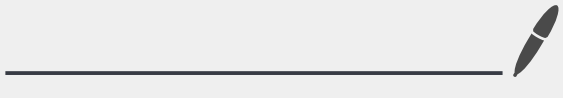

	Pdf	CDf	Scale		
$H_r(0) = 1$	$P_r(0) = \frac{1}{15}$	$F_r(0)\frac{1}{15}$	$T(0) = \frac{7}{15}$	0	$(q-1)\,F_r(r)$
$H_r(1) = 1$	$P_r(1) = \frac{1}{15}$	$\frac{2}{15}$	$T(1) = \frac{14}{15}$	0	
$H_r(2) = 0$	$P_r(2) = \frac{0}{15}$	$\frac{2}{15}$	$T(2) = \frac{14}{15}$	0	
$H_r(3) = 1$	$P_r(3) = \frac{1}{15}$	$\frac{3}{15}$	$T(3) = \frac{21}{15}$	1	
$H_r(4) = 2$	$P_r(4) = \frac{2}{15}$	$\frac{5}{15}$	$T(4) = \frac{35}{15}$	2	
$H_r(5) = 2$	$P_r(5) = \frac{2}{15}$	$\frac{7}{15}$	$T(5) = \frac{49}{15}$	3	
$H_2(6) = 4$	$P_r(6) = \frac{4}{15}$	$\frac{11}{15}$	$T(6) = \frac{77}{15}$	5	
$H_r(7) = 4$	$P_r(7) = \frac{4}{15}$	$\frac{15}{15}$	$T(7) = 7$	7	

1 1 7 6 3 6 6

1	1	7	6	3	6	6
7	7	6	5	6	4	4
5	5	4	7	7	0	0
5	5	4	7	7	0	0

1	0	-1
2	0	-2
1	0	-1

Pad with 1

-17	-13	12	1	-7
-3	-3	1	9	8
4	-4	-9	22	23

$$C(y_n, \hat{y}_n) = \frac{1}{2}(y_n - \hat{y}_n)^2$$

Forward pass

$a_1 = 1 \quad c_1 = 2 \quad \hat{y} = 2 \quad C = \frac{1}{2}(y - \hat{y})^2 = \frac{1}{2}$

$a_2 = 0$

$a_3 = 1 \quad c_2 = -4$

$a_4 = -4$

Backward pass

$$\frac{\partial C}{\partial \hat{y}} = \frac{\partial}{\partial \hat{y}}\left[\frac{1}{2}(y-\hat{y})^2\right] = -(y-\hat{y}) = 1 \qquad \hat{y}' = 1$$

$$\frac{\partial C}{\partial c_1} = \frac{\partial \hat{y}}{\partial c_1}\frac{\partial C}{\partial \hat{y}} = \left(\frac{\partial \max(c_1, c_2) = 1}{\partial c_1}\right) \cdot 1 = 1$$

$$\frac{\partial C}{\partial c_2} = \frac{\partial \hat{y}}{\partial c_1}\frac{\partial C}{\partial \hat{y}} = \left(\frac{\partial \max(c_1, c_2) = 0}{\partial c_2}\right) \cdot 1 = 0$$

$$\frac{\partial C}{\partial b_1} = \frac{\partial c_1}{\partial b_1}\frac{\partial C}{\partial c_1} = \frac{\partial (a_1 + a_2 + b_1)}{\partial b_1} \cdot 1 = 1$$

$$\frac{\partial C}{\partial b_2} = \frac{\partial c_2}{\partial b_2}\frac{\partial C}{\partial c_2} = 0$$

$$\frac{\partial C}{\partial a_1} = \frac{\partial c_1}{\partial a_1}\cdot\frac{\partial C}{\partial c_1} = 1$$

$$\frac{\partial C}{\partial a_2} = 1$$

$$\frac{\partial L}{\partial q_3} = 0 \qquad \frac{\partial L}{\partial q_4} = 0$$

$$\frac{\partial L}{\partial \omega_1} = \frac{\partial q_1}{\partial \omega_1} \cdot \frac{\partial L}{\partial q_1} = 1 \cdot X_1 = X_1 = -1$$

$$\frac{\partial L}{\partial \omega_2} = \frac{\partial q_2}{\partial \omega_2} \cdot \frac{\partial L}{\partial q_2} = 1 \cdot X_2 = X_2 = 0$$

$$\frac{\partial L}{\partial \omega_3} = 0$$

$$\frac{\partial L}{\partial \omega_4} = 0$$

$$C(y_n, \hat{y}_n) = \frac{1}{2}(y_n - \hat{y}_n)^2$$

Forward pass

$a_1 = 1 \quad c_1 = 2 \qquad \hat{y} = 2 \qquad C = \frac{1}{2}(y - \hat{y})^2 = \frac{1}{2}$

$a_2 = 0$

$a_3 = 1 \quad c_2 = -4$

$a_4 = -4$

Backword pass

$$\frac{\partial C}{\partial \hat{y}} = \frac{\partial}{\partial \hat{y}}\left[\frac{1}{2}(y-\hat{y})^2\right] = -(y-\hat{y}) = 1 \qquad \hat{y}' = 1$$

$$\frac{\partial C}{\partial c_1} = \frac{\partial \hat{y}}{\partial c_1}\frac{\partial C}{\partial \hat{y}} = \left(\frac{\partial \max(c_1, c_2) = 1}{\partial c_1}\right) \cdot 1 = 1$$

$$\frac{\partial C}{\partial c_2} = \frac{\partial \hat{y}}{\partial c_1}\frac{\partial C}{\partial \hat{y}} = \left(\frac{\partial \max(c_1, c_2) = 0}{\partial c_2}\right) \cdot 1 = 0$$

$$\frac{\partial C}{\partial b_1} = \frac{\partial c_1}{\partial b_1}\frac{\partial C}{\partial c_1} = \frac{\partial (a_1 + a_2 + b_1)}{\partial b_1} \cdot 1 = 1$$

$$\frac{\partial C}{\partial b_2} = \frac{\partial c_2}{\partial b_2}\frac{\partial C}{\partial c_2} = 0$$

$$\frac{\partial C}{\partial a_1} = \frac{\partial c_1}{\partial a_1} \cdot \frac{\partial C}{\partial c_1} = 1$$

$$\frac{\partial C}{\partial a_2} = 1$$

$$\frac{\partial C}{\partial a_3} = 0 \qquad \frac{\partial C}{\partial a_4} = 0$$

$$\frac{\partial C}{\partial w_1} = \frac{\partial a_1}{\partial w_1} \cdot \frac{\partial C}{\partial a_1} = 1 \cdot x_1 = x_1 = -1$$

$$\frac{\partial C}{\partial w_2} = \frac{\partial a_2}{\partial w_2} \cdot \frac{\partial C}{\partial a_2} = 1 \cdot x_2 = x_2 = 0$$

$$\frac{\partial C}{\partial w_3} = 0$$

$$\frac{\partial C}{\partial w_4} = 0$$

Gradient descent

w_1 : $\bar{w}_1 = w_1 + \alpha \cdot \left(-\frac{\partial C}{\partial w_1}\right) = -0.9$

w_3 : $\bar{w}_3 = w_3 + \alpha \left(-\frac{\partial C}{\partial w_3}\right) = -1$

b_1 : $\bar{b}_1 = b_1 + \alpha \left(-\frac{\partial C}{\partial b_1}\right) = 0.9$