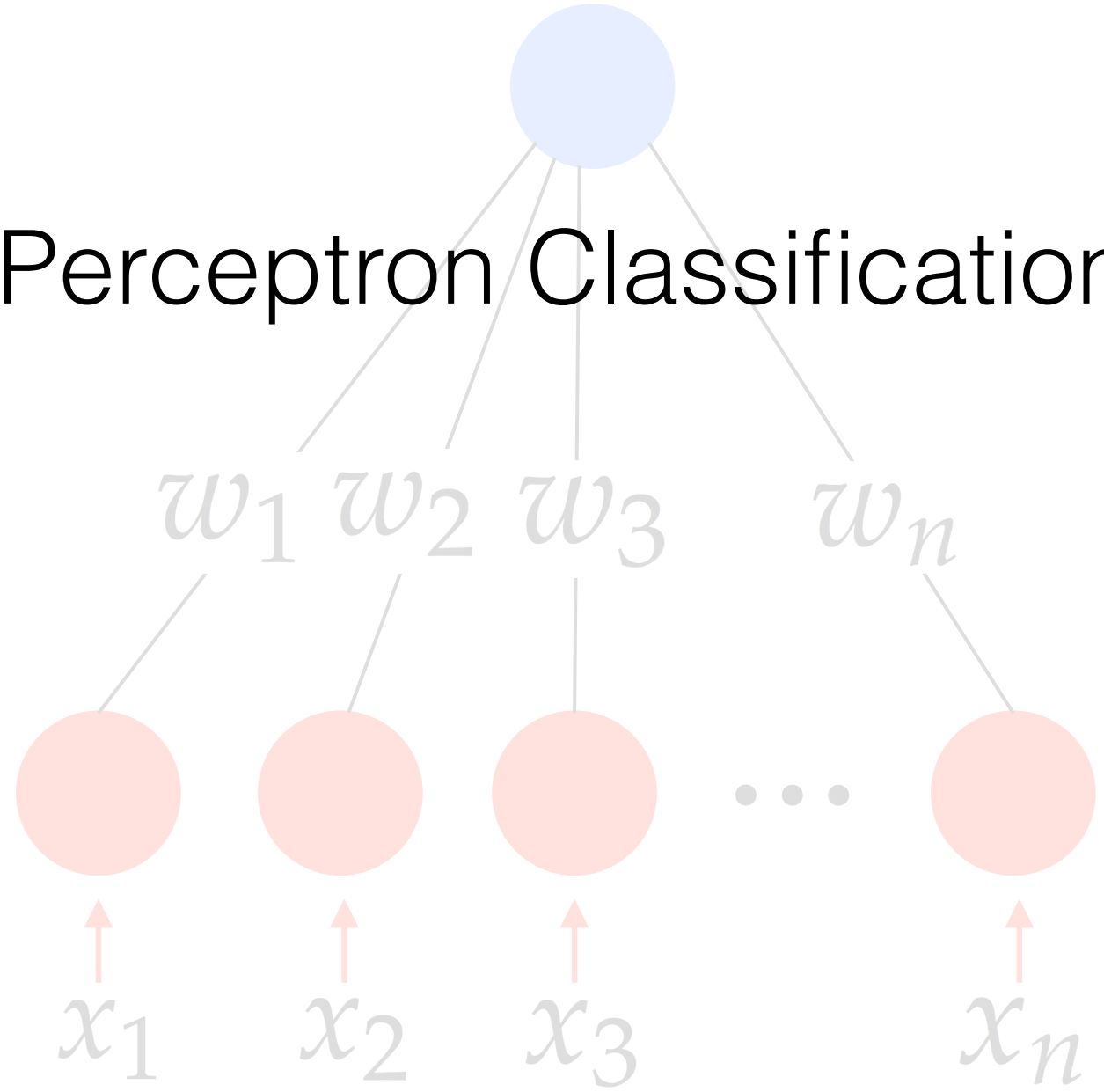
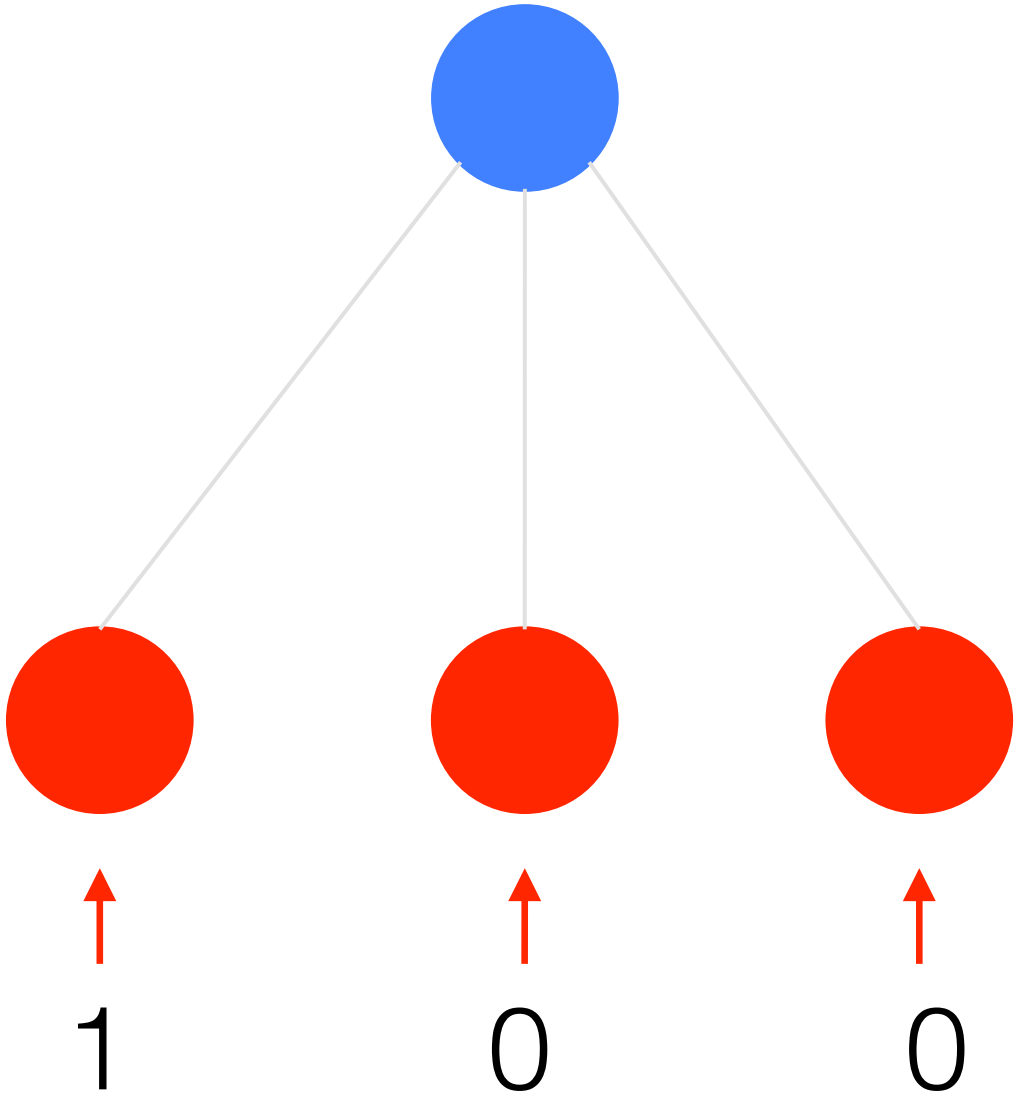
