Examples and Intuitions I

A simple example of applying neural networks is by predicting x_1 AND x_2, which is the logical 'and' operator and is only true if both x_1 and x_2 are 1.

The graph of our functions will look like:

$$x_0$$
$$x_1 \rightarrow g(z^{(2)}) \rightarrow h_\Theta(x)$$
$$x_2$$

Remember that x_0 is our bias variable and is always 1.

Let's set our first theta matrix as:

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

This will cause the output of our hypothesis to only be positive if both x_1 and x_2 are 1. In other words:

$$h_\Theta(x) = g(-30 + 20x_1 + 20x_2)$$
$$x_1 = 0 \ and \ x_2 = 0 \ then \ g(-30) \approx 0$$
$$x_1 = 0 \ and \ x_2 = 1 \ then \ g(-10) \approx 0$$
$$x_1 = 1 \ and \ x_2 = 0 \ then \ g(-10) \approx 0$$
$$x_1 = 1 \ and \ x_2 = 1 \ then \ g(10) \approx 1$$

So we have constructed one of the fundamental operations in computers by using a small neural network rather than using an actual AND gate. Neural networks