Intelligent Systems Assignment 2

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1 Back propagation

The formula for estimating the ΔC along the activation path $a_2^{(2)}, a_3^{(3)}, a_1^{(4)}$ is below.

$$\Delta C \approx \frac{\partial C}{\partial a_1^4}\frac{\partial a_1^4}{\partial a_3^3}\frac{\partial a_3^3}{\partial a_2^2}\frac{\partial a_2^2}{\partial w_{21}^2}\Delta w_{21}^2$$

$\frac{\partial C}{\partial a_1^4} = \frac{\partial}{\partial a_1^4}(y - a_1^4) = -y + 2a_1^4$
$\frac{\partial a_1^4}{\partial a_3^3} = a_1^4(1 - a_1^4)w_{13}^4$
$\frac{\partial a_3^3}{\partial a_2^2} = a_3^3(1 - a_3^3)w_{32}^3$
$\frac{\partial a_2^2}{\partial w_{21}^2} = a_2^2(1 - a_2^2)w_{21}^2$

$$\Delta C \approx (-y + 2a_1^4)(a_1^4(1 - a_1^4)w_{13}^4)(a_3^3(1 - a_3^3)w_{32}^3)(a_2^2(1 - a_2^2)w_{21}^2)\Delta w_{21}^2$$