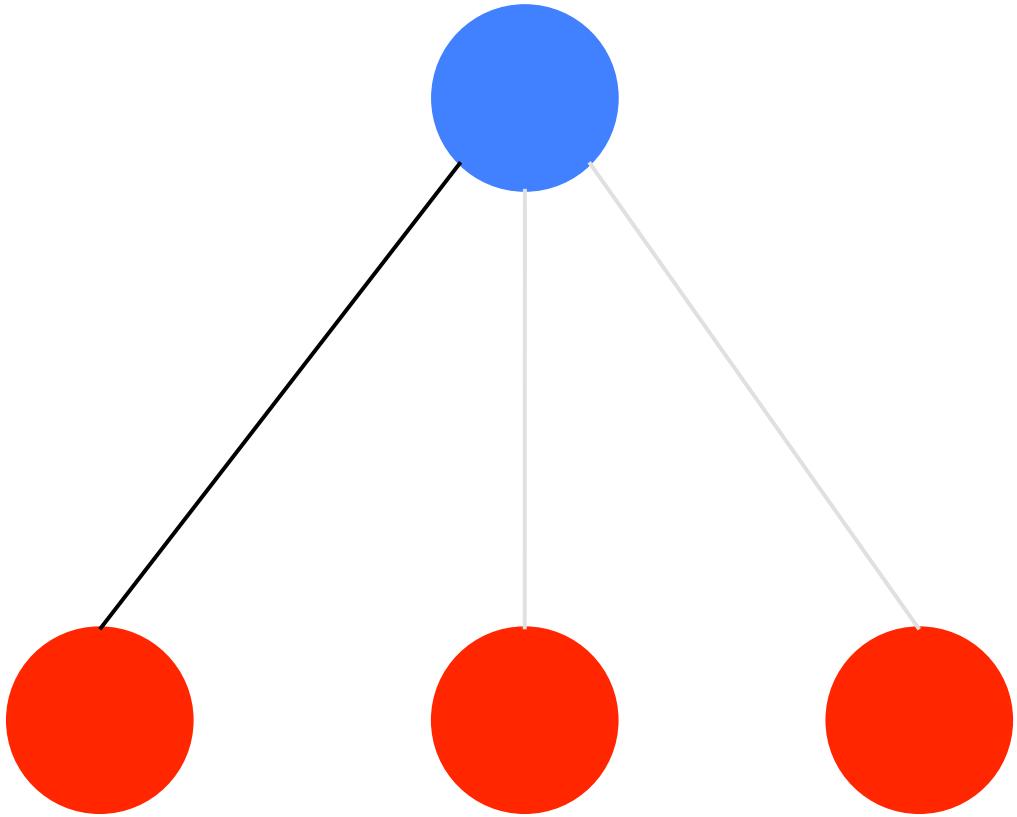
Perceptron Classification



