Neuronal network- quiz

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Neural Networks: Representation

Cuestionario, 5 questions

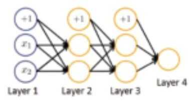
1. (1 point) Which of the following statements are true? Check all that apply.

- [ ] 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 $a_1^{(3)} + a_2^{(3)} + a_3^{(3)} = 1$.
- [ ] A two layer (one input layer, one output layer; no hidden layer) neural network can represent the XOR function.
- [x] Any logical function over binary-valued (0 or 1) inputs x_1 and x_2 can be (approximately) represented using some neural network.
- [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. (1 point) 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?

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

3. (1 point) 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.

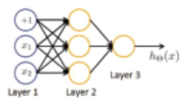


vg de diapositiva

X $a_1^{(3)} = g(\Theta^{(2)}_{1,0}a_0^{(2)} + \Theta^{(2)}_{1,1}a_1^{(2)} + \Theta^{(2)}_{1,2}a_2^{(2)})$ Error al marcar $\begin{pmatrix} \boxed{\cdot\ \cdot\ \cdot\ \cdot} \\ \cdot\ \cdot\ \cdot\ \cdot \\ \cdot\ \cdot\ \cdot\ \cdot \end{pmatrix}\begin{pmatrix} \cdot \\ \cdot \\ \cdot \end{pmatrix} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix}$

- ( ) $a_1^{(3)} = g(\Theta^{(2)}_{1,0}a_0^{(1)} + \Theta^{(2)}_{1,1}a_1^{(1)} + \Theta^{(2)}_{1,2}a_2^{(1)})$
- (●) $a_1^{(3)} = g(\Theta^{(1)}_{1,0}a_0^{(2)} + \Theta^{(1)}_{1,1}a_1^{(2)} + \Theta^{(1)}_{1,2}a_2^{(2)})$
- ( ) $a_1^{(3)} = g(\Theta^{(2)}_{2,0}a_0^{(2)} + \Theta^{(2)}_{2,1}a_1^{(2)} + \Theta^{(2)}_{2,2}a_2^{(2)})$

4. (1 point) You have the following neural network:



You'd like to compute the activations of the hidden layer $a^{(2)} \in \mathbb{R}^3$. One way to do so is the following Octave code:

```
% Theta1 is Theta with superscript "(1)" from lecture
% ie, the matrix of parameters for the mapping from layer 1 (input) to layer 2
% Theta1 has size 3x3
% Assume 'sigmoid' is a built-in function to compute 1 / (1 + exp(-z))

a2 = zeros (3, 1);
for i = 1:3
  for j = 1:3
    a2(i) = a2(i) + x(j) * Theta1(i, j);
  end
  a2(i) = sigmoid (a2(i));
end
```

→ lo que hace es generar $a = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix}$

$$\begin{array}{ccc} \Theta & X & a \\ \begin{pmatrix} - & - & - \\ - & - & - \\ - & - & - \end{pmatrix} & \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} & = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix} \end{array}$$

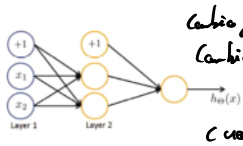
fila * columna

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.

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

5. (1 point) You are using the neural network pictured below and have learned the parameters $\Theta^{(1)} = \begin{bmatrix} 1 & 0.5 & 1.9 \\ 1 & 1.2 & 2.7 \end{bmatrix}$ (used to compute $a^{(2)}$) and $\Theta^{(2)} = \begin{bmatrix} 1 & -0.2 & -1.7 \end{bmatrix}$ (used to compute $a^{(3)}$) as a function of $a^{(2)}$). Suppose you swap the parameters for the first hidden layer between its two units so $\Theta^{(1)} = \begin{bmatrix} 1 & 1.2 & 2.7 \\ 1 & 0.5 & 1.9 \end{bmatrix}$ and also swap the output layer so $\Theta^{(2)} = \begin{bmatrix} 1 & -1.7 & -0.2 \end{bmatrix}$. How will this change the value of the output $h_\Theta(x)$?

Cambio fila ⇒ -1
Cambio columna ⇒ -1 $\{ -1 \cdot -1 = 1$, se queda igual
(creo que es algo de eso)



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

- [x] Entiendo que enviar trabajo que no es mío resultará en la desaprobación permanente de este curso y la desactivación de mi cuenta de Coursera.

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