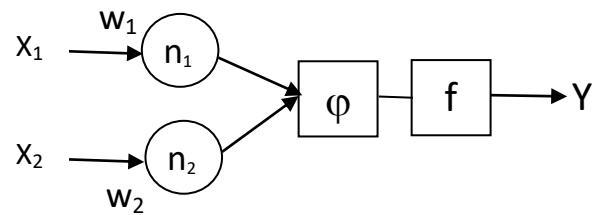


SERIES NO. 03

Exercise 01

We consider the following diagram representing a simple neural network composed of two inputs x_1, x_2 , the weights associated with the inputs w_1, w_2 , the weighted summation function ϕ , an activation function f and the output y .



1. Give the canonical form of $\phi(x_1, x_2)$
2. Write the expression for the output y as a function of the activation function f

We suppose that the activation function f is a sigmoid function which gives the output value in the interval $[0, 1]$ whatever the values of x_1, x_2 ($\text{sig}(x) = 1/(1+e^x)$)

3. Give the value of the output y in the following two cases:
 - a) $x_1 = 2, x_2 = 3, w_1 = 0, w_2 = 1, b = 4$
 - b) $x_1 = 2, x_2 = 3, w_1 = -1, w_2 = 0, b = 2$
4. Plot the curve of the output function f

Exercise 02

Given the neural network AN whose characteristics are:

- ✓ Two inputs x_1, x_2
- ✓ A hidden layer with two neurons h_1, h_2
- ✓ An output layer O with a single neuron

1. Represent this AN network with a diagram

We assume that: $x_i \in \{2, 3\}$, all neurons have the same weights $w_i \in \{0, 1\}$, bias $b = 0$, an activation function $f(y) = \text{sigmoid}(y)$

2. Express the outputs h_1 and h_2 as a function of the inputs x_i and the weights w_i and the bias b , then calculate their values.
 3. Give the expression for the output O in terms of h_1, h_2 then calculate its value.
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Exercise 03

Let $BF = \{B, C\}$,

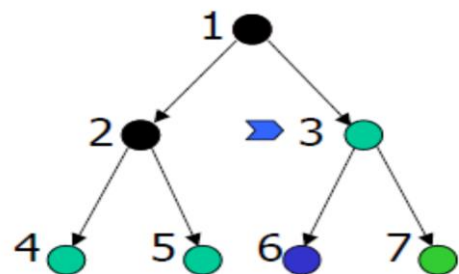
The BR is composed of the rules:

- | | |
|----------------------------|----------------------|
| 1. If B and D and E then F | 2. If G and D then A |
| 3. If C and F then A | 4. If B then X |
| 5. If D then E | 6. If X and A then H |
| 7. If C then D | 8. If X and C then A |
| 9. If X and B then D | |

1. How to prove the fact H
2. Refresh BF

Exercise 4

1. Build the search tree if the search follows a Breadth-First search strategy and give the contents of the queue for each phase



Exercise 5

Build the search tree if the search follows a depth-first search strategy and give the contents of the queue for each phase

