

$$\frac{\partial J}{\partial \mathbf{z}} = \frac{\partial J}{\partial \mathbf{y}} \circ \left( \frac{\partial y_{m,j}}{\partial z_{m,j}} \right)_{m,j}$$

$$\frac{\partial J}{\partial \mathbf{x}} = \frac{\partial J}{\partial \mathbf{z}} \mathbf{W}^T$$

$$\frac{\partial J}{\partial \mathbf{W}} = \frac{1}{M} \cdot \mathbf{x}^T \frac{\partial J}{\partial \mathbf{z}}$$

$$\frac{\partial J}{\partial \mathbf{b}} = \frac{1}{M} \left( \frac{\partial J}{\partial \mathbf{z}} \right)^T \mathbf{1}_M$$

$$\mathbf{1}_M = \begin{pmatrix} 1 \\ \vdots \\ 1 \end{pmatrix} \begin{matrix} \uparrow \\ M \\ \downarrow \end{matrix} \text{ is an all-one vector}$$