



$$\begin{aligned}
\frac{\partial E}{\partial w_2} &= \frac{\partial \sum (T_i - z_i)^2}{\partial w_2} \\
&= 2(T - z) \frac{\partial z}{\partial w_2} \\
&= 2(T - z) \frac{\partial (\sigma(w_2^T y + b_2))}{\partial w_2} \\
&= 2(T - z) \sigma' (w_2^T y + b_2) x
\end{aligned}$$

$$\begin{aligned}
\frac{\partial E}{\partial b_2} &= \frac{\partial \sum (T_i - z_i)^2}{\partial b_2} \\
&= 2(T - z) \frac{\partial z}{\partial b_2} \\
&= 2(T - z) \frac{\partial (\sigma(w_2^T y + b_2))}{\partial w_2} \\
&= 2(T - z) \sigma' (w_2^T y + b_2)
\end{aligned}$$

$$\begin{aligned}
\frac{\partial E}{\partial w_1} &= \frac{\partial \sum (T_i - z_i)^2}{\partial w_1} \\
&= 2(T - z) \frac{\partial z}{\partial w_1} \\
&= 2(T - z) \frac{\partial (\sigma(w_2^T y + b_2))}{\partial w_1} \\
&= 2(T - z) \sigma' (w_2^T y + b_2) w_2 \frac{\partial y}{\partial w_1} \\
&= 2(T - z) \sigma' (w_2^T y + b_2) w_2 \frac{\partial (\sigma(w_1^T x + b_1))}{\partial w_1} \\
&= 2(T - z) \sigma' (w_2^T y + b_2) w_2 \sigma' (w_1^T x + b_1) x
\end{aligned}$$

$$\begin{aligned}
\frac{\partial E}{\partial b_1} &= \frac{\partial \sum (T_i - z_i)^2}{\partial b_1} \\
&= 2(T - z) \frac{\partial z}{\partial b_1} \\
&= 2(T - z) \frac{\partial (\sigma(w_2^T y + b_2))}{\partial b_1} \\
&= 2(T - z) \sigma' (w_2^T y + b_2) w_2 \frac{\partial y}{\partial b_1} \\
&= 2(T - z) \sigma' (w_2^T y + b_2) w_2 \frac{\partial (\sigma(w_1^T x + b_1))}{\partial b_1} \\
&= 2(T - z) \sigma' (w_2^T y + b_2) w_2 \sigma' (w_1^T x + b_1)
\end{aligned}$$