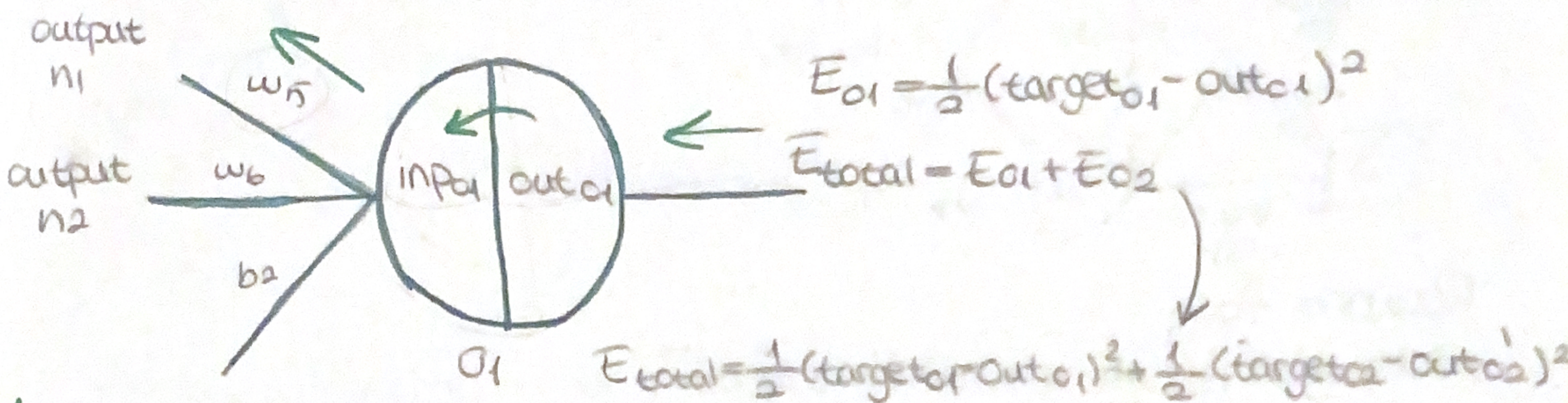


Backprop + Chain Rule Visual

$$\frac{\partial \text{inp}_{o1}}{\partial w_5} * \frac{\partial \text{out}_{o1}}{\partial \text{inp}_{o1}} * \frac{\partial E_{\text{total}}}{\partial \text{out}_{o1}} = \frac{\partial E_{\text{total}}}{\partial w_5}$$



$$\frac{\partial E_{\text{total}}}{\partial \text{out}_{o1}} = 2 * \frac{1}{2} (\text{target}_{o1} - \text{out}_{o1})^{2-1} * (-1) + 0$$

$$= -(\text{target}_{o1} - \text{out}_{o1}) = \underline{\underline{0.741}}$$

$$\frac{\text{out}_{o1}}{\text{inp}} = \frac{1}{1 + e^{-\text{inp}_{o1}}} \rightarrow \frac{\partial \text{out}_{o1}}{\partial \text{inp}_{o1}} = \text{out}_{o1} (1 - \text{out}_{o1}) = \underline{\underline{0.186}}$$

$$3 \text{ inp}_{o1} = w_5 * \text{out}_{n1} + w_6 * \text{out}_{n2} + b_2 * 1$$

$$\frac{\partial \text{inp}_{o1}}{\partial w_5} = \text{out}_{n1} = \underline{\underline{0.593}}$$

$$\frac{\partial E_{\text{total}}}{\partial w_5} = \frac{\partial E_{\text{total}}}{\partial \text{out}_{o1}} * \frac{\partial \text{out}_{o1}}{\partial \text{inp}_{o1}} * \frac{\partial \text{inp}_{o1}}{\partial w_5} = 0.741 * 0.18 * 0.593 = \underline{\underline{0.082}}$$

Delta Rule

$$\frac{\partial E_{\text{total}}}{\partial w_5} = - \underbrace{(\text{target}_{o1} - \text{out}_{o1})}_{\frac{\partial E_{\text{total}}}{\partial \text{out}_{o1}}} * \underbrace{\text{out}_{o1} (1 - \text{out}_{o1})}_{\frac{\partial \text{out}_{o1}}{\partial \text{inp}_{o1}}} * \underbrace{\text{out}_{n1}}_{\frac{\partial \text{inp}_{o1}}{\partial w_5}}$$

Then update

$$w_i = w - \alpha \frac{\partial J(w, b)}{\partial w}$$

$$b_i = b - \alpha \frac{\partial J(w, b)}{\partial b}$$

