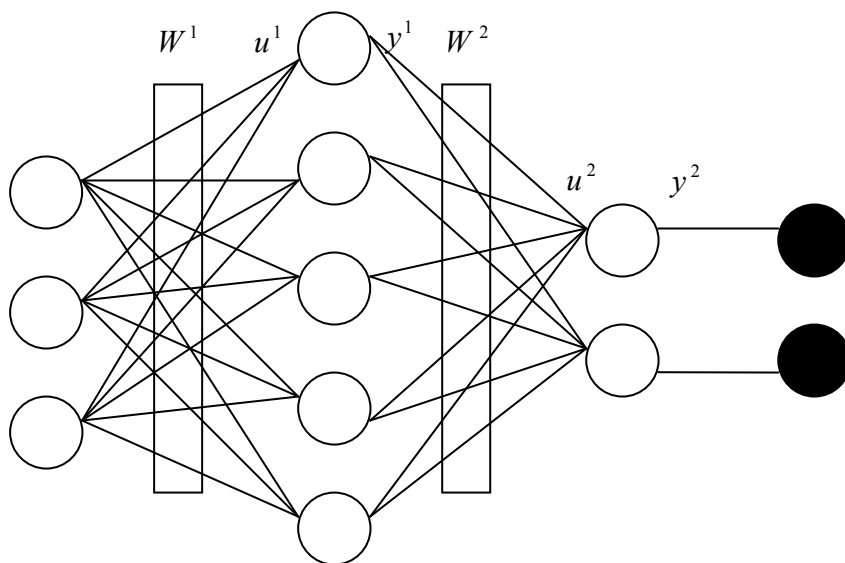


به نام خدا

محاسبات یک شبکه عصبی MLP با ۳ نرون ورودی و ۴ نرون میانی و ۲ نرون خروجی.



$$x = \begin{bmatrix} x_1 & x_2 & x_3 \end{bmatrix}_{(1 \times 3)}$$

$$W_1 = \begin{bmatrix} W_{11} & W_{12} & W_{13} & W_{14} & W_{15} \\ W_{21} & W_{22} & W_{23} & W_{24} & W_{25} \\ W_{31} & W_{32} & W_{33} & W_{34} & W_{35} \end{bmatrix}_{(3 \times 5)}$$

$$u^1 = x \times W_1 = \begin{bmatrix} u_1^1 & u_2^1 & u_3^1 & u_4^1 & u_5^1 \end{bmatrix}_{(1 \times 5)}$$

$$y^1 = f^1(u^1) = \begin{bmatrix} y_1^1 & y_2^1 & y_3^1 & y_4^1 & y_5^1 \end{bmatrix}_{(1 \times 5)}$$

$$W_2 = \begin{bmatrix} W_{11} & W_{12} \\ W_{21} & W_{22} \\ W_{31} & W_{32} \\ W_{41} & W_{42} \\ W_{51} & W_{52} \end{bmatrix}_{(5 \times 2)}$$

$$u_2 = \begin{bmatrix} u_1^2 & u_2^2 \end{bmatrix}_{(1 \times 2)}$$

$$y^2 = f^2(u^2) = \begin{bmatrix} y_1^2 & y_2^2 \end{bmatrix}_{(1 \times 2)}$$

$$E_{(1 \times 2)} = \frac{1}{2} e^2 = \frac{1}{2} (r_{(1 \times 2)} - y_{(1 \times 2)}^2)$$

$$\begin{aligned} w^2(k+1) &= w^2(k) - \eta \frac{dE}{dw^2} \\ &= w^2(k) - \eta \frac{dE}{de} \frac{de}{dy^2} \frac{dy^2}{du^2} \frac{du^2}{dw^2(k)} \\ &= w^2(k) + \eta e (f^2(u^2))' y^1 = \end{aligned}$$

$$w(t) = \underbrace{\eta}_{(2 \times 1)} \underbrace{e}_{(2 \times 1)} \underbrace{(f^2(u^2))'}_{(2 \times 6)} \underbrace{w^2}_{(6 \times 1)} \underbrace{(f^1(u^1))'}_{(6 \times 1)} \underbrace{y^0}_{(1 \times 3)}$$

$\eta$ : نرخ یادگیری.