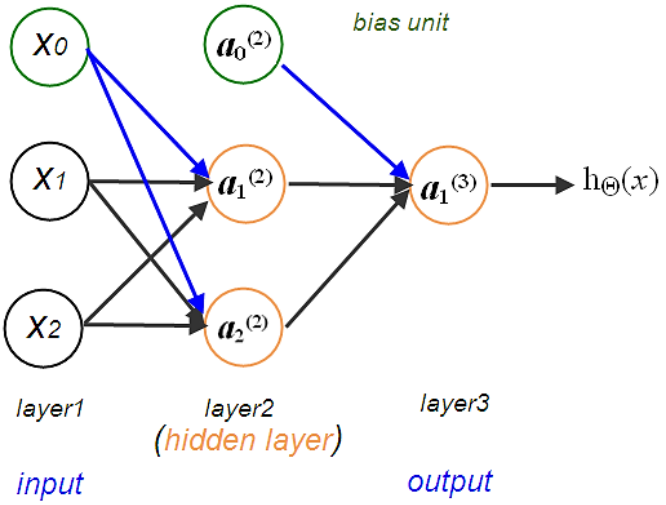
Soft Computiong

Homework#01 Due Date: 2021/03/29

https://www.bogotobogo.com/python/python_Neural_Networks_Backpropagation_for_XOR_using_one_hidden_layer.php



In the picture, we used the following definitions for the notations:

1. $a_i^{(j)}$: "activation" of unit i in layer j
2. $\Theta^{(j)}$: matrix of weights controlling function mapping from layer j to layer $j+1$

Here are the computations represented by the NN picture above:

$$a_0^{(2)} = g(\Theta_{00}^{(1)}x_0 + \Theta_{01}^{(1)}x_1 + \Theta_{02}^{(1)}x_2) = g(\Theta_0^T x) = g(z_0^{(2)})$$
$$a_1^{(2)} = g(\Theta_{10}^{(1)}x_0 + \Theta_{11}^{(1)}x_1 + \Theta_{12}^{(1)}x_2) = g(\Theta_1^T x) = g(z_1^{(2)})$$
$$a_2^{(2)} = g(\Theta_{20}^{(1)}x_0 + \Theta_{21}^{(1)}x_1 + \Theta_{22}^{(1)}x_2) = g(\Theta_2^T x) = g(z_2^{(2)})$$
$$h_\Theta(x) = a_1^{(3)} = g(\Theta_{10}^{(2)}a_0^{(2)} + \Theta_{11}^{(2)}a_1^{(2)} + \Theta_{12}^{(2)}a_2^{(2)})$$

In the equations, the g is **sigmoid** function that refers to the special case of the **logistic** function and defined by the formula:

$$g(z) = \frac{1}{1+e^{-z}}$$

使用 PSO 演算法找出上圖神經網路的權重值(weights)，使得輸出結果為 X_1 XOR X_2
訓練資料：(1, 1: 0), (1, 0: 1), (0, 1: 1), (0, 0: 0)
適應度值：訓練資料誤差的總和 (請註明 L1 或 L2)

繳交報告中：

1. 需說明所有使用的參數與 particle 編碼方式
2. 需記錄並圖式每次疊代(搜尋)過程中，gbest 的適應度值(fitness value)
3. 依據 PSO 找出的權重值，測試輸入為(0.8, 0.7)、(0.8, 0.2)與(0.2, 0.3)時，神經網路的輸出值為何？
4. 其它你認為需要的記錄或說明事項