$$a_{i}(l) = \sigma \left( \sum_{j=1}^{n_{i-1}} w_{ij}(l) a_{j}(l-1) + b_{i}(l) \right),$$

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

$$(2)$$

(1)

$$\mathbf{W}(l) = \begin{bmatrix} W_{11}(l) & W_{12}(l) & \cdots & W_{1n_{l-1}}(l) \\ W_{21}(l) & W_{22}(l) & \cdots & W_{2n_{l-1}}(l) \\ \vdots & \vdots & \ddots & \vdots \\ W_{n_l1}(l) & W_{n_l2}(l) & \cdots & W_{n_ln_{l-1}}(l) \end{bmatrix}$$
(3)

$$\begin{bmatrix} W_{n_l 1}(l) & W_{n_l 2}(l) & \cdots & W_{n_l n_{l-1}}(l) \end{bmatrix}$$

$$\begin{bmatrix} \sigma(z_1(l)) \\ \sigma(z_2(l)) \end{bmatrix}$$

$$\mathbf{a}(l) = \sigma[\mathbf{z}(l)] = \begin{bmatrix} \sigma(z_1(l)) \\ \sigma(z_2(l)) \\ \vdots \\ \sigma(z_n(l)) \end{bmatrix}. \tag{4}$$