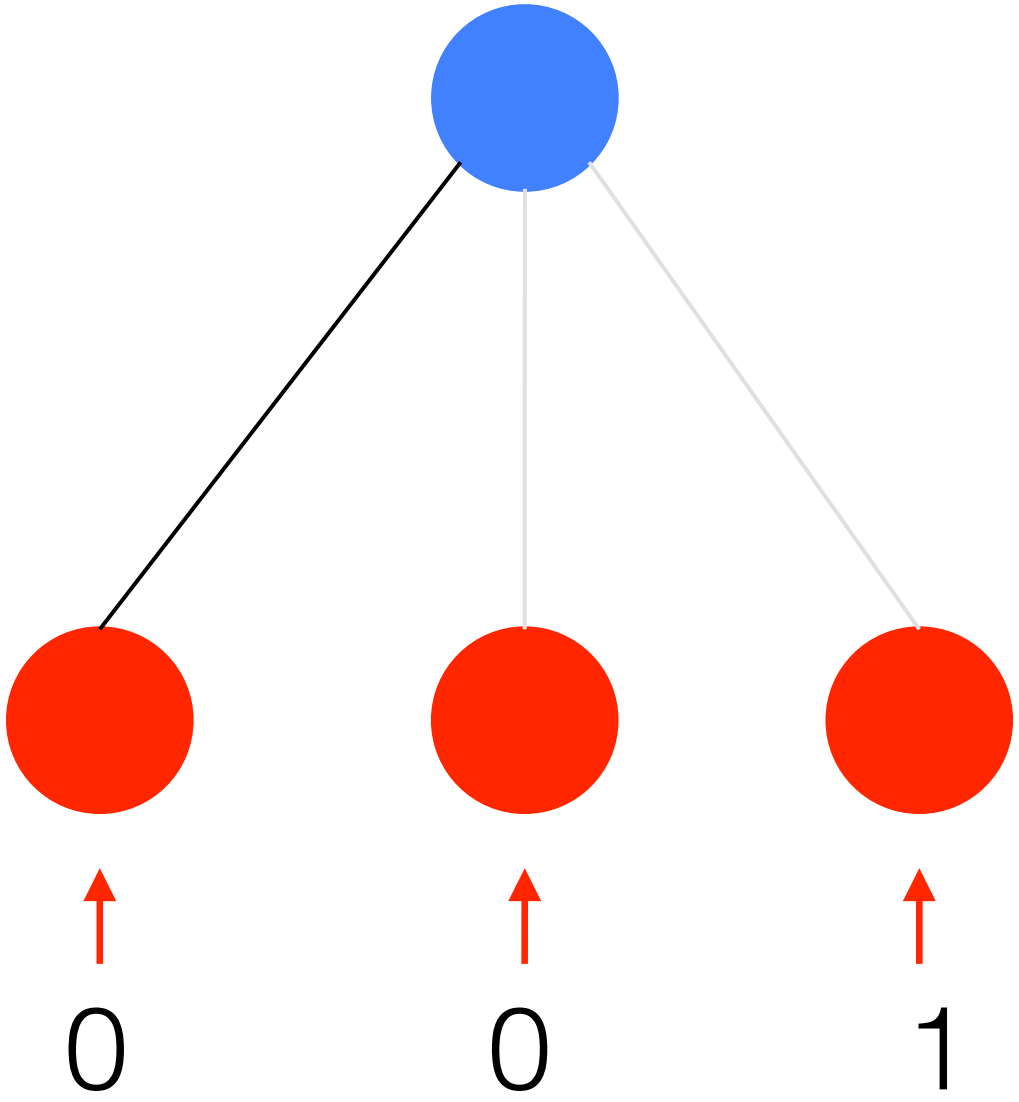
j = 1



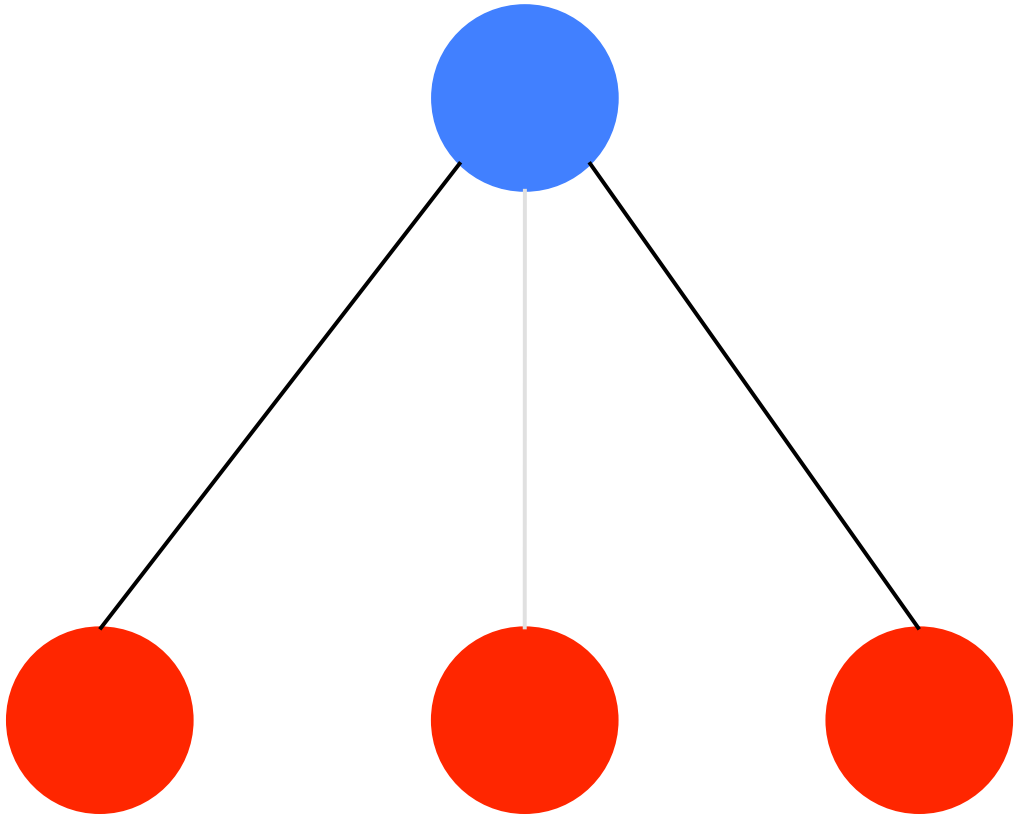
j = 1



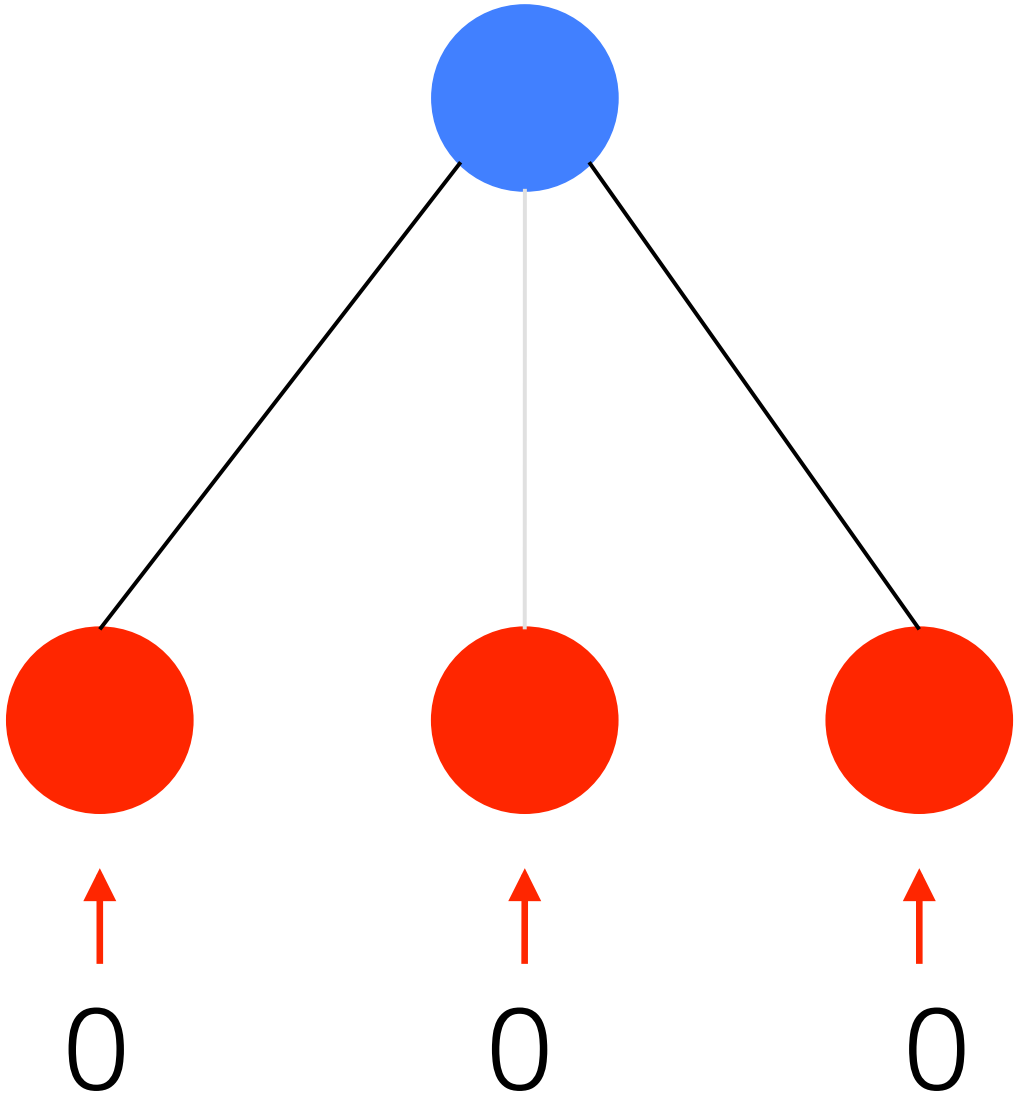
