PRACTICAL-1: PEN AND PAPER SOLUTIONS

ANDREA JEMMETT

Exercise-1

Solution.

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial W_{out}} &= \frac{\partial}{\partial W_{out}}\frac{1}{2}(y_{out}-y_{gt})^2 \\ &= (y_{out}-y_{gt})\cdot\frac{\partial}{\partial W_{out}}(y_{out}-y_{gt}) \\ &= (y_{out}-y_{gt})\cdot\frac{\partial}{\partial W_{out}}f_3(W_{out}z_2) \\ &= (y_{out}-y_{gt})\cdot f_3'(s_{out})\cdot z_2.\end{aligned} \tag{1}$$

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial W_2} &= \frac{\partial}{\partial W_2}\frac{1}{2}(y_{out}-y_{gt})^2 \\ &= (y_{out}-y_{gt})\cdot\frac{\partial}{\partial W_2}f_3(W_{out}\cdot f_2(W_2z_1)) \\ &= (y_{out}-y_{gt})\cdot f_3'(s_{out})\frac{\partial}{\partial W_2}f_2(W_2z_1) \\ &= (y_{out}-y_{gt})\cdot f_3'(s_{out})\cdot f_2'(s_2)\cdot z_1.\end{aligned} \tag{2}$$

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial W_1} &= \frac{\partial}{\partial W_1}\frac{1}{2}(y_{out}-y_{gt})^2 \\ &= (y_{out}-y_{gt})\cdot\frac{\partial}{\partial W_1}f_3(W_{out}\cdot f_2(W_2z_1)) \\ &= (y_{out}-y_{gt})\cdot f_3'(s_{out})\cdot\frac{\partial}{\partial W_1}f_2(W_2z_1) \\ &= (y_{out}-y_{gt})\cdot f_3'(s_{out})\cdot f_2'(s_2)\cdot\frac{\partial}{\partial W_1}f_1(W_1x_{in}) \\ &= (y_{out}-y_{gt})\cdot f_3'(s_{out})\cdot f_2'(s_2)\cdot f_1'(s_1)\cdot x_{in}.\end{aligned} \tag{3}$$

■

Received by the editors November 1, 2016.