

#1 Weight Updates

	a	b	d	w_{ca}	w_{cb}	w_{cd}	w_{dc}	w_{db}
T1	1	0	1	.1	.1	.1	.1	.1
T2	0	1	0					

Training Set 1

$$C = A * w_{ca} + B * w_{cb} + 1$$

$$= 1 * .1 + 0 + 1 + 1 * .1$$

$$= 0.2$$

$$\text{sigmoid} = \frac{1}{1+e^{-x}}$$

$$= \frac{1}{1+e^{-.2}}$$

$$C = 0.5498$$

$$D = C * w_{dc} + 1 * 0.1$$

$$= (0.5498 * 0.1) + (1 * .1)$$

$$= 0.15498$$

$$= \frac{1}{1+e^{-.15498}}$$

$$D = 0.538667$$

$$\text{Total Error} = \sum \frac{1}{2} (\text{TARGET} - \text{OUTPUT})^2$$

$$= \frac{1}{2} (1 - .538667)^2$$

$$E_d = 0.1064$$

$$E_c = .5 (1 - 0.5498) * 1 * 0.1064$$

$$E_c = 0.02395$$

$$\Delta w_{cb} = 0.3 * .002395 * 0 = 0$$

$$\Delta w_{ca} = 0.3 * .002395 * 1 = 0.0007194$$

$$\Delta w_{cd} = 0.3 * .002395 * 1 = 0.0007194$$

$$\Delta w_{dc} = 0.3 * 0.1064 * 0.5498 = 0.0175$$

$$\Delta w_{db} = 0.3 * 0.1064 * 1 = 0.0392$$

NEW WEIGHTS First TRAINING ITERATION

$$w_{CA} = 0.1 + 0.0007194 = 0.1007194$$

$$w_{CB} = 0.1 + 0 = 0.1$$

$$w_{CO} = 0.1 + 0.0007194 = 0.1007194$$

$$w_{PC} = 0.1 + 0.0175 = 0.1175$$

$$w_{BO} = 0.1 + 0.0392 = 0.1392$$

Training Set 2

$$C = (0 * 0.1007194) + (1 * 0.1) + (1 * 0.1007194)$$
$$= 0.2007194$$

$$\frac{1}{1 + e^{-0.2007194}}$$

$$C = 0.5500121$$

$$D = (0.1175 * 0.5500121) + (0.0392 * 1)$$

$$= 0.06462642175 + 0.0392$$

$$= 0.10382642175$$

$$\frac{1}{1 + e^x}$$

$$D = 0.525933$$

Total Error

$$E_d = \frac{1}{2} (0 - 0.525933)^2$$

$$E_d = 0.1383027602445$$

$$S_c = \frac{1}{2} (0 - 0.5500121) * 0.1175 * 0.13830276...$$

$$S_c = -0.00446907857$$

$$\Delta w_{cb} = 0.3 * (-0.00446907) * 1 + (0.9 * 0) = -0.001340721$$

$$\Delta w_{ca} = 0.3 * (-0.00446907) * 0 + (0.9 * 0.0007194) = 0.00064746$$

$$\Delta w_{co} = 0.3 * (-0.00446907) * 1 + (0.9 * 0.0007194) = 0.005133879$$

$$\Delta w_{bc} = 0.3 * (.1383627602445) * 0.550121 + (0.9 * 0.1175) = 0.0232198$$

$$\Delta w_{bo} = 0.3 * (.1383627602445) * 1 + (0.9 * 0.0392) = 0.98069$$

New weights for TRAINING set 2

$$w_{ca} = 0.1007194 - 0.00064746 = 0.10007194$$

$$w_{cb} = 0.1 - (-0.001340721) = 0.101340721$$

$$w_{co} = 0.1007194 - 0.005133879 = 0.095585521$$

$$w_{bc} = 0.1175 - 0.0232198 = 0.0942802$$

$$w_{bo} = 0.1392 - 0.98069 = -0.84149$$

#2 Changing Backprop

Since the derivative of $\tanh = 1 - y^2$ and $o = \tanh$,

Then
$$\delta_k \leftarrow o_k(1-o_k)(t_k-o_k)$$

$$\delta_k \leftarrow (1-o_k)(1-o_k)(t_k-o_k)$$

$$\delta_k \leftarrow (1-o_k)^2(t_k-o_k)$$

$$\delta_h \leftarrow o_h(1-o_h) \sum_k w_{kh} \delta_k$$

$$\delta_h \leftarrow (1-o_h)(1-o_h) \sum_k w_{kh} \delta_k$$

$$\delta_h \leftarrow (1-o_h)^2 \sum_k w_{kh} \delta_k$$