j = 2



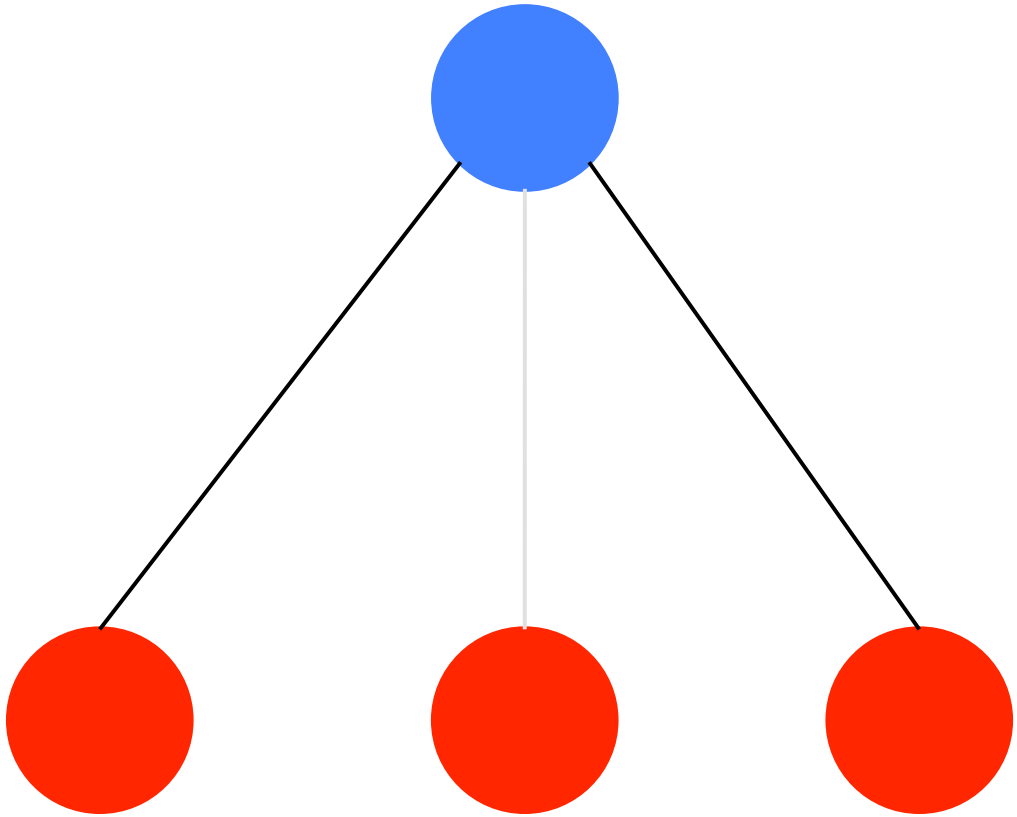
$j = 2$



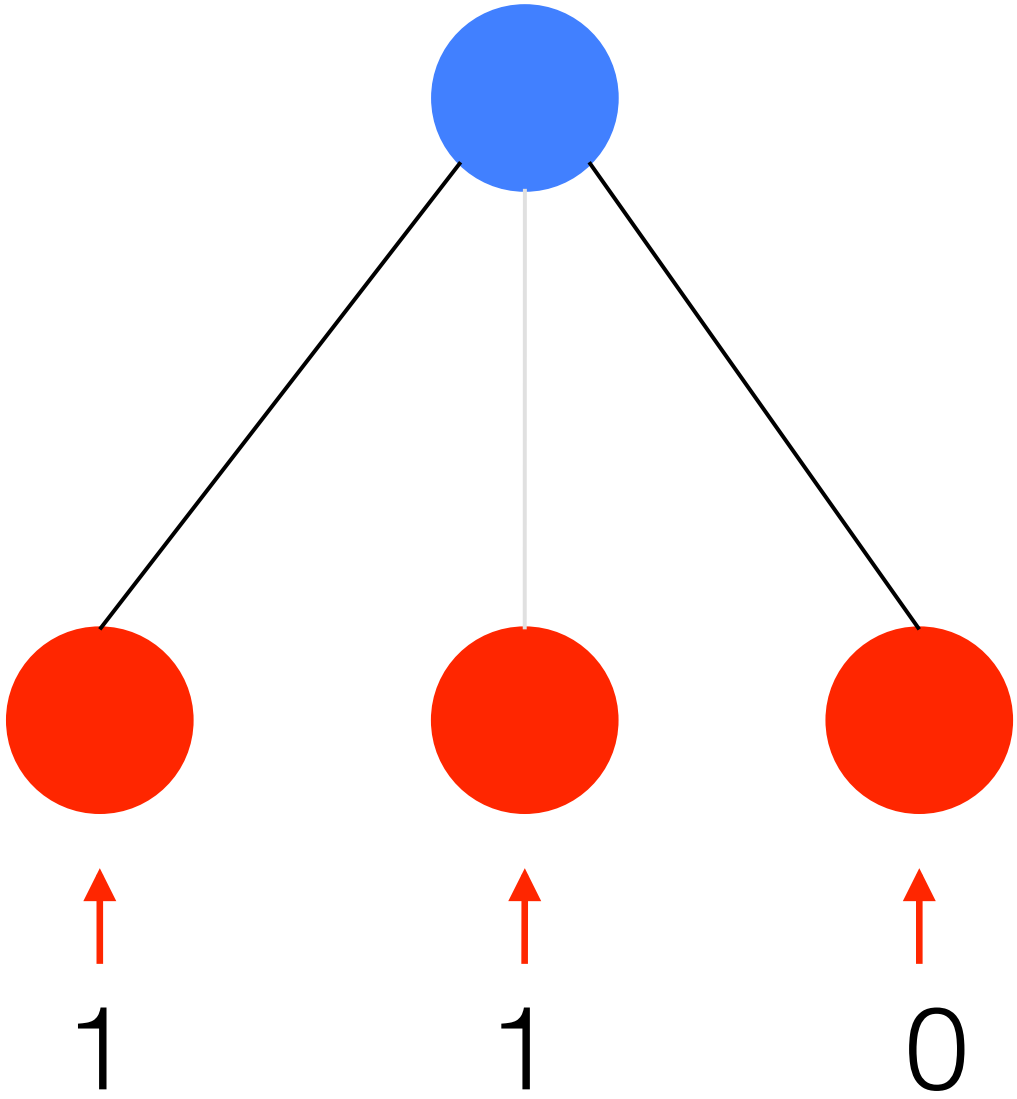
j = 3



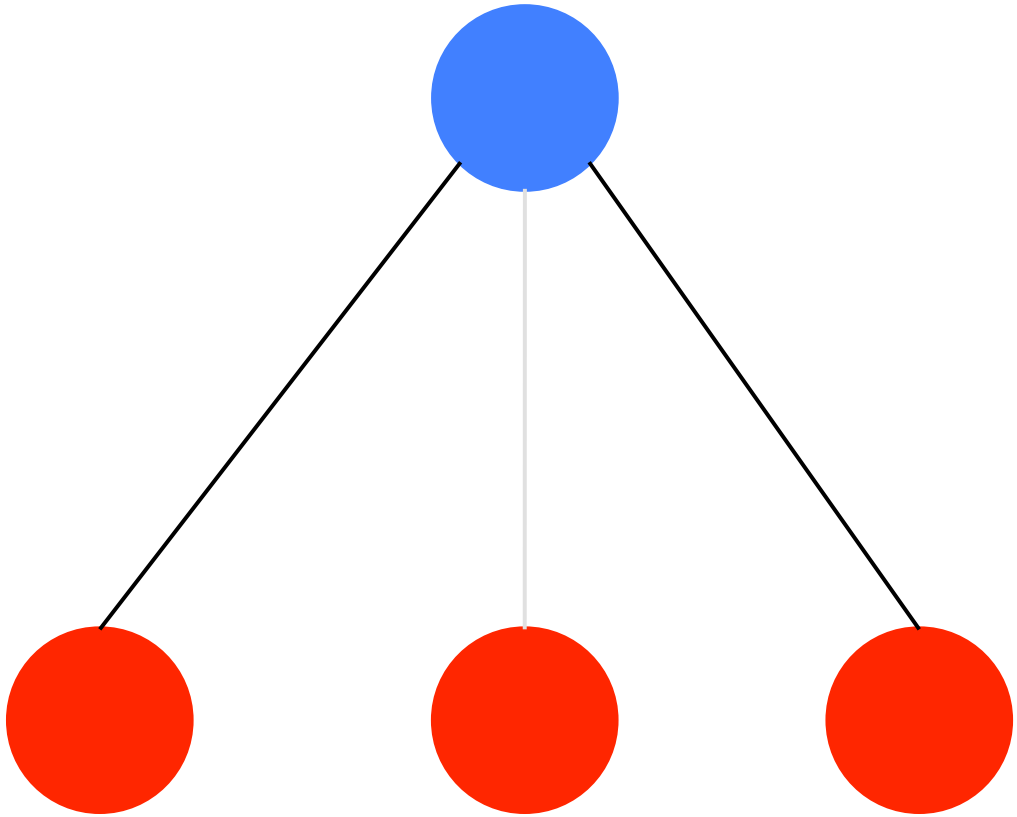
