(3) Loss ∠ back propagation - for hidden layer

$E_{total} = \frac{1}{2}(target_k - out_k)^2$

• Apply chain rule for i

(*) $\frac{dE_{total}}{dw_{ik}} = \frac{dE_{total}}{dout_k}_{(1)} \times \frac{dout_k}{dnetout_k}_{(2)} \times \frac{dnetout_k}{dw_{ik}}_{(3)}$

(1) $= 2 \times \frac{1}{2}(target_k - out_k)^{2-1} \times (-1)$

$= 2 \times \frac{1}{2}(1 - 0.58)^1 \times (-1) =$

$= -0.42$

(2) $= 0.58 * (1 - 0.58) = 0.24$

(3) $= 0.54$

$\Rightarrow \frac{dE_{total}}{dw_{ik}} = 0.42 \times 0.24 \times 0.54 =$

$= 0.054.$

• $w_{ik}' = w_{ik} - \mu \times (*)$; with $\mu = 0.5$

$= 0.54 - 0.5 \times 0.054$

$= 0.513$

• Apply chain rule for j

$\Rightarrow w_{jk}' = w_{jk} - \mu_n(*)$

$= 0.1 - 0.5 \times 0.056$

$= 0.072.$

(4) loss ∠ back prop - for input

• Apply chain rule for node 1, 2, 3.

(*) $\frac{dE_{total}}{dw_{ij}} = \frac{dE_{total}}{dout_j} \times \frac{dout_j}{dnetout_j}_{(2)} \times \frac{dnetout_j}{dw_{ij}}_{(3)}$

$\hookrightarrow \frac{dE_{total}}{dw_{ij}} = \frac{dE_{total}}{dout_k} \times \frac{dout_k}{dnetout_k} \times \frac{dnetout_k}{dw_{ij}}$

(*) $\frac{dE_{total}}{dw_{ij}} = \frac{dE_{total}}{dout_k} \times \frac{dout_k}{dnetout_k} \times \frac{dnetout_k}{dout_j} \times \frac{dout_j}{dnetout_j} \times \frac{dnetout_j}{dw_{ij}}$

$\Rightarrow$