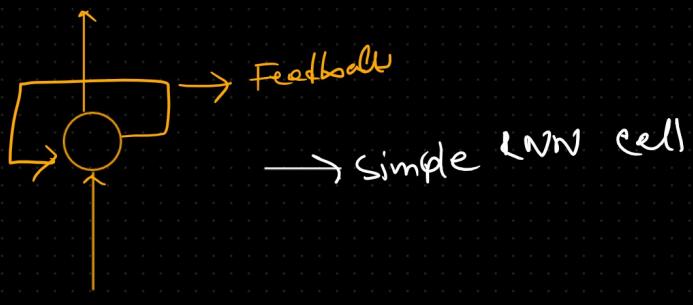


* Agenda

- ① LSTM → with practical
- ② GRU
- ③ BiRNN, BiLSTM, BiGRU
- ④ Hand speech classification using LSTM

RNN:

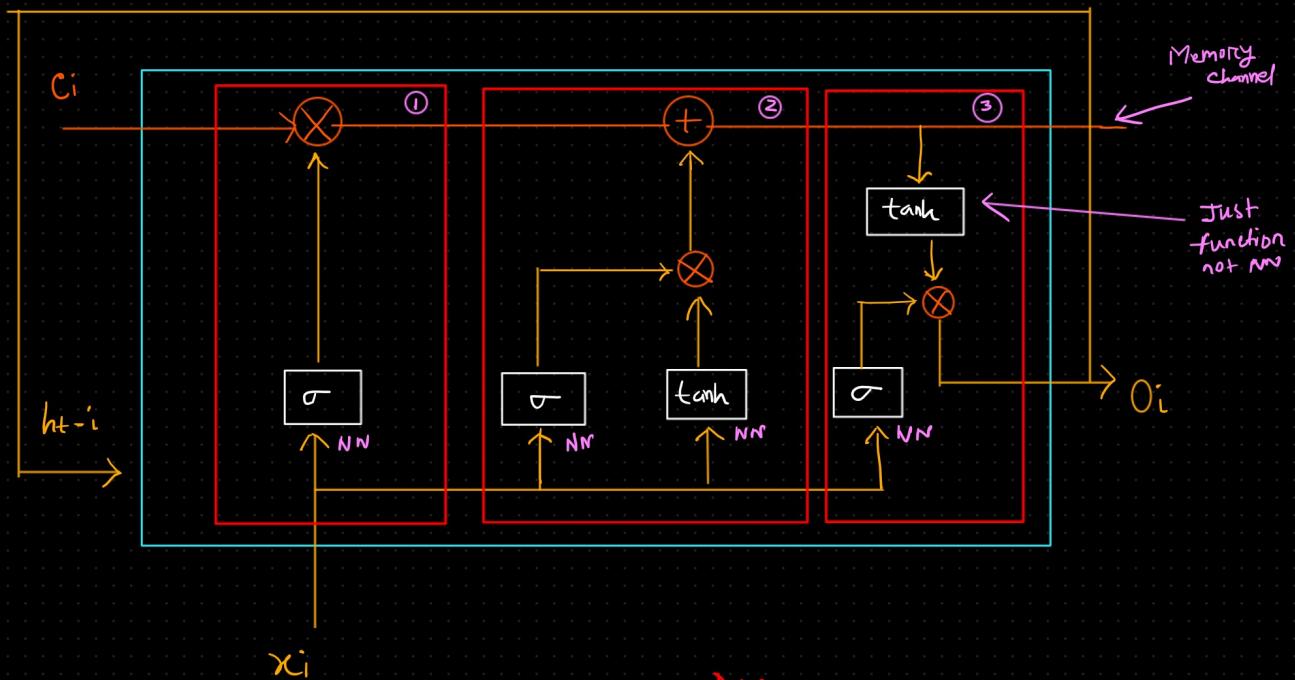


→ simple RNN cell

- ① can't remember longer context

LSTM → Long short term memory

LSTM Architecture



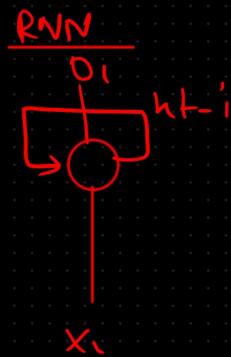
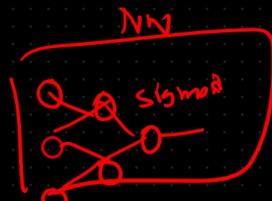
Hence,

