

[Machine Learning Intelligent Chip Design] Homework #2

Due: 2023/05/17

Problem

The neural network is known for solving regression and classification problems. Each neuron output is obtained by multiplying and accumulating the previous layer's input and corresponding weight, as shown in Fig.1 (a). After accumulating, the Y is obtained through the activation function operation. The activation function we use is Sigmoid, and the formula of Sigmoid is

$$\text{Sigmoid}(x) \approx \frac{1}{2} + \frac{1}{4}x - \frac{1}{48}x^3 + \frac{1}{480}x^5$$

If the result of the Sigmoid function is greater than 0.5, the output result is 1; otherwise, it is 0. Please design a neural network to simulate the XOR operation, and weights are shown in Table I. The neural network architecture is shown in Fig.1 (b). The truth table of XOR is demonstrated in Fig. 2.

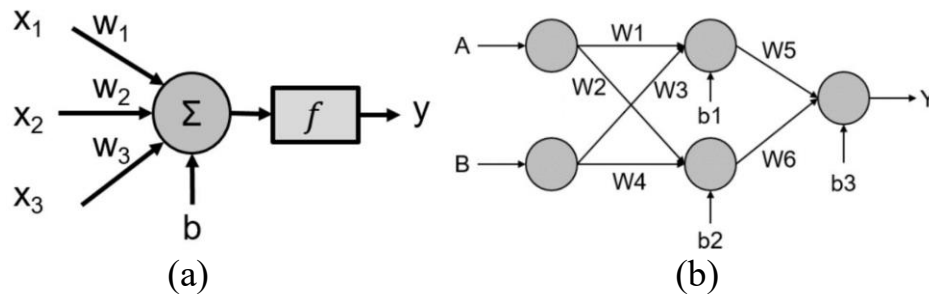


Fig. 1

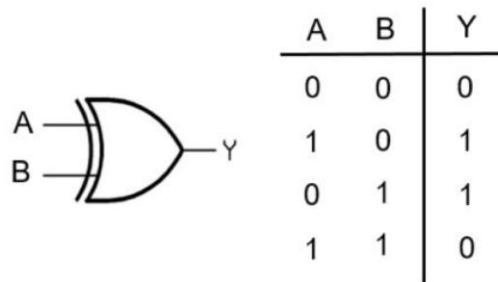


Fig. 2

Table 1

	W1	W2	W3	W4	W5	W6	b1	b2	b3
value	10	-10	-10	10	10	10	-5	-5	-5

Requirements

Complete the Neural Network block. The Neural Network block contains three neurons as sub-modules. The Pattern block is used to generate the testing patterns to verify your design. The Monitor block is used to print your output result on the screen to help you confirm the answer. Please use the Platform Architect (PA) to simulate the system and show the simulation result.

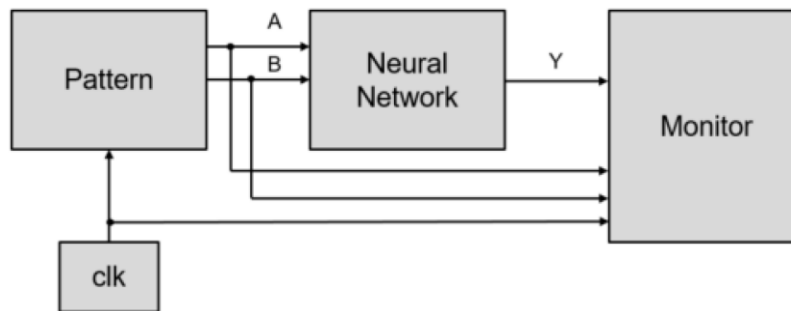


Fig. 3

Please upload the compressed file (i.e., .zip or .rar), which includes the following files, to E3@NYCU. The file name rule is Student ID_HW1.

1. Source code
2. Report (Word file Include design ideas, block diagram, and simulation result of PA)