j = 3



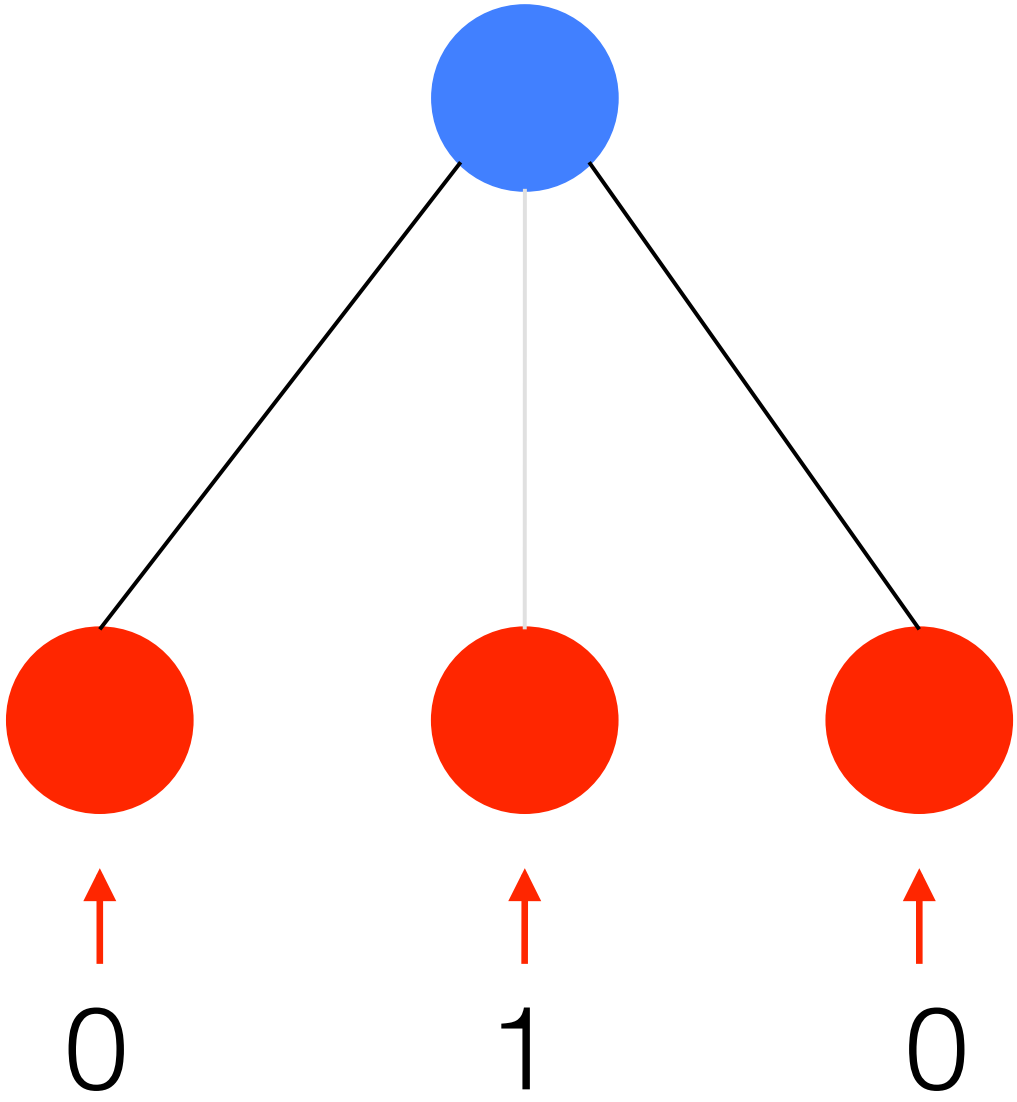
j = 4



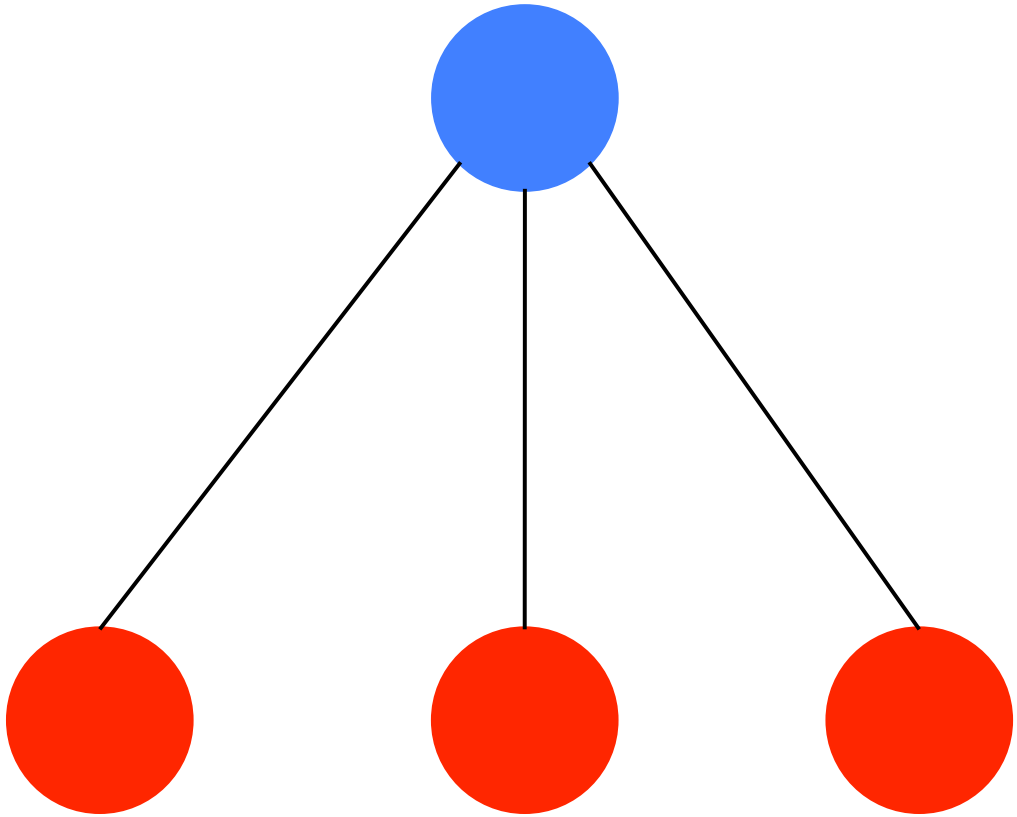
j = 4



j = 5



