inputs weights bias

$$d = a @ b + c$$

We have $\frac{dL}{dd}$, we want both $\frac{dL}{da}$ and $\frac{dL}{db}$

$$\begin{bmatrix} d_{11} & d_{12} \\ d_{21} & d_{22} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} + \begin{bmatrix} c_1 & c_2 \\ c_1 & c_2 \end{bmatrix}$$

$$\boxed{\begin{aligned} d_{11} &= a_{11} b_{11} + a_{12} b_{21} + c_1 \\ d_{12} &= a_{11} b_{12} + a_{12} b_{22} + c_2 \\ d_{21} &= a_{21} b_{11} + a_{22} b_{21} + c_1 \\ d_{22} &= a_{21} b_{12} + a_{22} b_{22} + c_2 \end{aligned}}$$

$$\frac{dL}{da_{11}} = \frac{dL}{dd_{11}} \cdot b_{11} + \frac{dL}{\partial d_{12}} \cdot b_{12}$$

$$\frac{dL}{da_{12}} = \frac{\partial L}{\partial d_{11}} \cdot b_{21} + \frac{dL}{dd_{12}} \cdot b_{22}$$

$$\frac{dL}{da_{21}} = \frac{dL}{\partial d_{21}} \cdot b_{11} + \frac{\partial L}{\partial d_{22}} \cdot b_{12}$$

$$\frac{dL}{da_{22}} = \frac{dL}{\partial d_{21}} \cdot b_{21} + \frac{dL}{dd_{22}} \cdot b_{22}$$

Grad w.r.t. inputs to Layer

$$\frac{dL}{da}$$

$$\begin{bmatrix} \frac{dL}{da_{11}} & \frac{dL}{da_{12}} \\ \frac{dL}{da_{21}} & \frac{dL}{da_{22}} \end{bmatrix} = \begin{bmatrix} \frac{dL}{\partial d_{11}} & \frac{dL}{\partial d_{12}} \\ \frac{dL}{dd_{21}} & \frac{dL}{d_{22}} \end{bmatrix} \begin{bmatrix} b_{11} & b_{2} \\ b_{12} & b_{2} \end{bmatrix}$$

$$\frac{dL}{da} = \frac{dL}{dd} @ b^T$$