

# Intelligent Systems: Reasoning and Recognition

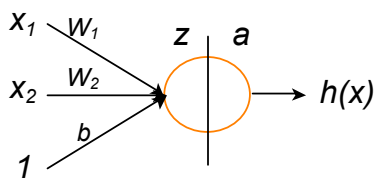
James L. Crowley

MoSIG M1  
Exercise 4 version 3

Winter Semester 2020  
(updated 30 march 2020)

## Artificial Neural Networks and Backpropagation.

You are presented with a single neuron with two inputs ( $x_1, x_2$ ) and a single output, computed using a sigmoid,  $\sigma(z)$ . Your network has been initialized with weights  $W_1=0.1$  and  $W_2=-0.2$  and  $b=+0.2$ . Assume a learning rate of  $\eta=0.1$ . Use the latest version of the course notes (updated 17 march) Your network should be trained to recognize the following training data:



m	$x_1$	$x_2$	$y_m$
1	0	1	0
2	1	0	0
3	1	1	1
4	0	0	1

- Compute  $z$ , and  $a$  for  $m=1$ .
- Compute  $\delta_m^{(out)} = (a - y_m)$  for  $m=1$ .
- Compute  $\delta_m$  for  $m=1$ . ( $\delta_m$  is the error propagating back from the neuron)
- Compute  $\Delta W_1$ ,  $\Delta W_2$ , and  $\Delta b$  for  $m=1$ .
- Update  $W_1$ ,  $W_2$ , and  $b$  for  $m=1$ .
- Will your neuron converge for this training data?