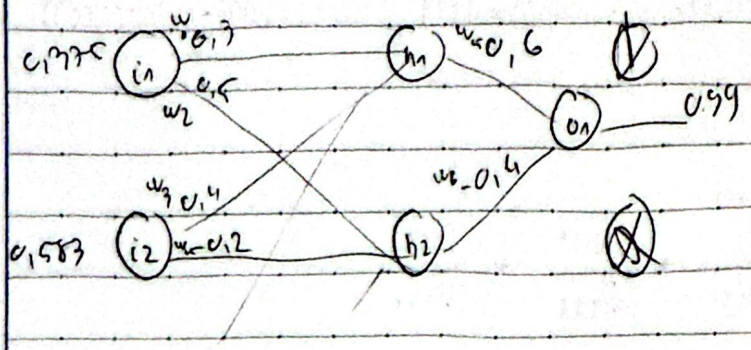
Thứ
Ngày . . No.

Question 10



$\eta = 0,1$

$b_1 = [0,1, -0,1]$ $\quad b_2 = 0.2$

Forward pass

$net_{h_1} = w_{11} i_1 + w_{12} i_2 + b_{11} = 0,375.0,3$

$= 0,3.0,375 + 0,4.0,583 + 0,1 = 0,4457$

$out_{h_1} = \frac{1}{1+e^{-net_{h_1}}} = \frac{1}{1+e^{0,4457}} = 0,3904$

$net_{h_2} = w_{21} i_1 + w_{22} i_2 + b_{12} =$

$= 0,5 . 0,375 + -0,2.0,583 + 0,1 = -0,0291$

$out_{h_2} = \frac{1}{1+e^{-net_{h_2}}} = \frac{1}{1+e^{+0,0291}} = 0,5073$

output o_1

~~$net_{o_1} = W_{21} h_1 + W_{22} h_2 +$~~

$net\,o_1 = W_{51} . out_{h_1} + W_{52} . out_{h_2} + b_2$

$= 0,6 . 0,3904 - 0,4 . 0,5073 + 0,2 = 0,2313$

$out\,o_1 = \frac{1}{1+e^{-net\,o_1}} = \frac{1}{1+e^{-0,2313}} = 0,5576$

Thứ
Ngày . . No.

Calculating the Error

$$E = \frac{1}{2}(\text{target} - \text{output})^2 = \frac{1}{2}(0,99 - 0,5576)^2$$

Backpropagation

$$\frac{\partial E}{\partial w_5} = \frac{\partial E}{\partial out} * \frac{\partial out}{\partial net} * \frac{\partial net}{\partial w_5}$$

$$+\frac{\partial E}{\partial out} = -(\text{target} - out) = -(0,99 - 0,5576) = -0,4324$$

$$\frac{\partial out}{\partial net} = out(1 - out) = 0,5576 \cdot (1 - 0,5576) = 0,2467$$

$$\frac{\partial net}{\partial w_5} = out \text{ ~~to~~ } out_{h_1} = 0,3904$$

$$\frac{\partial E}{\partial w_5} = -0,4324 \cdot 0,2467 \cdot 0,3904 = -0,0416$$

$$w_5' = w_5 - \eta \frac{\partial E}{\partial w_5} = 0,6 - 0,01 \cdot (-0,0416) = 0,6004$$

$$\frac{\partial E}{\partial w_6} = \frac{\partial E}{\partial out} * \frac{\partial out}{\partial net} * \frac{\partial net}{\partial w_6}$$

$$= -(\text{target} - out) * out(1 - out) * out_{h_2}$$

$$= -0,4324 * 0,2467 * 0,5073 = -0,0541$$

$$w_6' = w_6 - \eta \frac{\partial E}{\partial w_6} = -0,4 - 0,01 \cdot (-0,0541)$$

$$= -0,3946$$

KOKUYO

Thứ
Ngày . . No.

$$\frac{\partial E_1}{\partial w_1} = \frac{\partial E_1}{\partial out_{h_1}} * \frac{\partial out_{h_1}}{\partial net_{h_1}} * \frac{\partial net_{h_1}}{\partial w_1}$$

$$\frac{\partial E}{\partial out_{h_1}} = -(target - out_{h_1}) =$$

Hidden Layer.

