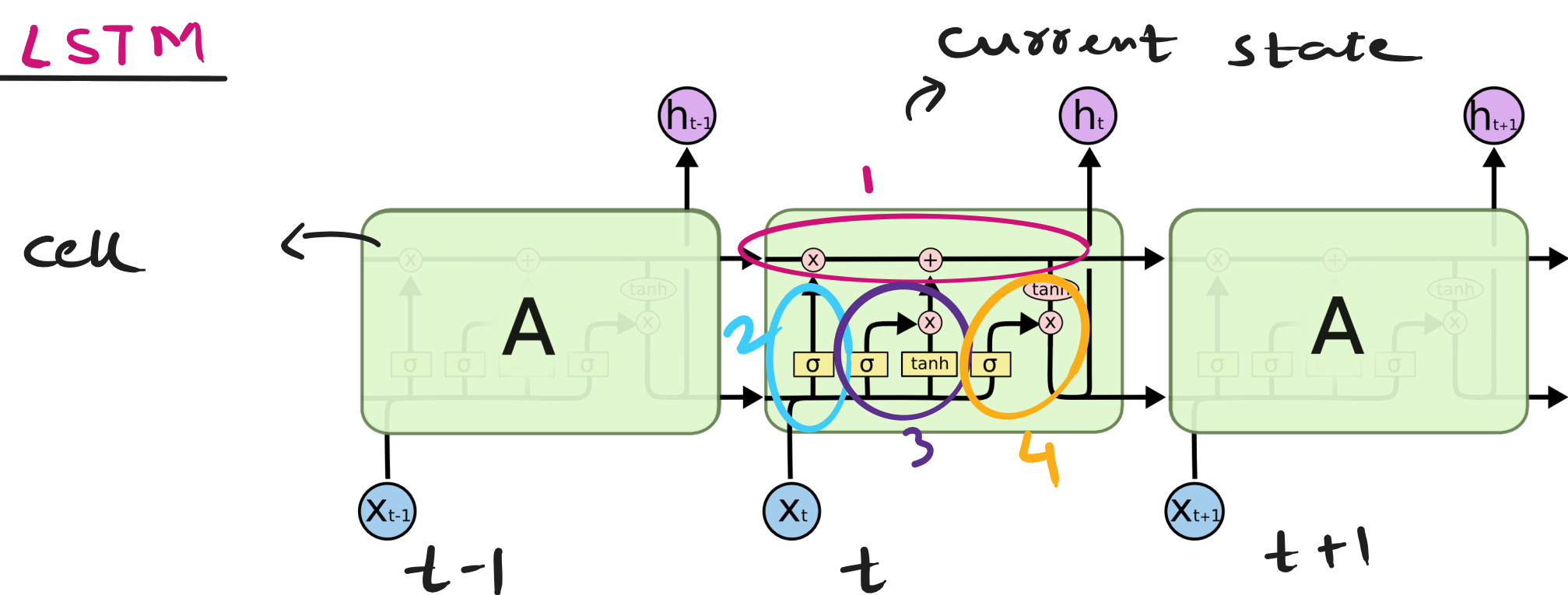
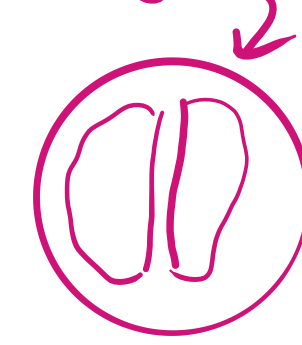


