$$\frac{\partial J(\theta)}{\partial \theta_{ij}^{(l)}} = \frac{\partial J(\theta)}{\partial a_i^{(l+1)}} \times \frac{\partial a_i^{(l+1)}}{\partial z_i^{(l+1)}} \times \frac{\partial z_i^{(l+1)}}{\partial \theta_{ij}^{(l)}}$$

$$\frac{\partial a_i^{(l+1)}}{\partial z_i^{(l+1)}} = g'(z_i^{(l+1)})$$

$$\frac{\partial z_i^{(l+1)}}{\partial \theta_{ij}^{(l)}} = \frac{\partial((\theta^{(l)} \times a^{(l)})_i)}{\partial \theta_{ij}^{(l)}} = a_j^{(l)}$$

Definition: $\delta_i^{(l)} = \frac{\partial J(\theta)}{\partial z_i^{(l)}}$ $\quad \delta^{(l)} = \frac{\partial J(\theta)}{\partial z^{(l)}}$

$$\frac{\partial J(\theta)}{\partial a_i^{(l+1)}} = \sum_{k=1}^{s_{l+2}} \left(\frac{\partial J(\theta)}{\partial z_k^{(l+2)}} \times \frac{\partial z_k^{(l+2)}}{\partial a_i^{(l+1)}}\right) = \sum_{k=1}^{s_{l+2}} \left(\frac{\partial J(\theta)}{\partial z_k^{(l+2)}} \times \theta_{ki}^{(l+1)}\right)$$
$$= ((\theta^{(l+1)})^T \times \frac{\partial J(\theta)}{\partial z^{(l+2)}})_i = ((\theta^{(l+1)})^T \times \delta^{(l+2)})_i$$

Hence, $\frac{\partial J(\theta)}{\partial \theta_{ij}^{(l)}} = a_j^{(l)} \times \delta_i^{(l+1)}$ and $\delta_i^{(l)} = \left(\left(\theta^{(l)}\right)^T \times \delta^{(l+1)}\right) \times g'(z^{(l)})$