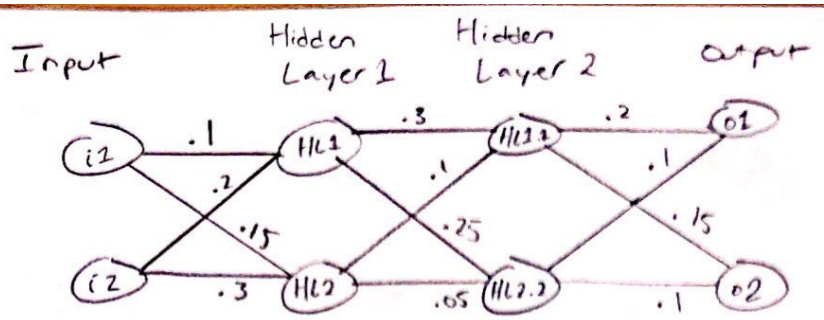


Biases:

Hidden 1: 0.2, 0.1

Hidden 2: 0.3, 0.15

Output: 0.15, 0.2

Inputs:

$i1 = 0.1 \quad i2 = 0.15$

$HL1 = (0.1)0.1 + (0.15)(0.2) + 0.2 = 0.24$

$\text{output } HL1 = \frac{1}{1+e^{-0.24}} \approx 0.56$

$HL2 = (0.1)(0.15) + (0.15)(0.3) + 0.1 = 0.16$

$\text{output } HL2 = \frac{1}{1+e^{-.16}} \approx 0.54$

Logistic Function

$\text{output}_{\substack{HL1 \\ \text{or} \\ HL2}} = \frac{1}{1+e^{-\text{net}_{HL1 \text{ or } HL2}}}$

$HL1.1 = (0.56)(0.3) + (0.54)(0.1) + 0.3 = 0.522$

$\text{output } HL1.1 = \frac{1}{1+e^{-.522}} \approx 0.63$

$HL2.2 = (0.56)(0.25) + (0.54)(.05) + 0.15 = 0.317$

$\text{output } HL2.2 = \frac{1}{1+e^{-.317}} \approx 0.58$

Outputs

$O_1 = 0.58$

$O_2 = 0.59$

$o1 = (0.63)(.2) + (0.58)(.1) + .15 = 0.334$

$\text{output}_{o1} = \frac{1}{1+e^{-.334}} \approx \boxed{0.58}$

$o2 = (0.63)(.15) + (0.58)(.1) + .2 = 0.3525$

$\text{output}_{o2} = \frac{1}{1+e^{-0.3525}} \approx \boxed{0.59}$

Target Outputs

$O_1 = 0.95$

$O_2 = 0.05$

Total Error

$E_{O_1} = 0.06845$

$E_{O_2} = 0.1458$

$E_{\text{total}} = 0.21425$

$$\frac{\partial E_{\text{total}}}{\partial w} = \frac{\partial E_{\text{total}}}{\partial \text{out}} * \frac{\partial \text{out}}{\partial \text{net}} * \frac{\partial \text{net}}{\partial w}$$

$$\frac{\partial E_{\text{total}}}{\partial \text{out}} = -(\text{target}_{o1} - \text{out}_{o1})$$

$$\frac{\partial \text{net}}{\partial w} = \text{out}_{\text{previous}}$$

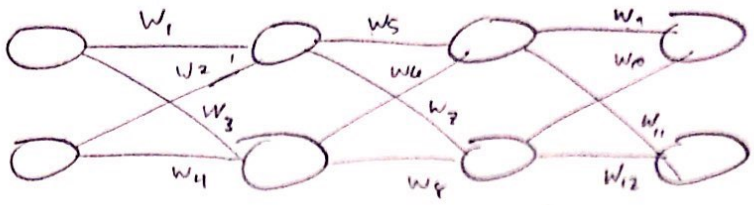
Learning Rate

$\eta = 0.5$

$$\frac{\partial \text{out}}{\partial \text{net}} = \text{out}(1 - \text{out})$$

$$w^+ = w - \eta \cdot \frac{\partial E_{\text{total}}}{\partial w}$$

Scanned with CamScanner



$$\frac{\partial E_T}{\partial w_9} = -(.95-.58)\cdot.58(1-.58)\cdot.63 = -0.05608$$

$$\frac{\partial E_T}{\partial w_{10}} = -(.95-.58)\cdot.58(1-.58)\cdot.58 = -0.0523$$

$$\frac{\partial E_T}{\partial w_{11}} = -(.05-.59)\cdot.59(1-.59)\cdot.63 = 0.08229$$

$$\frac{\partial E_T}{\partial w_{12}} = -(0.5-.59)\cdot.59(1-.59)\cdot.58 = 0.07576$$

$$w_9^+ = .2-(.5)(-.0568) = 0.228$$

$$w_{10}^+ = .1-(.5)(-0.0523) = 0.126$$

$$w_{11}^+ = .15-(.5)(.08229) = 0.109$$

$$w_{12}^+ = .1-(.5)(.07576) = 0.062$$

$$\frac{\partial E_T}{\partial w} = \left(\sum \frac{\partial E_T}{\partial out} \cdot \frac{\partial out_o}{\partial net_o} \cdot \frac{\partial net_o}{\partial out_{h_1}}\right) \cdot \frac{\partial out_{h_1}}{\partial net_{h_1}} \cdot \frac{\partial net_{h_1}}{\partial w_1}$$

$$\frac{\partial E_T}{\partial w_5} = -(.95-.58)\cdot.58(1-.58)\cdot.2 + -(0.5-.59)\cdot.59(1-.59)\cdot.15 = 0.0081$$

$$= 0.0081\cdot.63(1-.63)\cdot.56 = 0.0011$$

$$\frac{\partial E_T}{\partial w_6} = 0.0081\cdot.63(1-.63)\cdot.54 = 0.001$$

$$w_5^+ = .3-(.5)(0.0011) = 0.299$$

$$w_6^+ = .1-(.5)(.001) = 0.0995$$

$$\frac{\partial E_T}{\partial w_7} = -(.95-.58)\cdot.58(1-.58)\cdot.1 + -(.5-.59)\cdot.59(1-.59)\cdot.1 = 0.004$$

$$= 0.004\cdot.58(1-.58)\cdot.56 = 0.0005$$

$$\frac{\partial E_T}{\partial w_8} = 0.004-.58(1-.58)\cdot.54 = 0.0005$$

$$w_7^+ = .25-(.5)(.0005) = 0.2498$$

$$w_8^+ = 0.05-(.5)(.0005) = 0.04975$$

Scanned with CamScanner