

Q: In this task, you are required to compute the forward pass for the subsequent time step of a Recurrent Neural Network (RNN), given the provided details.

1. Draw Architecture of RNN for this simple scenario where $t=0$ information is given and you are asked to compute for next time stamp i.e., $t=1$. Also mention dimensions of each component.
2. Compute Hidden State (h_t) for the next time Stamp, Use Tanh activation function?
3. Compute Output (y^{\wedge}) for the next time Stamp, Use Sigmoid activation function?

Weight for Input:

[[4]

[1]]

Weight for Hidden State:

[[6 6]

[1 4]]

Weight for Output:

[[4 3]]

Bais for Input:

[[6]

[4]]

Bais for Ouput:

[[4]]

Input: [[-0.56843908]]

Previous Context: [[0.2357065]

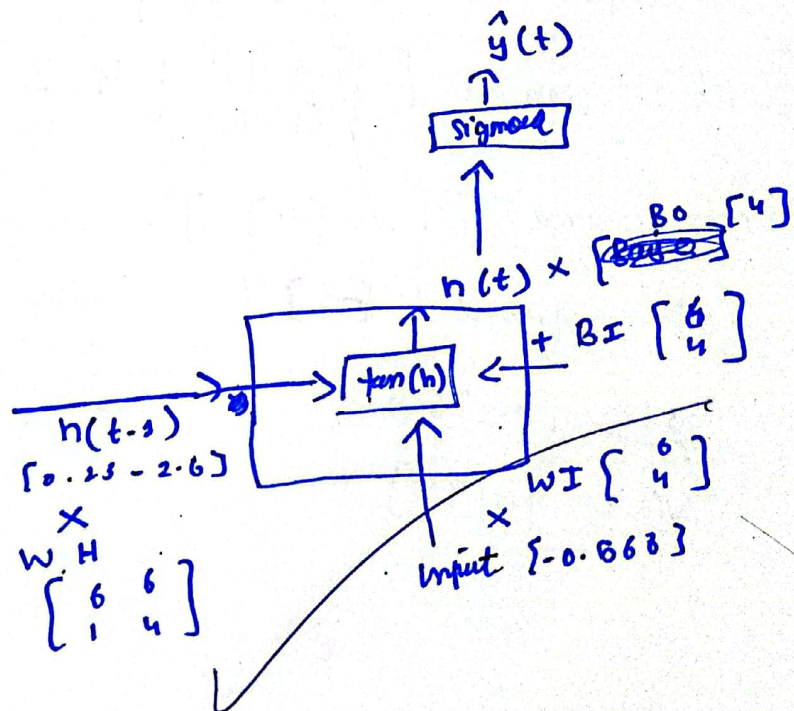
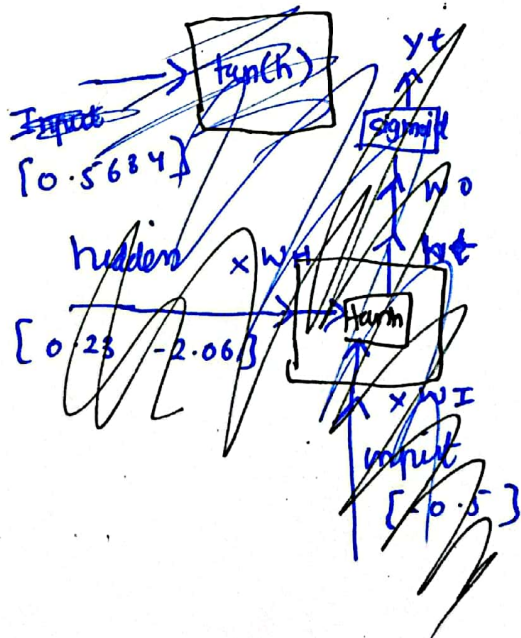
[-2.06228849]]

Important Formulas:

$$\tanh x = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$

Sigmoid / Logistic

$$f(x) = \frac{1}{1 + e^{-x}}$$



2 Hidden state :

$$a_t = [0.23 \ 57065 \ -2.062288 \ -0.5684] \times \begin{bmatrix} 6 & 6 & 4 \\ 1 & 4 & 1 \end{bmatrix} \\ + \begin{bmatrix} 6 \\ 4 \end{bmatrix}$$

$$= \begin{bmatrix} -13.232 \\ -8.58 \end{bmatrix} + \begin{bmatrix} 6 \\ 4 \end{bmatrix}$$

$$= \begin{bmatrix} -7.232 \\ -4.58 \end{bmatrix}$$

$$h_t = \tanh \begin{pmatrix} -7.232 \\ -4.58 \end{pmatrix}$$

$$h_t = \begin{bmatrix} -1 \\ -1 \end{bmatrix}$$

3) output state: $[-1 \ -1]$

$$o_t = \text{sigmoid} \left[\begin{bmatrix} -1 \\ -1 \end{bmatrix} \cdot \begin{bmatrix} 4 & 3 \end{bmatrix} + \begin{bmatrix} 4 \end{bmatrix} \right)$$

$$o_t = \text{sigmoid} [(-7) + [4]]$$

$$o_t = \text{sigmoid} [-3]$$

$$\cancel{y_t = 0.95}$$

$$y(t) = 0.95$$

