

# Practice – Backward Propagation

Assume there is the multi-layer neural network in Fig. 1 is trained with a backward propagation algorithm and the current values of the weights are shown in the followed table. A vector  $x = [0.2, 0.5, 0.1]^T$  serves as the input of the network and the result  $y$  is expected to be  $[1., 0.]^T$ .

The learning rate  $\eta = 0.5$ .

The loss function  $E = \frac{1}{2}(y_{pred} - y_{real})^2$ .

The activation function  $\varphi(v) = \frac{1}{1+\exp(-10v)}$ .

Note that some values of the activation function are shown in Fig. 2.

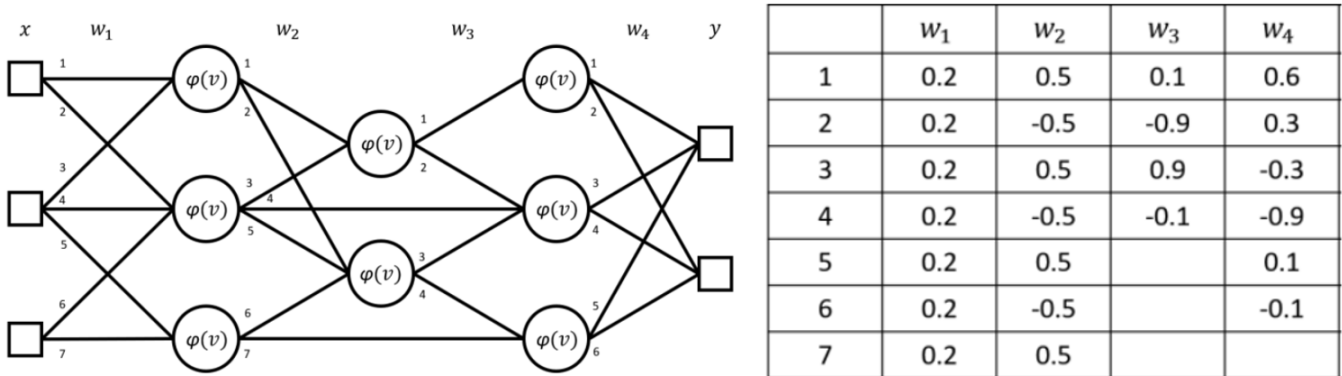


Figure 1.

$v$	-0.53	-0.37	-0.38	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.37	0.38	0.39	0.40	0.53
$\varphi(v)$	0	0.02	0.02	0.73	0.75	0.77	0.79	0.8	0.82	0.83	0.98	0.98	0.98	0.98	1
$\varphi'(v)$	0	0.2	0.2	1.97	1.88	1.77	1.66	1.6	1.48	1.41	0.2	0.2	0.2	0.2	0

Figure 2.

## Questions:

- Please compute the value of each hidden node and  $y_{pred}$ .
- Please compute the value of the updated weights of  $w_3$  after one iteration.
- Please compute the value of the next updated weights of  $w_2$  after one iteration.

(Deriving the equations first is recommended for the last two questions.)