

Examples and Intuitions II

The $\Theta^{(1)}$ matrices for AND, NOR, and OR are:

AND :

$$\Theta^{(1)} = [-30 \quad 20 \quad 20]$$

NOR :

$$\Theta^{(1)} = [10 \quad -20 \quad -20]$$

OR :

$$\Theta^{(1)} = [-10 \quad 20 \quad 20]$$

We can combine these to get the XNOR logical operator (which gives 1 if x_1 and x_2 are both 0 or both 1).

$$\begin{bmatrix} x_0 \\ x_1 \\ x_2 \end{bmatrix} \rightarrow \begin{bmatrix} a_1^{(2)} \\ a_2^{(2)} \end{bmatrix} \rightarrow [a^{(3)}] \rightarrow h_{\Theta}(x)$$

For the transition between the first and second layer, we'll use a $\Theta^{(1)}$ matrix that combines the values for AND and NOR:

$$\Theta^{(1)} = [-30 \quad 20 \quad 20 \quad 10 \quad -20 \quad -20]$$

For the transition between the second and third layer, we'll use a $\Theta^{(2)}$ matrix that uses the value for OR:

$$\Theta^{(2)} = [-10 \quad 20 \quad 20]$$

Let's write out the values for all our nodes:

$$a^{(2)} = g(\Theta^{(1)} \cdot x)$$

$$a^{(3)} = g(\Theta^{(2)} \cdot a^{(2)})$$

$$h_{\Theta}(x) = a^{(3)}$$

And there we have the XNOR operator using a hidden layer with two nodes! The following summarizes the above algorithm:

Putting it together: x_1 XNOR x_2