Recap: LSTM



① memory Cell \rightarrow Remembers & Forget



② Forget Gate

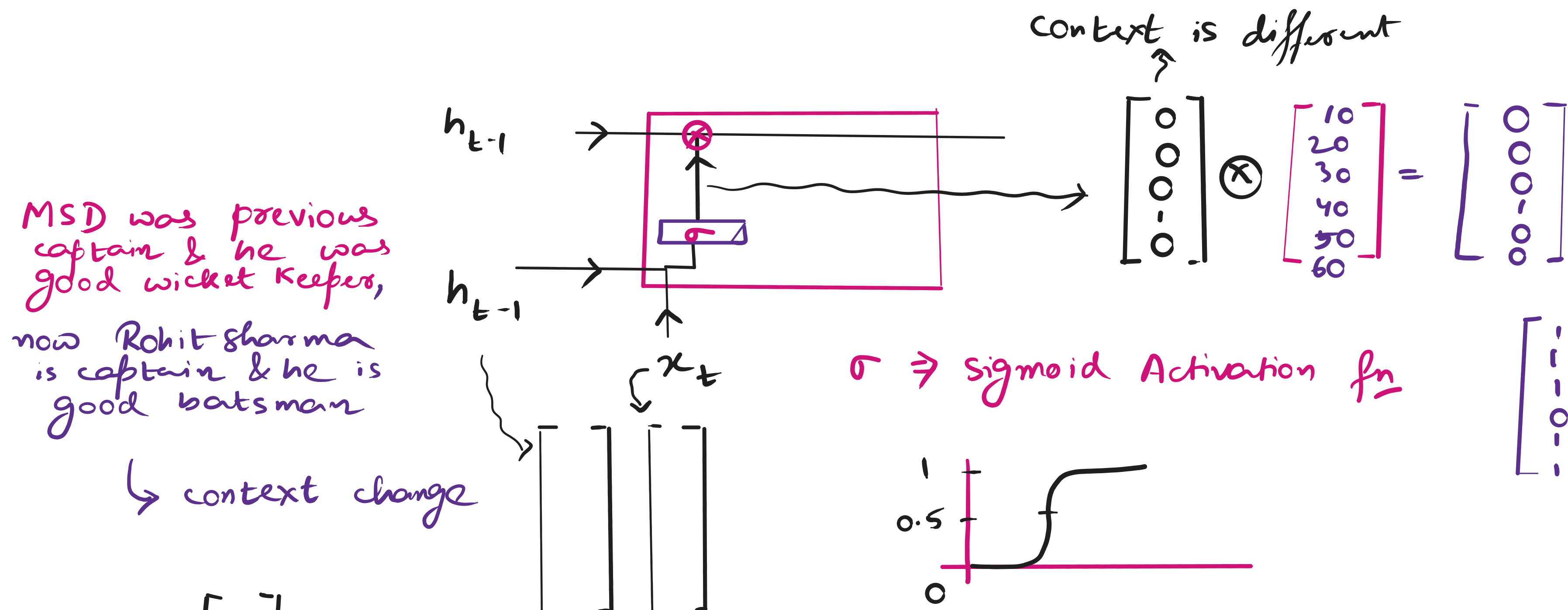
③ Input "

④ Output "

LSTM solves long term Dependencies

Neural Network

$$\begin{bmatrix} 10 \\ 20 \\ 30 \\ 40 \\ 50 \\ 60 \end{bmatrix} \otimes \begin{bmatrix} 1 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 10 \\ 0 \\ 0 \\ 40 \\ 0 \\ 0 \end{bmatrix}$$



MSD was previous captain & he was good wicket keeper, now Rohit sharma is captain & he is good batsman