j = 5



What if we wanted to hand the perceptron non-binary inputs?

Outline

pdrive

[w, w0] = perceptron(x,y)

Outline

pdrive

-call perceptron to train 3 different problems

-plot the output of perceptron

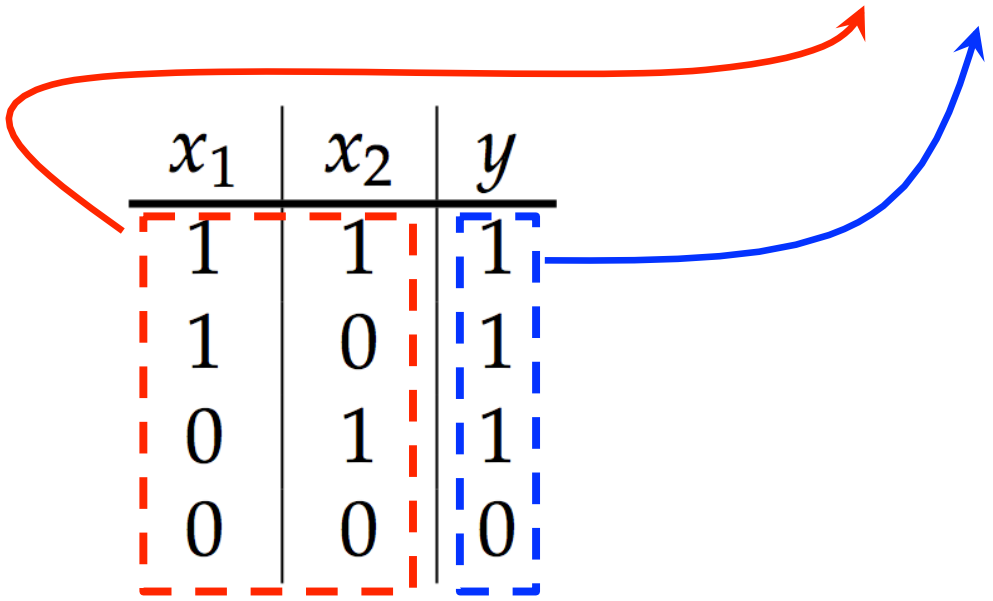
[w, w0] = perceptron(x,y)

