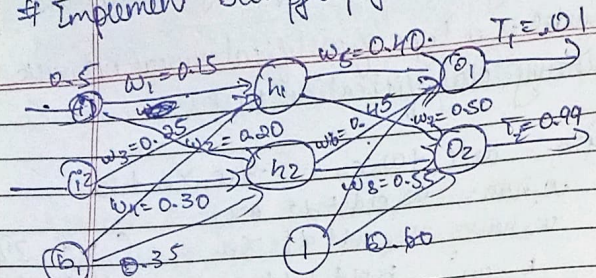
Implement backpropagation model algorithm.



$S(x) = 1/(1+e^{-x})$.

$h_{1in} = S(w_1 i_1 + w_2 i_2 + b_1)$

$= S(0.15 \times 0.05) + (0.20 \times 0.1) + 0.35$

$= S(0.3775) = 0.59327$

$h_{1in} = 1/(1+e^{-(0.3775)}) =$

$h_{2in} = (0.3 \times 0.1) + (0.25 \times 0.05) + 0.35$

$= S(0.3925)$

$h_{2in} = 1/(1+e^{-(0.3925)}) = 0.59689$.

$O_{1in} = (w_5 \times h_{1in} + w_7 \times h_{2in} + b_2)$

$O_{2in} = (w_6 \times h_{2in} + w_8 \times h_{2in} + b_2)$

$O_{1in} = (0.40 \times 0.59327 + 0.45 \times 0.59689 + 0.60)$

$S(1.10591) = 1/(1+e^{-(1.10591)}) = 0.75137$

$O_{2in} = (0.5 \times 0.59327 + 0.55 \times 0.59689 + 0.6)$

$S(1.22499) = 1/(1+e^{-1.22499})$

$= 0.77293$

$Error = \frac{1}{2} \sum (target - output)^2$.

$E = \frac{1}{2}(T_1 - out_{O_1})^2 + \frac{1}{2}(T_2 - out_{O_2})^2$.

$= (0.01 - 0.75137)^2 + (0.99 - 0.77293)^2$

$= 0.298371$.

$\delta_{O1} = (T_1 - out_{in}) \times O_{1in} \times (1 - O_{1in})$

$(0.01 - 0.75137) \times 0.75137 \times (1 - 0.75137)$

$= -0.13850$.

$w_5^{new} = w_5^{old} + \alpha * \delta_{O1} * h_{1in}$.

$= 0.4 + 0.5 \times (-0.13850) * 0.59327$.

$= 0.35892$.

$w_6^{new} = w_6^{old} + \delta \times \delta_{O1} \times h_{2in}$.

$= 0.45 + 0.5 \times (-0.13850) \times 0.59689$

$= 0.40867$

$b_3^{+} = b_3 + \eta \times \delta_{O1} \times 1$

$= 0.60 + 0.5 \times (-0.13850) \times 1. = 0.53075$

$\delta_{o2} = (T_2 - \theta_{in}) \times \theta_{gin} \times (1 - \theta_{gin})$

$= (0.99 - 0.77293) \times 0.77293 \times (1 - 0.77293)$

$= 0.03810$

$w_{7new} = w_7 + \alpha \times \delta_{o2} \times h_{gin}$

$= 0.50 + 0.5 \times 0.03810 \times 0.59327$

$= 0.51130$

$w_{8new} = w_8 + \alpha \times \delta_{o2} \times h_{2in}$

$= 0.55 \times 0.5 \times 0.03810 \times 0.59689$

$= 0.56137$

$b_4 = b_4 + \alpha \times \delta_{o2} \times 1$

$= 0.60 + 0.5 \times 0.03810 \times 1 = 0.61905$

$\delta_{h1} = (\delta_{o1} + w_5 + \delta_{o2} \times w_7) \times o_1 \times (1 - o_{ut_{h1}})$

$= (-0.13850 \times 0.40 + 0.03810 \times 0.50) \times 0.59327 \times (1 - 0.59327)$

$= -0.00877.$

$w_1 = w_1 + \alpha \times \delta_{h1} \times i_1$

$= 0.15 + 0.5 \times (-0.00877) \times 0.05$

$= 0.14978$

$w_2 = w_2 + \alpha \times \delta_{h1} \times i_2$

$= 0.20 + 0.5 \times (-0.00877) \times 0.10$

$= 0.19956.$

$b_1 = b_1 \times \alpha \times \delta_{h1} \times 1$

$= 0.035 \times 0.5 \times (-0.00877)$

$b_1 = 0.34562.$

$\delta_{h2} = (\delta_{o1} \times w_6 + \delta_{o2} \times w_8) \times o_2 (1 - o_2)$

$= ((-0.13850) \times 0.45 + 0.03810 \times 0.55) \, 0.59689 \, (1 - 0.59689))$

$= -0.00995$

$w_3 = w_3 + \alpha \times \delta_{h2} \times i_1$

$= 0.025 + 0.5 \times (-0.00995) \times 0.05$

$= 0.24975$

$w_4 = w_4 + \alpha \times \delta_{h2} \times i_2$

$= 0.30 + 0.5 \times (-0.00995) \times 0.10$

$w_4 = 0.29950$

$b_2 = b_2 \times \alpha \times \delta_{h2} \times 1$

$= 0.35 \times 0.5 \times (-0.00995) \times 1$

$= 0.34503.$

$w_1 = 0.14978 \quad w_2 = 0.19956 \quad w_3 = 0.24975$

$w_4 = 0.29950 \quad w_5 = 0.35842 \quad w_6 = 0.53075$

$w_7 = 0.51130 \quad w_8 = 0.56137$

$b_1 = 0.34562 \quad b_2 = 0.3450 \quad b_3 = 0.53075$

$b_4 = 0.61905$