x_t = Input

o_t = Output

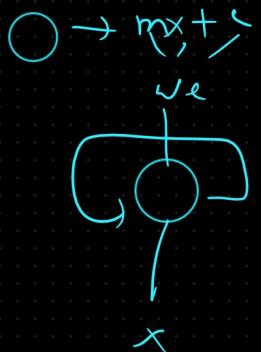
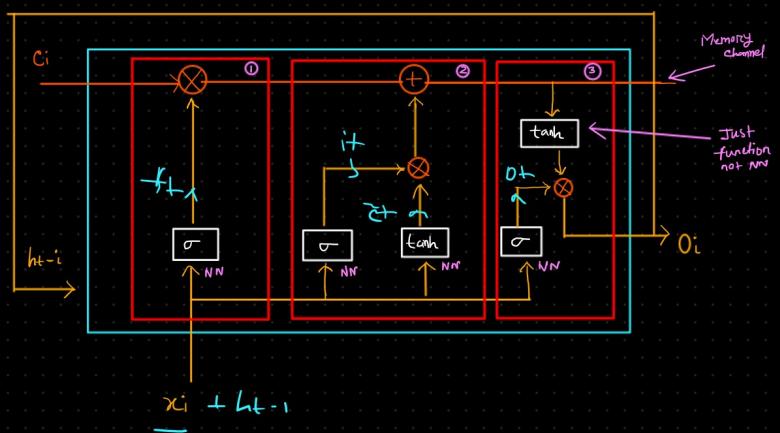
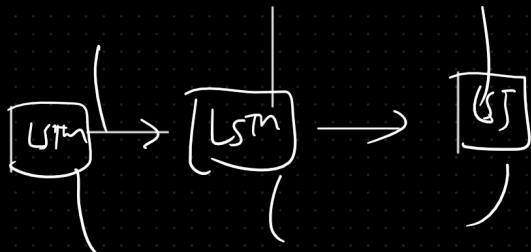
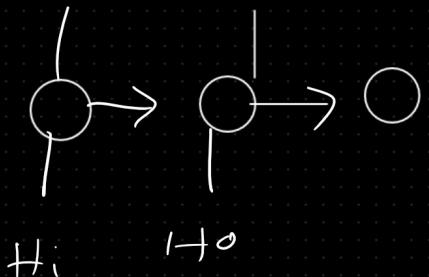
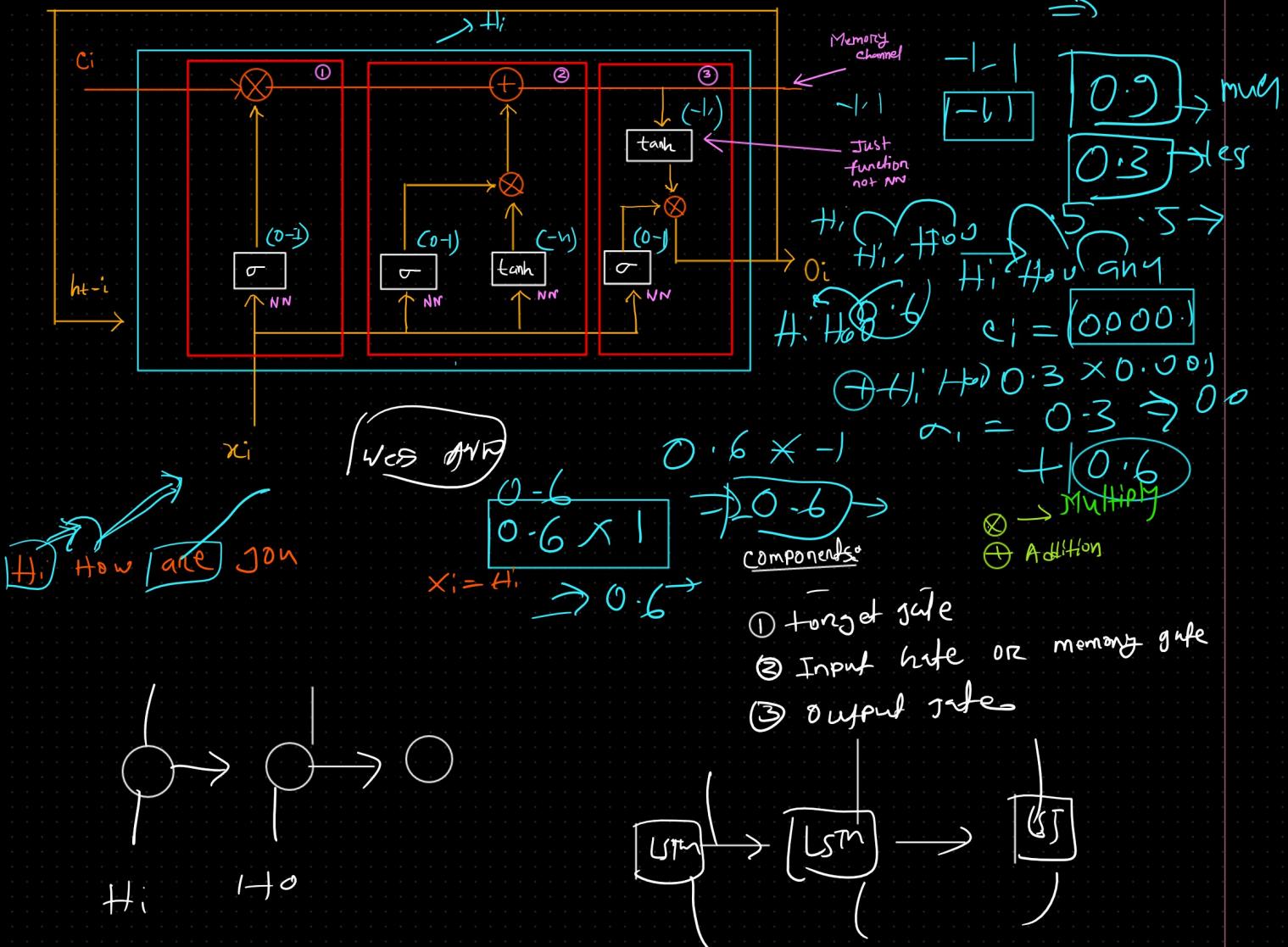
c_t = memory channel

