

$$f(u; w, c, v, b) = v^T \max \{0, w^T u + c\} + b$$

$$j(\theta) = \frac{1}{N} \sum \left(\underbrace{f^*(u)}_{\text{true}} - f(u; w, c, v, b) \right)$$

$$\frac{\partial j(\theta)}{\partial w}, \frac{\partial j(\theta)}{\partial c}, \frac{\partial j(\theta)}{\partial v}, \frac{\partial j(\theta)}{\partial b} ?$$

الانتاجات Forward pass، الخسائر Backprop

$$\frac{\partial j(\theta)}{\partial f(u; w, c, v, b)} = \frac{1}{N} \sum \left(f^*(u) - f(u; w, c, v, b) \right) \times (-1)$$

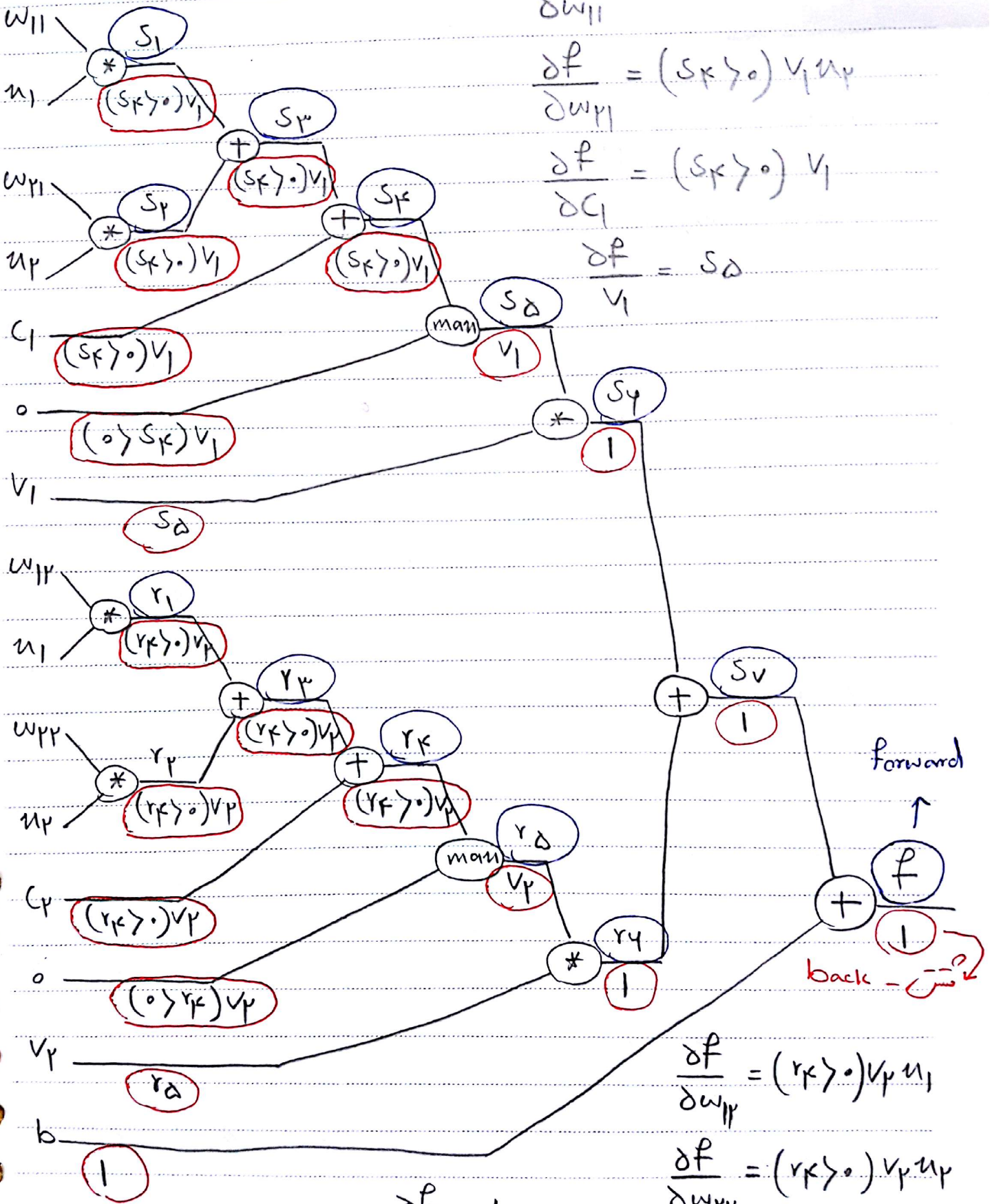
$$= g \leftarrow \text{المشتق}$$

$$\frac{\partial f}{\partial w_{11}} = (s_k > 0) v_1 u_1$$

$$\frac{\partial f}{\partial w_{p1}} = (s_k > 0) v_1 u_p$$

$$\frac{\partial f}{\partial c_1} = (s_k > 0) v_1$$

$$\frac{\partial f}{\partial v_1} = s_\Delta$$



subject:

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$$\frac{\partial J}{\partial w_{11}} = \frac{\partial f}{\partial w_{11}} \times \left(\frac{\partial J}{\partial f} \right) = (s_k > 0) v_1 u_1 \times g$$

$$\frac{\partial J}{\partial w_{11}} = \frac{\partial f}{\partial w_{11}} \times \frac{\partial J}{\partial f} = (s_k > 0) v_1 u_1 \times g$$

$$\frac{\partial J}{\partial c_1} = \frac{\partial f}{\partial c_1} \times \frac{\partial J}{\partial f} = (s_k > 0) v_1 \times g$$

$$\frac{\partial J}{\partial v_1} = \frac{\partial f}{\partial v_1} \times \frac{\partial J}{\partial f} = s_2 \times g$$

