$$(h_{t-1}, x) = [0.5 \quad 0.3 \quad 0.4 \quad 0.9]$$

$$f = \sigma\left([0.5 \quad 0.3 \quad 0.4 \quad 0.9] \begin{bmatrix} 0 \\ 0.50 \\ 0 \\ 0.50 \end{bmatrix}\right)$$

$$f = \sigma(0.6)$$

$$\boxed{f = 0.645}$$

$$i = \sigma\left([0.5 \quad 0.3 \quad 0.4 \quad 0.9] \begin{bmatrix} 0.75 \\ 0 \\ 0.75 \\ 0 \end{bmatrix}\right)$$

$$= \sigma(0.675)$$

$$\boxed{i = 0.6626}$$

$$O = \sigma\left([0.5 \quad 0.3 \quad 0.4 \quad 0.9] \begin{bmatrix} 0 \\ 1 \\ 1 \\ 0 \end{bmatrix}\right)$$

$$O = \sigma(0.7)$$

$$\boxed{O = 0.668}$$

$$\tilde{C}_t = \tanh\left(\begin{bmatrix} 0.5 & 0.3 & 0.4 & 0.9 \end{bmatrix} \begin{bmatrix} 0.8 \\ 0 \\ 0.75 \\ 0 \end{bmatrix}\right)$$

$$= \tanh(0.675)$$

$$\boxed{\tilde{C}_t = 0.588}$$

$$C_t = f_t \circ C_{t-1} + i_t \circ \tilde{C}_t$$

$$C_t = 0.645 \times 0.75 + 0.6626 \times 0.588$$

$$\boxed{C_t = 0.873}$$

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$$h_t = o_t \circ \tanh(C_t)$$

$$h_t = 0.668 \circ \tanh(0.873)$$

$$\boxed{h_t = 0.469}$$

$$\hat{y} = W_{\text{softmax output}} \, h_t$$

$$\hat{y} = \begin{bmatrix} 0.8 & 0.1 & 0.1 \end{bmatrix} \begin{bmatrix} 0.469 \end{bmatrix}$$

$$\boxed{\hat{y} = \begin{bmatrix} 0.375 & 0.0469 & 0.0469 \end{bmatrix}}$$

Response will be positive as it has highest value