$$\Delta^{(2)} = \sum_k \Delta_k^{(2)}$$

$$\Delta_k^{(2)} = \overbrace{-2\left(y^{(k)} - {}_k a^{(3)}\right) * {}_k a^{(3)} * \left(1 - {}_k a^{(3)}\right)}^{{}_k\sigma^{(3)}} \cdot {}_k a^{(2)} = \underset{(s^{(3)}\times 1)}{{}_k\sigma^{(3)}} \cdot \underset{(1\times s^{(2)})}{{}_k a^{(2)}}$$

$\Delta^{(2)}$ [redacted] $= -2\left(Y - A^{(3)}\right) * A^{(3)} * \left(1 - A^{(3)}\right) \cdot \left[A^{(2)}\right]^T$ $\quad \boxed{s^{(3)} \times s^{(2)}}$ SIZE

[redacted]

$$A^{(2)} = \begin{bmatrix} | & | & & | & & | \\ {}_1a^{(2)} & {}_2a^{(2)} & \cdots & {}_ka^{(2)} & \cdots & {}_Ma^{2} \\ | & | & & | & & | \end{bmatrix}$$

$\Delta^{(2)}$ [redacted] $= \underbrace{\underbrace{\begin{bmatrix} | & & | & & | \\ {}_1\sigma^{(3)} & \cdots & {}_k\sigma^{(3)} & \cdots & {}_M\sigma^{(3)} \\ | & & | & & | \end{bmatrix}}_{s^{(3)} \times M} \cdot \underbrace{\begin{bmatrix} — {}_1a^{(2)} — \\ \vdots \\ — {}_Ma^{2} — \end{bmatrix}}_{M \times s^{(2)}}}_{s^{(3)} \times s^{(2)}}$

$$= \begin{bmatrix} \left(\sum_k {}_k\sigma_1^{3}\, {}_ka_1^{(2)}\right) & \cdots & \left(\sum_k {}_k\sigma_1^{(3)}\, {}_ka_{s^2}^{(2)}\right) \\ \vdots & \ddots & \\ \left(\sum_k {}_k\sigma_{s^3}^{(3)}\, {}_ka_1^{(2)}\right) & \cdots & \left(\sum_k {}_k\sigma_{s^3}^{(3)}\, {}_ka_{s^2}^{(2)}\right) \end{bmatrix}$$

So it works!!