$$a_i(l) = \sigma\left(\sum_{j=1}^{n_{l-1}} w_{ij}(l)a_j(l-1) + b_i(l)\right), \tag{1}$$

$$\mathbf{z}(l) = \mathbf{W}(l)\,\mathbf{a}(l-1) + \mathbf{b}(l) \qquad \text{where } l = 2, 3, \ldots, L, \tag{2}$$

$$\mathbf{W}(l) = \left[\begin{array}{cccc} W_{11}(l) & W_{12}(l) & \cdots & W_{1n_{l-1}}(l) \\ W_{21}(l) & W_{22}(l) & \cdots & W_{2n_{l-1}}(l) \\ \vdots & \vdots & \ddots & \vdots \\ W_{n_l1}(l) & W_{n_l2}(l) & \cdots & W_{n_ln_{l-1}}(l) \end{array}\right] \tag{3}$$

$$\mathbf{a}(l) = \sigma[\mathbf{z}(l)] = \left[\begin{array}{c} \sigma(z_1(l)) \\ \sigma(z_2(l)) \\ \vdots \\ \sigma(z_{n_l}(l)) \end{array}\right]. \tag{4}$$