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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).

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

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

$$\Theta^{(1)} = egin{bmatrix} -30 & 20 & 20 \ 10 & -20 & -20 \end{bmatrix}$$

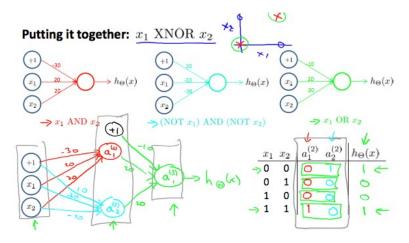
For the transition between the second and third layer, we'll use a $\Theta^{(2)}$ matrix that uses the value for OR:

$$\Theta^{(2)} = \begin{bmatrix} -10 & 20 & 20 \end{bmatrix}$$

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

$$egin{align} a^{(2)} &= g\left(\Theta^{(1)} \cdot x
ight) \ a^{(3)} &= g\left(\Theta^{(2)} \cdot a^{(2)}
ight) \ h_{\Theta}\left(x
ight) &= a^{(3)} \ \end{pmatrix}$$

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



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