$$\begin{bmatrix} 0.088 & 0.104 \\ 0.176 & 0.208 \end{bmatrix} W$$

$$\begin{bmatrix} 0.22 \\ 0.4 \end{bmatrix} \times \begin{bmatrix} 0.22 \\ 0.26 \end{bmatrix}$$

$$\begin{bmatrix} 0.22 \\ 0.4 \end{bmatrix} \times \begin{bmatrix} 0.44 \\ 0.52 \end{bmatrix} \xrightarrow{\begin{array}{c} 0.44 \\ 0.52 \end{array}} \begin{bmatrix} 0.116 \\ 1.00 \end{array} \xrightarrow{\begin{array}{c} \text{Always check: The gradient with respect to a variable should have the same shape as the variable}} \\ q = W \cdot x = \begin{pmatrix} W_{1,1}x_1 + \dots + W_{1,n}x_n \\ \vdots \\ W_{n,1}x_1 + \dots + W_{n,n}x_n \end{pmatrix} \xrightarrow{\begin{array}{c} \frac{\partial f}{\partial W_{i,j}} = \sum_k \frac{\partial f}{\partial q_k} \frac{\partial q_k}{\partial W_{i,j}} \\ = \sum_k (2q_k)(\mathbf{1}_{k=i}x_j) \\ = 2a_ix_i \end{array} = 2a_ix_i$$

A vectorized example: $f(x,W) = ||W \cdot x||^2 = \sum_{i=1}^n (W \cdot x)_i^2$