$$\text{updated weight}_2 = 2 - (0 - 1) * \text{input}_2$$

weights: 2, -2, 2

input: 1, 1, 0

output: 0

target: 1

$$\text{updated weight}_0 = 2 - (0 - 1) * 1$$

$$\text{updated weight}_1 = -2 - (0 - 1) * 1$$

$$\text{updated weight}_2 = 2 - (0 - 1) * 0$$

weights: 2, -2, 2

input: 1, 1, 0

output: 0

target: 1

$$\text{updated weight}_0 = 2 - (-1)$$

$$\text{updated weight}_1 = -2 - (-1)$$

$$\text{updated weight}_2 = 2 - 0$$

weights: 2, -2, 2

input: 1, 1, 0

output: 0

target: 1

$$\text{updated weight}_0 = 2 + 1$$

$$\text{updated weight}_1 = -2 + 1$$

$$\text{updated weight}_2 = 2 - 0$$

weights: 2, -2, 2

input: 1, 1, 0

output: 0

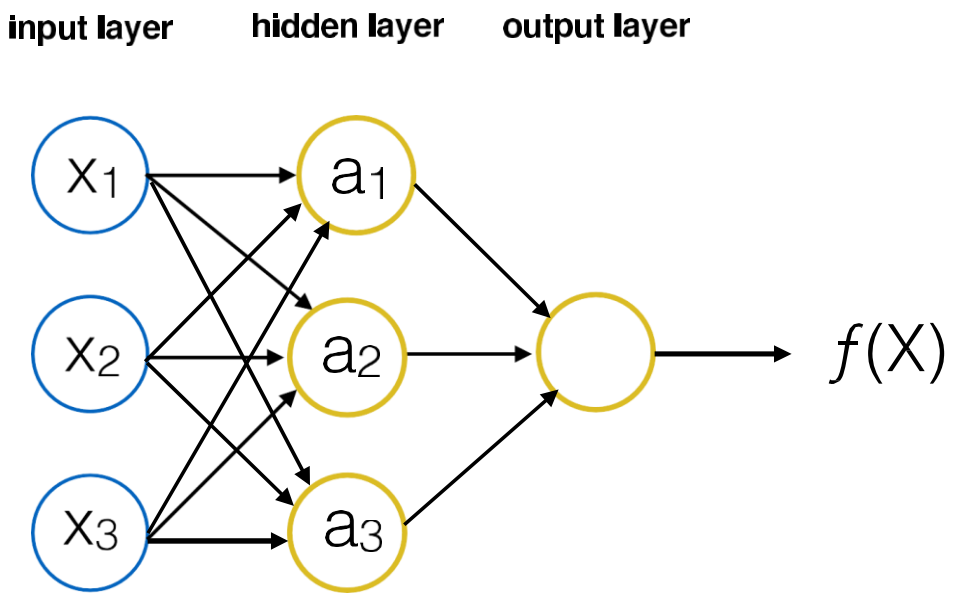
target: 1

updated $\text{weight}_0 = 3$

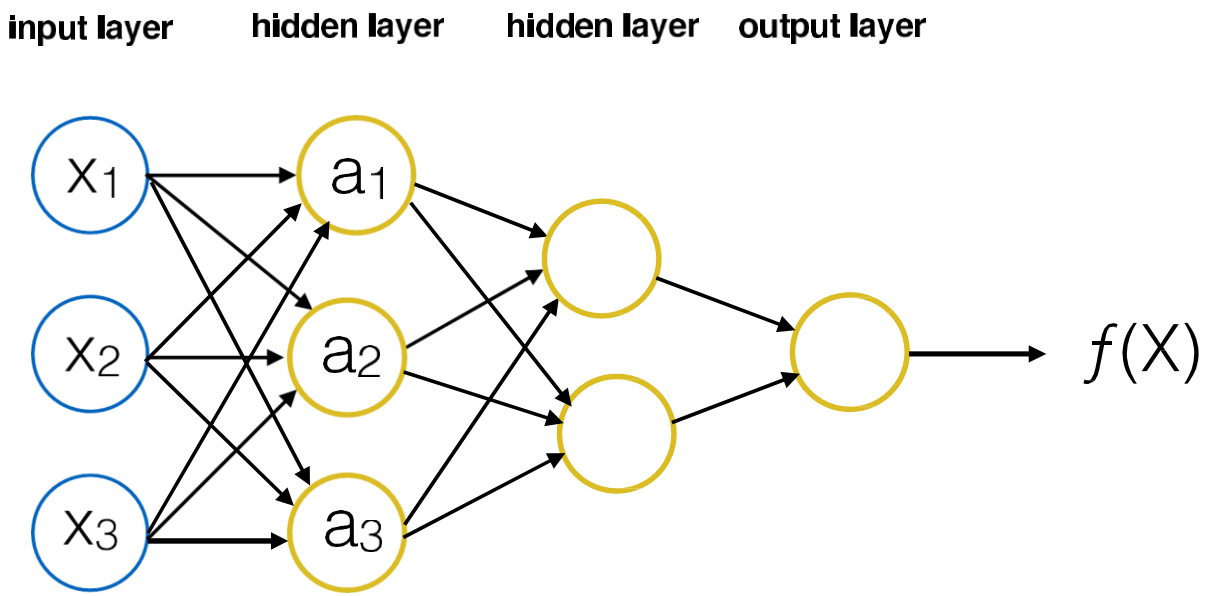
updated $\text{weight}_1 = -1$

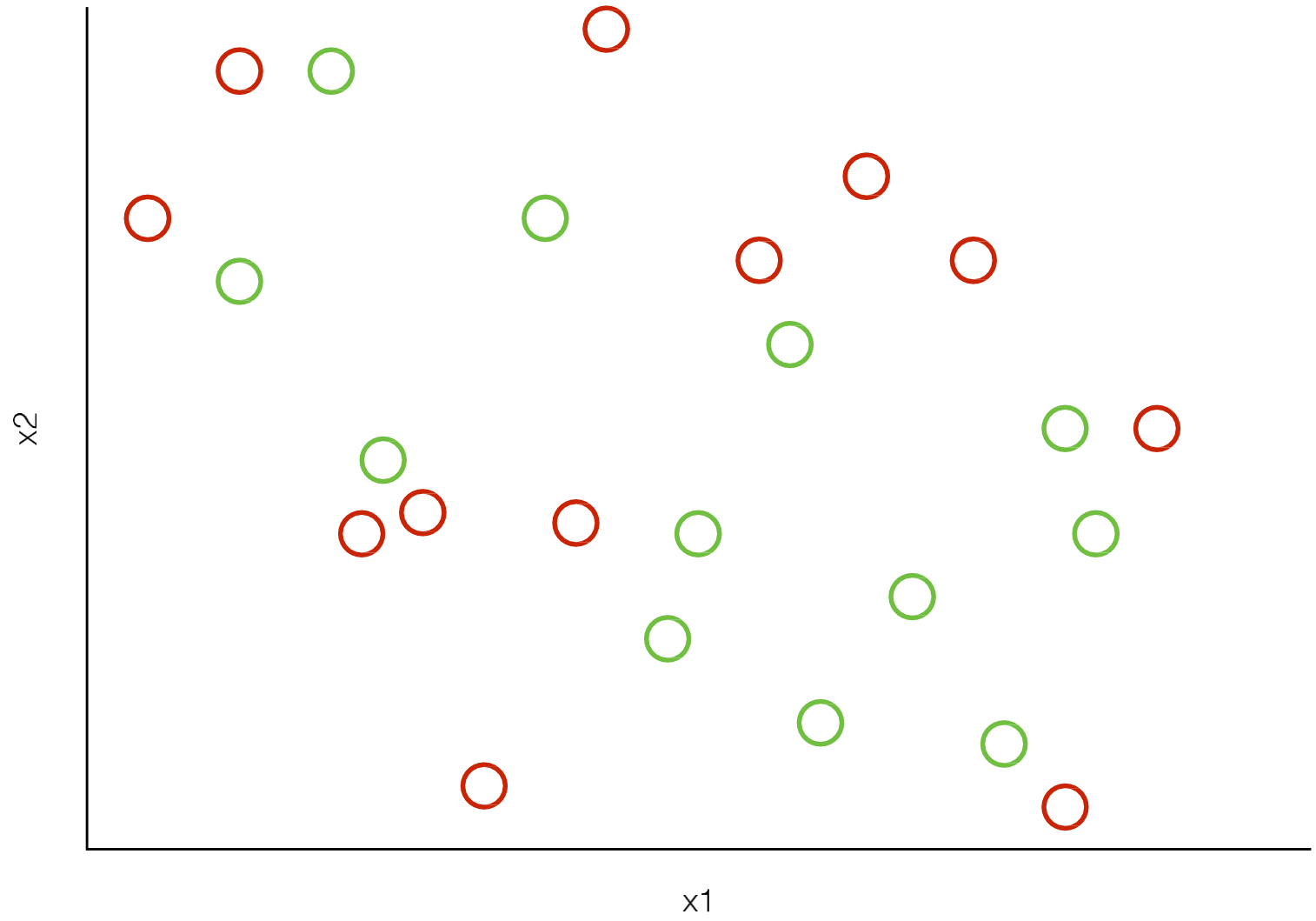
updated $\text{weight}_2 = 2$

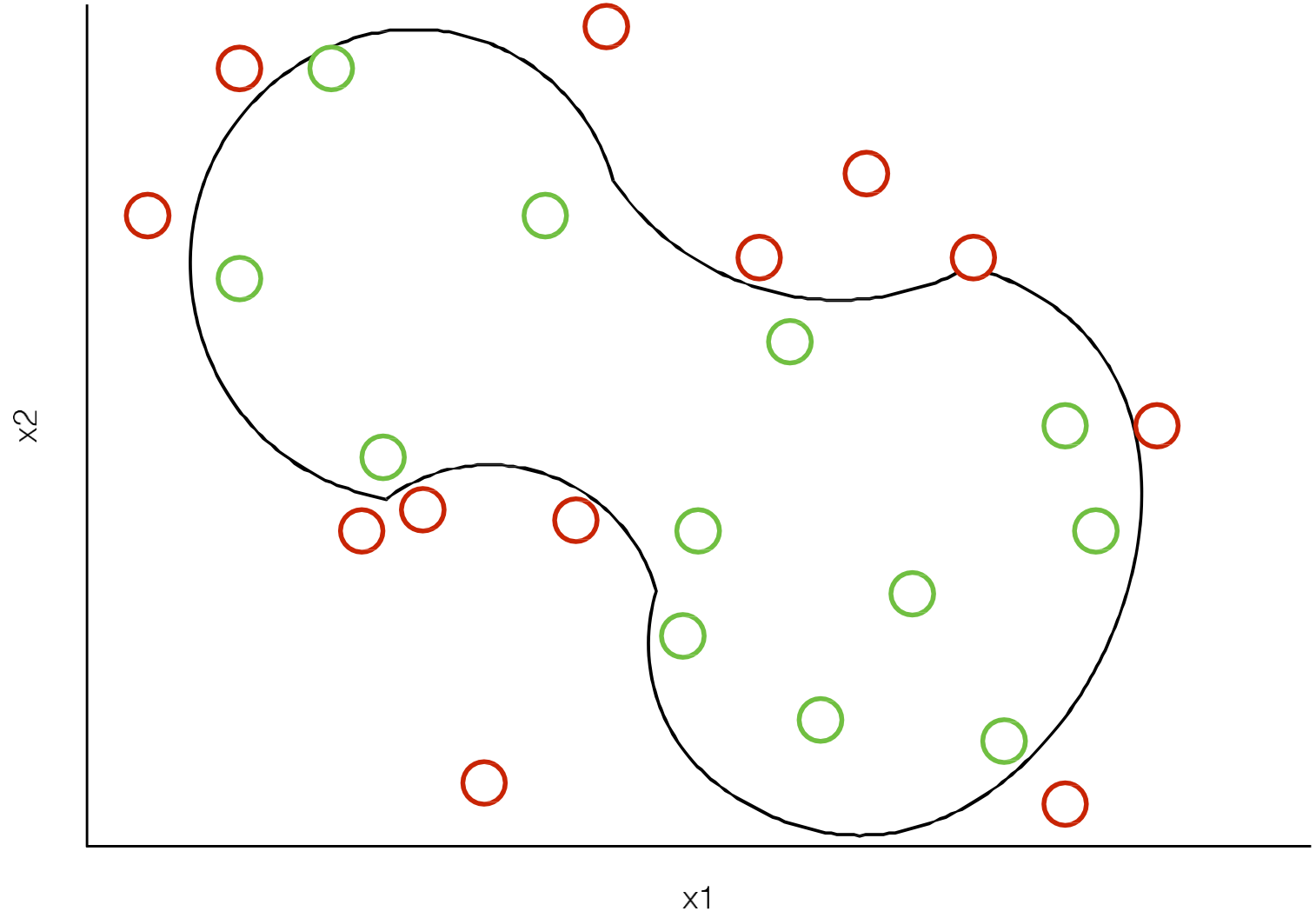
Multi-Layer Perceptron (MLP)



Multi-Layer Perceptron (MLP)




x2
x1


x2
x1