$$L_{simple}(w) = \left[\sigma\left(w, \begin{pmatrix}1\\0\end{pmatrix}\right) - 1\right]^2 + \left[\sigma\left(w, \begin{pmatrix}0\\1\end{pmatrix}\right)\right]^2 + \left[\sigma\left(w, \begin{pmatrix}1\\1\end{pmatrix}\right) - 1\right]^2$$

$$\sigma(w, x) = \frac{1}{1+e^{-w^T x}}, \quad w = \begin{bmatrix} w_1 \\ w_2 \end{bmatrix}$$

$$\sigma\left(w, \begin{pmatrix}1\\0\end{pmatrix}\right) = \frac{1}{1+e^{-[w_1\ w_2]\begin{bmatrix}1\\0\end{bmatrix}}} = \frac{1}{1+e^{-w_1}}$$

$$\sigma\left(w, \begin{pmatrix}0\\1\end{pmatrix}\right) = \frac{1}{1+e^{-[w_1\ w_2]\begin{bmatrix}0\\1\end{bmatrix}}} = \frac{1}{1+e^{-w_2}}$$

$$\sigma\left(w, \begin{pmatrix}1\\1\end{pmatrix}\right) = \frac{1}{1+e^{-[w_1\ w_2]\begin{bmatrix}1\\1\end{bmatrix}}} = \frac{1}{1+e^{-w_1-w_2}}$$

$$\Rightarrow \boxed{L_{simple}(w) = \left(\frac{1}{1+e^{-w_1}} - 1\right)^2 + \left(\frac{1}{1+e^{-w_2}}\right)^2 + \left(\frac{1}{1+e^{-w_1-w_2}} - 1\right)^2}$$

$$\nabla_w L_{simple}(w) = \left[\frac{\partial L_{simple}(w)}{\partial w_1}, \frac{\partial L_{simple}(w)}{\partial w_2}\right]$$

Using Wolfram Alpha:

$$\cancel{\frac{\partial L_{simple}(w)}{\partial w_1} = -2e^{w_1}(6e^{w_1+w_2} + 3e^{2(w_1+w_2)} + e^{3(w_1+w_2)} + 3e^{2x+y} + e^{3x+y} + e}$$

$$\boxed{\frac{\partial L_{simple}(w)}{\partial w_1} = \frac{-2e^{w_1}(6e^{w_1+w_2} + 3e^{2(w_1+w_2)} + e^{3(w_1+w_2)} + 3e^{2w_1+w_2} + e^{3w_1+w_2} + e^{w_2} + 1}{(e^{w_1}+1)^3(e^{w_1+w_2}+1)^3}}$$

$$\boxed{\frac{\partial L_{simple}(w)}{\partial w_2} = \frac{2e^{2w_2}}{(e^{w_2}+1)^3} - \frac{2e^{w_1+w_2}}{(e^{w_1+w_2}+1)^3}}$$

So:

$$\nabla_\omega L_{simple}(\omega) = \left[\frac{-2e^{\omega_1}(6e^{\omega_1+\omega_2} + 3e^{2(\omega_1+\omega_2)} + e^{3(\omega_1+\omega_2)} + 3e^{2\omega_1+\omega_2} + e^{3\omega_1+\omega_2} + e^{\omega_2} + 1}{(e^{\omega_1}+1)^3(e^{\omega_1+\omega_2}+1)^3}, \frac{2e^{2\omega_2}}{(e^{\omega_2}+1)^3} - \frac{2e^{\omega_1+\omega_2}}{(e^{\omega_1+\omega_2}+1)^3} \right]$$