$$\frac{\partial J}{\partial w_{12}} = \frac{\partial f}{\partial w_{12}} \times \frac{\partial J}{\partial f} = (r_k > 0) v_1 u_1 g$$

$$\frac{\partial J}{\partial w_{12}} = \frac{\partial f}{\partial w_{12}} \times \frac{\partial J}{\partial f} = (r_k > 0) v_1 u_1 g$$

$$\frac{\partial J}{\partial c_2} = \frac{\partial f}{\partial c_2} \times \frac{\partial J}{\partial f} = (r_k > 0) v_1 g$$

$$\frac{\partial J}{\partial v_2} = \frac{\partial f}{\partial v_2} \times \frac{\partial J}{\partial f} = r_2 g$$

$$\frac{\partial J}{\partial b} = g$$



subject:

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$$\frac{\partial J}{\partial P}$$

$$J = \frac{1}{N} \sum (P^* - P)^2 \times 1 \times -1$$

$$S_P = w_{11} u_1 + w_{21} u_2 + c_1$$

$$r_P = w_{12} u_1 + w_{22} u_2 + c_2$$

$$S_\alpha = \max \{ S_P, 0 \}$$

$$r_\alpha = \max \{ r_P, 0 \}$$

نکته: مشتق در متن نسبت به ماتریس یعنی مشتق در متن نسبت به متغیرها

$$\frac{\partial J}{\partial w} = \begin{bmatrix} \frac{\partial J}{\partial w_{11}} & \frac{\partial J}{\partial w_{12}} \\ \frac{\partial J}{\partial w_{21}} & \frac{\partial J}{\partial w_{22}} \end{bmatrix}$$

ماتریس در نتیجه:
که مشتق تابع ضرر نسبت به متغیرها

این متغیرها قبلاً صواب بوده.

$$\frac{\partial J}{\partial c} = \begin{bmatrix} \frac{\partial J}{\partial c_1} \\ \frac{\partial J}{\partial c_2} \end{bmatrix}$$

$$\frac{\partial J}{\partial v} = \begin{bmatrix} \frac{\partial J}{\partial v_1} \\ \frac{\partial J}{\partial v_2} \end{bmatrix}$$