$$\frac{\partial E}{\partial w_1} = \frac{\partial E}{\partial out_{h_1}} * \frac{\partial out_{h_1}}{\partial net_{h_1}} * \frac{\partial net_{h_1}}{\partial w_1}$$

w_5 before update

$$\frac{\partial E}{\partial out_{h_1}} = \frac{\partial E}{\partial net_{o_1}} * \frac{\partial net_{o_1}}{out_{h_1}} = \frac{\partial E}{\partial out} \frac{\partial out}{\partial net_o} \frac{\partial net_o}{\partial out_{h_1}}$$

$$= -0,11321 \times 0,2467 \times 0,6 = -0,0640$$

$$\frac{\partial out_{h_1}}{\partial net_{h_1}} = out_{h_1}(1 - out_{h_1}) = 0,3904(1 - 0,3904)$$
$$= 0,2379$$

$$\frac{\partial net_{h_1}}{\partial w_1} = i_1 = 0,375$$

$$\Rightarrow \frac{\partial E}{\partial w_1} = -0,0640 \times 0,2379 \times 0,375$$
$$= -0,0057$$

$$w_1' = w_1 - \eta \frac{\partial E}{\partial w_1} = 0,3 - 0,01(-0,0057) = 0,300057$$

$$\frac{\partial E}{\partial w_2} = \frac{\partial E}{\partial out_{h_2}} * \frac{\partial out_{h_2}}{\partial net_{h_2}} * \frac{\partial net_{h_2}}{\partial w_2}$$

$$\frac{\partial E}{\partial out_{h2}} = \frac{\partial E}{\partial net_{o}} \cdot \frac{\partial net_{o}}{\partial out_{h2}} = \frac{\partial E}{\partial out_{o}} \cdot \frac{\partial out_{o}}{\partial net_{o}} \cdot \frac{\partial net_{o}}{\partial out_{h2}}$$

$$= -0,4324 \times 0,2467 \times (-0,4) = 0,0427$$

$$\frac{\partial out_{h2}}{\partial net_{h2}} = out_{h2}(1 - out_{h2}) = 0,5073(1 - 0,5073) = 0,2499$$

$$\frac{\partial net_{h2}}{\partial w_2} = i_1 = 0,375$$

$$\Rightarrow \frac{\partial E}{\partial w_2} = 0,0427 \times 0,2499 \times 0,375 = 0,004$$

$$w_2' = w_2 - \eta \frac{\partial E}{\partial w_2} = 0,5 - 0,01 \times 0,004 = 0,49996$$

$$\frac{\partial E}{\partial w_3} = \frac{\partial E}{\partial out_{o}} \cdot \frac{\partial out_{o}}{\partial net_{o}} \times \frac{\partial net_{o}}{\partial out_{h1}} \times \frac{\partial out_{h1}}{\partial net_{h1}} \times \frac{\partial net_{h1}}{\partial w_3} \rightarrow i_2$$

$$= -0,4324 \times 0,2467 \times 0,16 \times 0,2379 \times 0,583$$

$$= -0,0089$$

$$w_3' = w_3 - \eta \frac{\partial E}{\partial w_3} = 0,4 - 0,01 \cdot (-0,0089) = 0,400089$$

$$\frac{\partial E}{\partial w_4} = \frac{\partial E}{\partial out_{o}} \cdot \frac{\partial out_{o}}{\partial net_{o}} \times \frac{\partial net_{o}}{\partial out_{h2}} \times \frac{\partial out_{h2}}{\partial net_{h2}} \times \frac{\partial net_{h2}}{\partial w_4} \rightarrow i_2$$

$$= -0,4324 \times 0,2467 \times (-0,4) \times 0,2499 \times 0,583$$

$$= 0,0062$$

$$w_4' = w_4 - \eta \frac{\partial E}{\partial w_4} = 0,2 - 0,01 \cdot (0,0062) = 0,199938$$