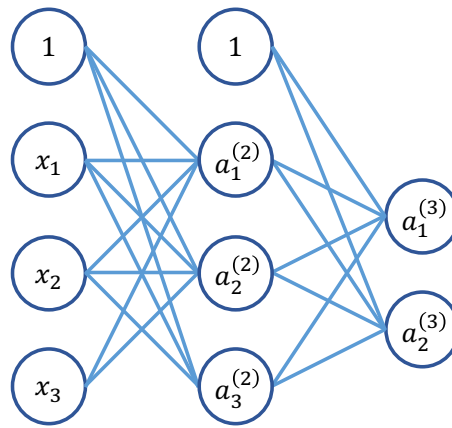


COMP4434 Big Data Analytics  
Assignment #2

Due Date: **23:59pm, Tuesday, 23 April 2019**

(marks will be deducted by 25% if late for 1 day or less, and by 100% if late for over 1 day)

The neural network given below adopts Rectified Linear Unit (ReLU) as its activation function:  $g(x) = \max\{x, 0\}$ , and its cost function is defined as  $J(\Theta) = \sum_{i=1}^2 \frac{1}{2} (a_i^{(3)} - y_i)^2$ .



Inputs: We consider a single data sample  $x = \begin{pmatrix} 0.9 \\ 0.1 \\ -1 \end{pmatrix}$  and the corresponding label  $y = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ .

Problem: Use the training data to develop the neural network model and solve it by using gradient descent algorithm. Find the values of  $\Theta^{(1)}$ ,  $\Theta^{(2)}$ , and cost function  $J$  in the first iteration. Show all calculation steps.

Initialization:  $\Theta^{(1)} = \begin{pmatrix} 0.3 & 0.9 & 1 & 0.4 \\ 0.6 & 0.8 & -0.3 & -0.6 \\ -1 & 0.1 & -0.4 & -0.2 \end{pmatrix}$ ,  $\Theta^{(2)} = \begin{pmatrix} 0.3 & 0.8 & 0.2 & 0 \\ -0.1 & 0 & -0.6 & 0.1 \end{pmatrix}$ ,  $\alpha = 0.01$