-execute perceptron learning algorithm

-return optimal set of weights

Input Structure

```
[w, w0] = perceptron(x,y)
```



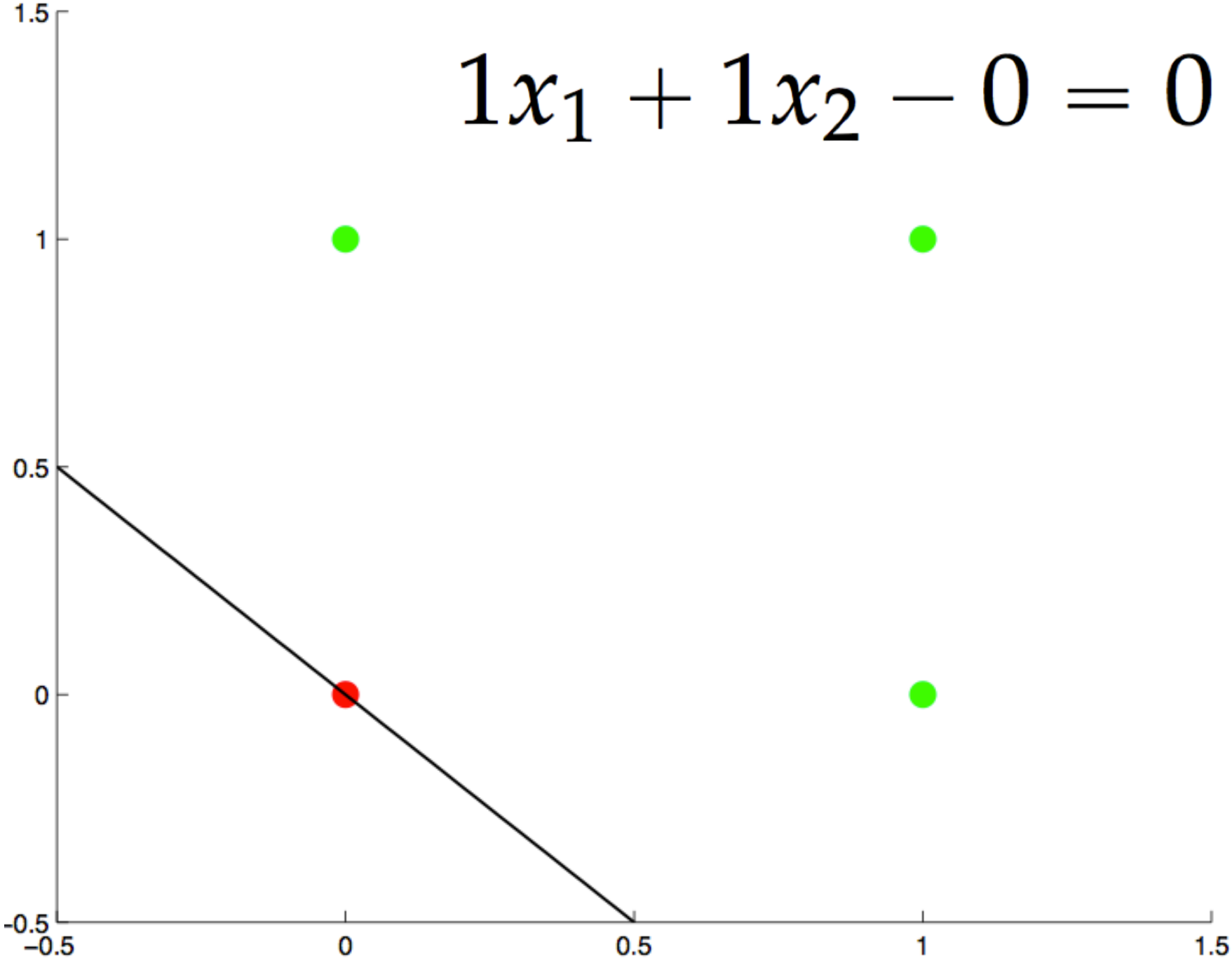
x_1	x_2	y
1	1	1
1	0	1
0	1	1
0	0	0

Table 2: OR with two inputs

What if we wanted to hand the perceptron non-binary inputs?

$$\overbrace{w_1 x_1 + w_2 x_2}^{(\sum_{i=1}^{n} w_i x_i)} = \theta$$

$$w_1 x_1 + w_2 x_2 - \theta = 0$$


$1x_1 + 1x_2 - 0 = 0$
1.5
1
0.5
0
-0.5
−0.5
0
0.5
1
1.5

What if we wanted to hand the perceptron non-binary inputs?

$$\overbrace{w_1 x_1 + w_2 x_2}^{(\sum_{i=1}^{n} w_i x_i)} = \theta$$

$$w_1 x_1 + w_2 x_2 - \theta = 0$$

How do we choose θ ?

Bias bit

$$w_1 x_1 + w_2 x_2 - \theta = 0$$

$$w_1 x_1 + w_2 x_2 + w_0 x_3 = 0$$

$$w_1 x_1 + w_2 x_2 + 1 w_0 = 0$$

How can we can update our input matrix *x* to include a third input that is always 1?

Plotting

We have the optimal set of weights (including the bias bit) and the desired outputs, what's next?

-Scatter points representing binary training input set, color appropriately.

-Plot the line: $w_1 x_1 + w_2 x_2 - \theta = 0$

Helpful functions:

-linspace

-num2str (for titling)