\rightarrow context change

vector
text

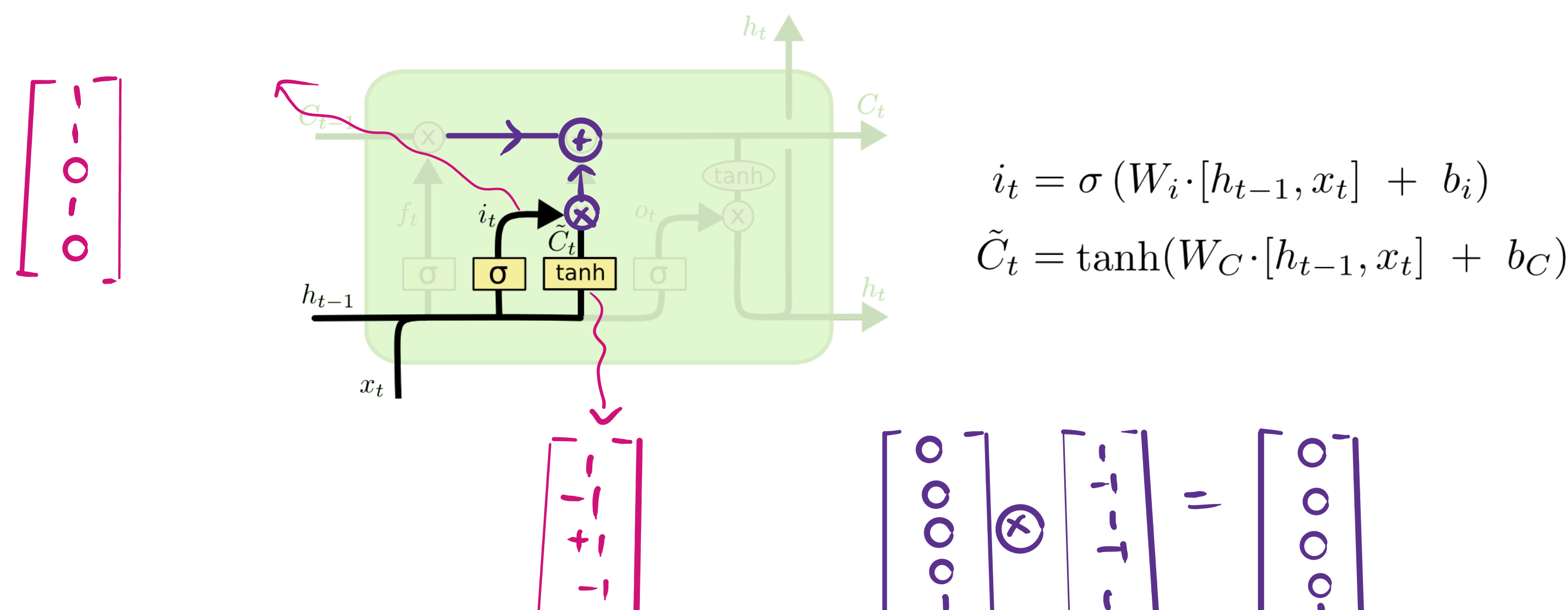
king rich

\rightarrow context similar

king poor

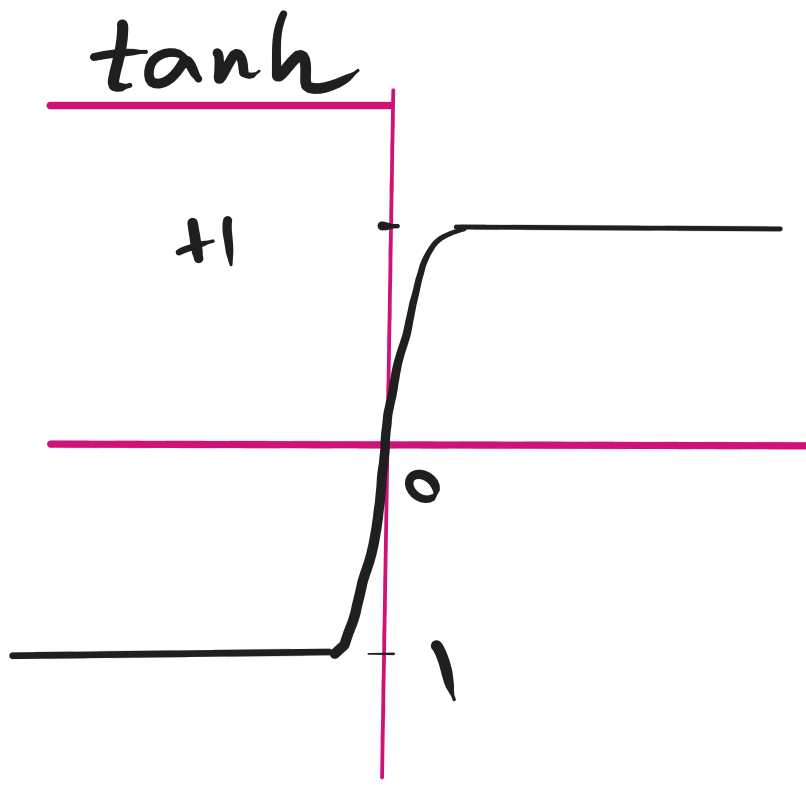
\rightarrow context is different

Input Gate : Additional info is added to memory cell



$$i_t = \sigma(W_i \cdot [h_{t-1}, x_t] + b_i)$$

$$\tilde{C}_t = \tanh(W_C \cdot [h_{t-1}, x_t] + b_C)$$



$$y = 1, x \gg 0$$

$$y = -1, x \ll 0$$

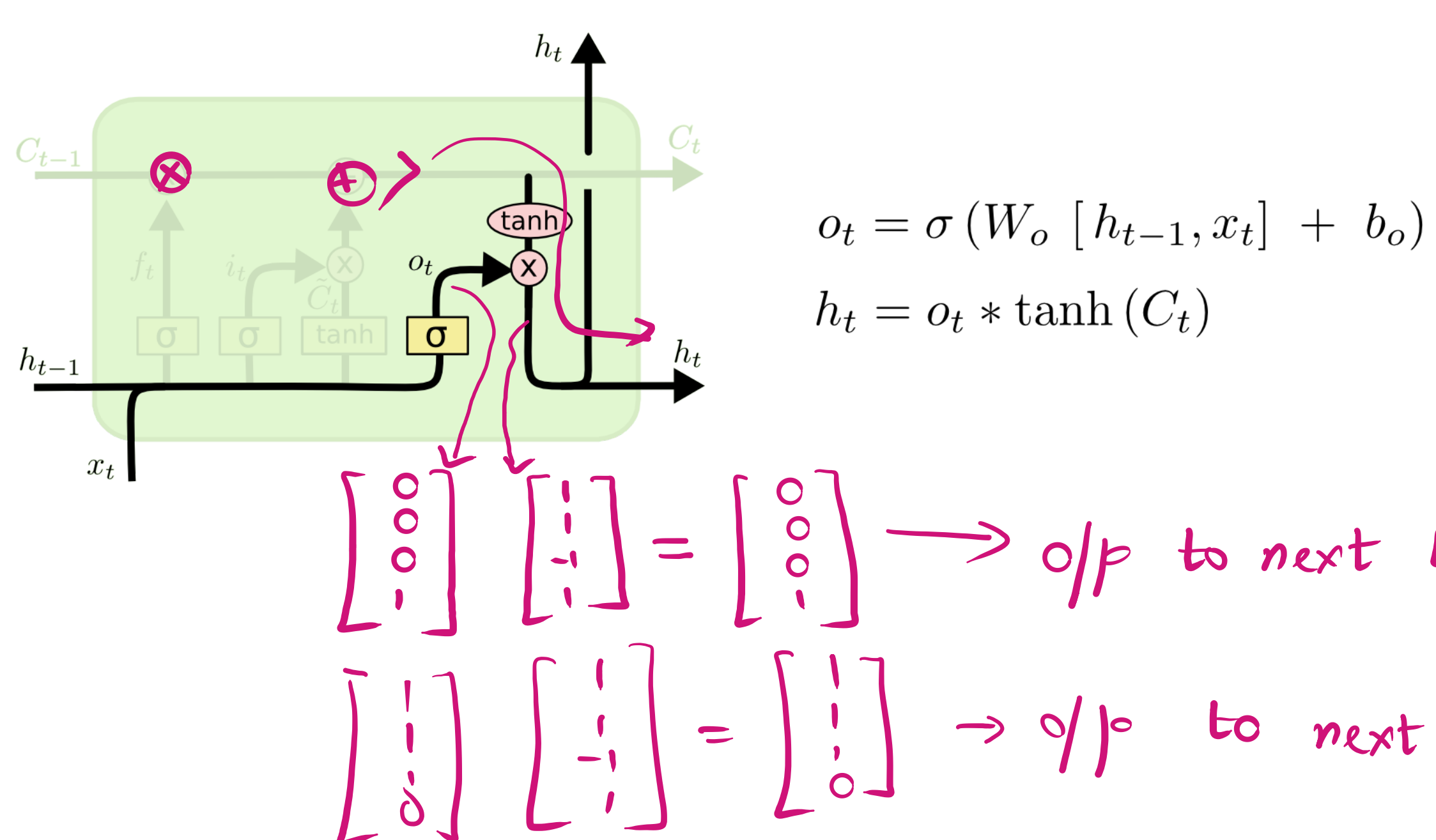
$$y = \begin{cases} 1 & x \gg 0 \\ -1 & x \ll 0 \end{cases}$$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} \otimes \begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \\ 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ -1 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 10 \\ 20 \\ 30 \\ 40 \\ 50 \end{bmatrix} \rightarrow \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \Rightarrow \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} \rightarrow \text{forgetting}$$

