Neural Network Prediction

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Multi-Dim Logistic Regression Vectorization

$$\Theta = \begin{bmatrix} \Theta_1^T \\ \Theta_2^T \\ \vdots \\ \Theta_n^T \end{bmatrix} \qquad \Theta^T = \begin{bmatrix} \Theta_1 & \Theta_2 & \cdots & \Theta_n \end{bmatrix}$$

$$X = \begin{bmatrix} X_1^T \\ X_2^T \\ \vdots \\ X_m^T \end{bmatrix}$$

$$X\Theta^T = \begin{bmatrix} X_1^T\Theta_1 & X_1^T\Theta_2 & \cdots & X_1^T\Theta_n \\ X_2^T\Theta_1 & X_2^T\Theta_2 & \cdots & X_2^T\Theta_n \\ \vdots & \vdots & \ddots & \\ X_m^T\Theta_1 & X_m^T\Theta_2 & & X_m^T\Theta_n \end{bmatrix}$$

N.B. $\rightarrow X^T\Theta = \Theta^T X$

$\Theta^{(1)}$: 25 x 401, m x n $= \begin{bmatrix} \Theta_1^{(1)T} \\ \Theta_2^{(1)T} \\ \vdots \\ \Theta_{25}^{(1)T} \end{bmatrix}$

$\Theta^{(2)}$: 10 x 26, m x n $= \begin{bmatrix} \Theta_1^{(2)T} \\ \Theta_2^{(2)T} \\ \vdots \\ \Theta_{10}^{(2)T} \end{bmatrix}$

X : 5000 x 401, m n $= \begin{bmatrix} a_1^{(1)} \\ a_2^{(1)} \\ \vdots \\ a_{5000}^{(1)} \end{bmatrix}$

$$X^{(1)}\Theta^{(1)T} = \begin{bmatrix} X_1^{(1)T}\Theta_1^{(1)} & X_1^{(1)T}\Theta_2^{(1)} & \cdots & X_1^{(1)T}\Theta_n^{(1)} \\ X_2^{(1)T}\Theta_1^{(1)} & X_2^{(1)T}\Theta_2^{(1)} & \cdots & X_2^{(1)T}\Theta_n^{(1)} \\ \vdots & & & \\ X_m^{(1)T} & & & X_m^T\Theta_n^{(1)} \end{bmatrix}$$

5000 x 25

$$X^{(2)} = \begin{bmatrix} 1 & h(X\Theta^{(1)T}) \end{bmatrix}$$

5000 x 26

$=$

$$X^{(2)}\Theta^{(2)T} = \begin{bmatrix} X_1^{(2)T}\Theta_1^{(2)} & X_1^{(2)T}\Theta_2^{(2)} & \cdots & X_1^{(2)T}\Theta_{10} \\ \vdots & & & \\ X_{5000}^{(2)T}\Theta_1^{(2)} & \cdots & & X_{5000}^{(2)T}\Theta_{10} \end{bmatrix}$$