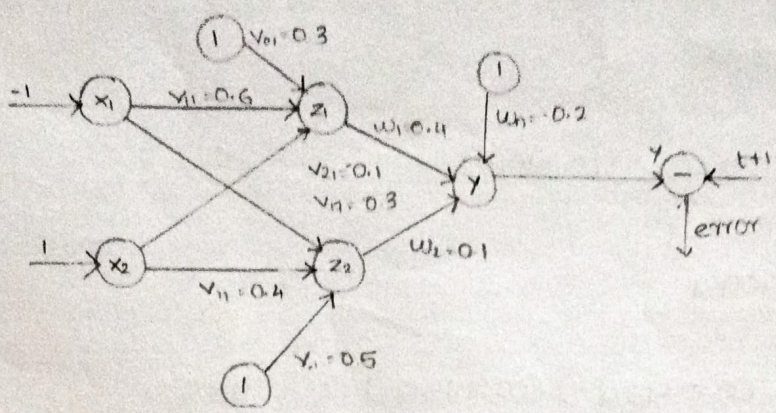
7 Using the back-propagaon network, find the new weights for the network shown in the figure. It is presented with the input pattern [-1, 1] and the target output is 1. Use a learning rate $\alpha = 0.25$ and binary sigmoidal activation function.



1. Initial weights

weight : bias $\rightarrow z_1 = 0.3$

bias $\rightarrow z_2 = 0.5$

2. Forward propagation

Hidden layer

For z_1

$net z_1 = (-1)(0.6) + (1)(-0.1) + (1)(0.3)$

$net z_1 = -0.6 - 0.1 + 0.3 = -0.4$

$z_1 = \sigma(-0.4) = 0.4013$

For z_2

$net z_2 = (-1)(-0.4) + (1)(0.4) + (1)(0.5)$

$net z_2 = 0.4 + 0.4 + 0.5 = 1.3$

$z_2 = \sigma(1.3) = 0.7858$

Output layer

$net y = (0.4013)(0.4) + (0.7858)(0.1) + (1)(0)$

$Net y = 0.1605 + 0.0786 + 0.2$

$= 0.4391$

Correct output (Before weight output)

$y = 0.6081$

3. Backward propagation

Output error Term

$\delta y = (t-y) \cdot y(1-y)$

$\delta y = (1-0.6081)(0.6081)(0.3919)$

$\delta y = 0.0934$

4. Update Hidden → output weights

$\Delta w = \alpha \delta y z$

w_{z1y}

$\Delta w = 0.25(0.0934)(0.4013)$

$= 0.00937$

$w_{z1y} = 0.4094$

w_{z2y}

$\Delta w = 0.25(0.0934)(0.7858) = 0.01836$

$w_{z2y} = 0.1184$

Bias to y

$\Delta b = 0.25(0.0934) = 0.02335$

$by^{new} = 0.2234$

5. Hidden layer Error Terms

$\delta_2 = z(1-z)\delta y w$

for z_1

$\delta_{z1} = (0.4013)(0.5987)(0.0934)(0.4)$

$\delta_{z1} = 0.00898$

for z_2

$\delta_{z2} = (0.7858)(0.2142)(0.0934)(0.1)$

$\delta_{z2} = 0.001572$

6. Update input → Hidden weight

$\Delta V = \alpha \delta_{z2} x$

updated weights for z_1

weight	Newvalue
V_{x1z1}	0.5978
V_{x2z1}	-0.0978
Bias z_1	0.3023

Updated weights for z_1

weight	New Value
$V_{x1}z_2$	-0.40039
$V_{x2}z_2$	0.40039
Bias z_2	0.50039

1. Network output

   $y = 0.6081$

2. Updated weights

   Hidden → output

   - $w_{z1y} = 0.4094$
   - $w_{z2y} = 0.1184$
   - $b_y = 0.2234$

   Input → Hidden

   - $V_{x1z1} = 0.5978$
   - $V_{x2z1} = -0.0978$
   - $b_{z1} = 0.3023$
   - $V_{x1z2} = -0.40039$
   - $V_{x2z2} = 0.40039$
   - $b_{z2} = 0.50039$