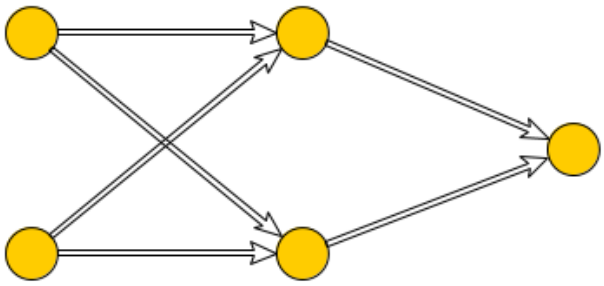

$$x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_{22} \end{bmatrix} \begin{bmatrix} b_1 \\ b_2 \end{bmatrix} \qquad \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} \quad \begin{bmatrix} b \end{bmatrix}$$

$$\text{MSE} = \frac{1}{4}\sum_x (f(x) - f^*(x))^2$$

$$f(x) = w_1\sigma(w_{11}x_1 + w_{12}x_2 + b_1) + w_2\sigma(w_{21}x_1 + w_{22}x_2 + b_2) + b$$

$$\text{MSE} = \frac{1}{4}\sum_x (w_1\sigma(w_{11}x_1 + w_{12}x_2 + b_1) + w_2\sigma(w_{21}x_1 + w_{22}x_2 + b_2) + b - f^*(x))^2$$

$$\begin{aligned}
\frac{\partial \text{MSE}}{\partial w_{11}} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))w_1\sigma'(w_{11}x_1 + w_{12}x_2 + b_1)x_1 \\
\frac{\partial \text{MSE}}{\partial w_{12}} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))w_1\sigma'(w_{11}x_1 + w_{12}x_2 + b_1)x_2 \\
\frac{\partial \text{MSE}}{\partial b_1} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))w_1\sigma'(w_{11}x_1 + w_{12}x_2 + b_1) \\
\frac{\partial \text{MSE}}{\partial w_{21}} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))w_2\sigma'(w_{21}x_1 + w_{22}x_2 + b_2)x_1 \\
\frac{\partial \text{MSE}}{\partial w_{22}} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))w_2\sigma'(w_{21}x_1 + w_{22}x_2 + b_2)x_2 \\
\frac{\partial \text{MSE}}{\partial b_2} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))w_2\sigma'(w_{21}x_1 + w_{22}x_2 + b_2) \\
\frac{\partial \text{MSE}}{\partial w_1} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))\sigma(w_{11}x_1 + w_{12}x_2 + b_1) \\
\frac{\partial \text{MSE}}{\partial w_2} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))\sigma(w_{21}x_1 + w_{22}x_2 + b_2) \\
\frac{\partial \text{MSE}}{\partial b} &= \frac{1}{4}\sum_x 2(f(x) - f^*(x))
\end{aligned}$$