W4 Neural Networks: Representation

Friday, August 26, 2016 10:00 AM

Right: 1, 2, 3, 5

1. Which of the following statements are true? Check all that apply.

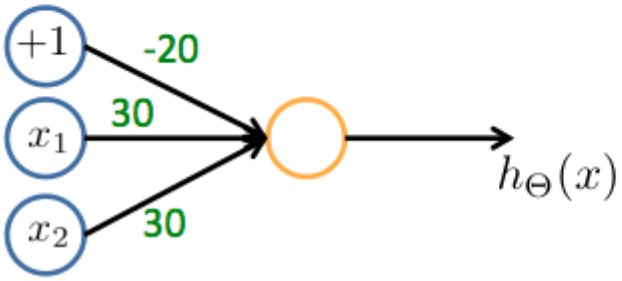
- [ ] Suppose you have a multi-class classification problem with three classes, trained with a 3 layer network. Let $a_1^{(3)} = (h_\Theta(x))_1$ be the activation of the first output unit, and similarly $a_2^{(3)} = (h_\Theta(x))_2$ and $a_3^{(3)} = (h_\Theta(x))_3$. Then for any input x, it must be the case that $a_1^{(3)} + a_2^{(3)} + a_3^{(3)} = 1$.

- [x] Any logical function over binary-valued (0 or 1) inputs x_1 and x_2 can be (approximately) represented using some neural network.

- [ ] A two layer (one input layer, one output layer; no hidden layer) neural network can represent the XOR function.

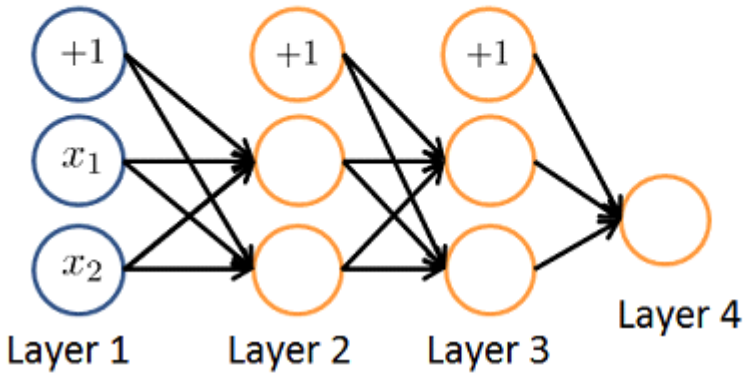
- [x] The activation values of the hidden units in a neural network, with the sigmoid activation function applied at every layer, are always in the range (0, 1).

2. Consider the following neural network which takes two binary-valued inputs $x_1, x_2 \in \{0, 1\}$ and outputs $h_\Theta(x)$. Which of the following logical functions does it (approximately) compute?



- (●) OR
- ( ) AND
- ( ) NAND (meaning "NOT AND")
- ( ) XOR (exclusive OR)

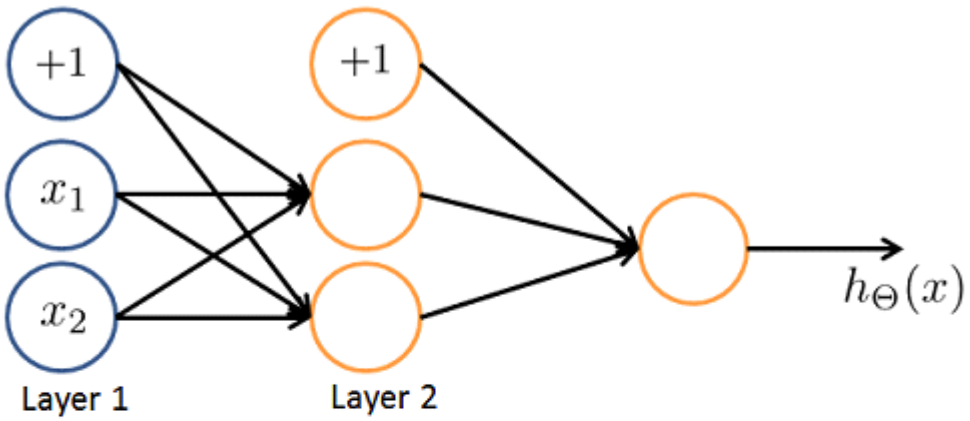
3. Consider the neural network given below. Which of the following equations correctly computes the activation $a_1^{(3)}$? Note: $g(z)$ is the sigmoid activation function.



- (●) $a_1^{(3)} = g(\Theta_{1,0}^{(2)} a_0^{(2)} + \Theta_{1,1}^{(2)} a_1^{(2)} + \Theta_{1,2}^{(2)} a_2^{(2)})$
- ( ) $a_1^{(3)} = g(\Theta_{1,0}^{(1)} a_0^{(1)} + \Theta_{1,1}^{(1)} a_1^{(1)} + \Theta_{1,2}^{(1)} a_2^{(1)})$
- ( ) $a_1^{(3)} = g(\Theta_{1,0}^{(1)} a_0^{(2)} + \Theta_{1,1}^{(1)} a_1^{(2)} + \Theta_{1,2}^{(1)} a_2^{(2)})$
- ( ) The activation $a_1^{(3)}$ is not present in this network.

You want to have a vectorized implementation of this (i.e., one that does not use for loops). Which of the following implementations correctly compute $a^{(2)}$? Check all that apply.

- [ ] z = Theta1 * x; a2 = sigmoid (z);
- [x] a2 = sigmoid (x * Theta1);
- [ ] a2 = sigmoid (Theta2 * x);
- [ ] z = sigmoid(x); a2 = sigmoid (Theta1 * z);



- (•) It will stay the same.
- ( ) It will increase.
- ( ) It will decrease
- ( ) Insufficient information to tell: it may increase or decrease.