$$\begin{bmatrix} 10 \\ 20 \\ 30 \\ 40 \\ 50 \end{bmatrix} \rightarrow \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \\ 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 2 \\ 0 \\ 2 \\ -1 \\ 2 \end{bmatrix} \rightarrow \text{remember}$$

③ Output gate



$$o_t = \sigma(W_o [h_{t-1}, x_t] + b_o)$$

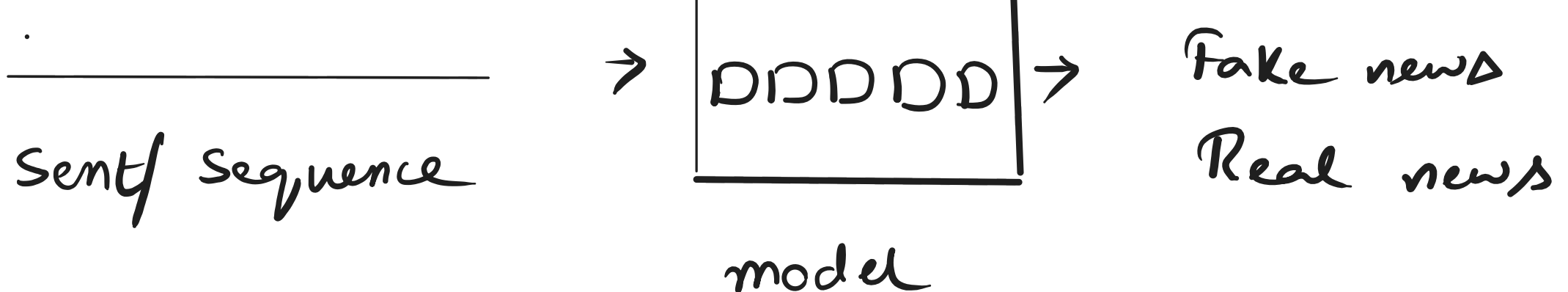
$$h_t = o_t * \tanh(C_t)$$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \text{o/p to next LSTM unit}$$

$$\begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \\ 1 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 1 \\ 0 \\ 1 \end{bmatrix} \rightarrow \text{o/p to next LSTM unit}$$

Practical Implementation

Python Coding \rightarrow Tensorflow \rightarrow Keras



text classifier

text Label
Fake
Real