h_{t-1} = Input from previous output

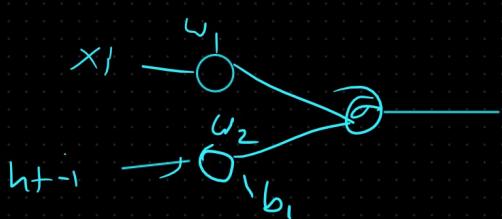


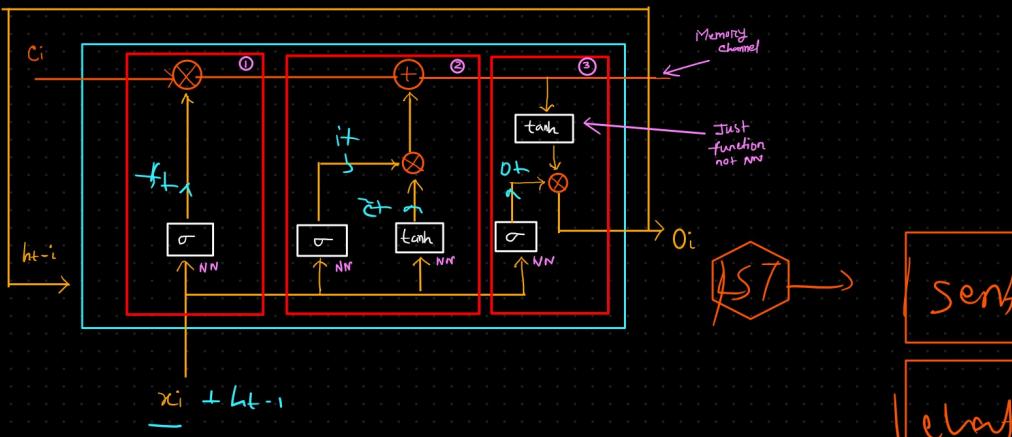
(+1)

10-0001 X -



$$f_t = \sigma(w_f[h_{t-1}, x_t] + b_f)$$





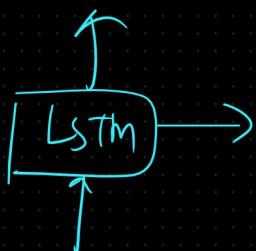
$$f_t \Rightarrow \sigma(w_f[h_{t-1}, x_t] + b_f)$$

$$i_t \Rightarrow \tanh(w_i[h_{t-1}, x_t] + b_i)$$

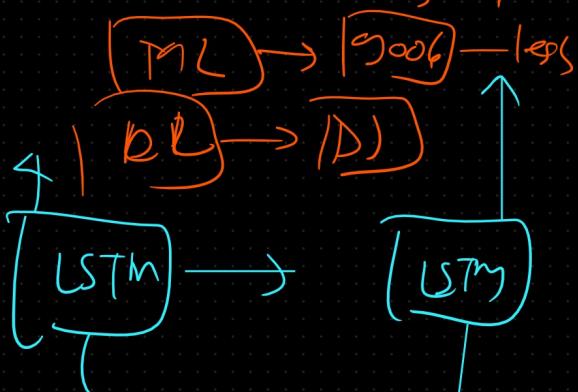
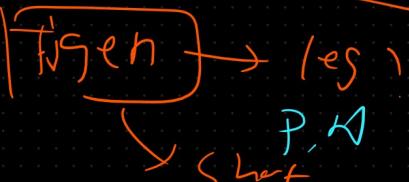
$$o_t \Rightarrow \sigma(w_o[h_{t-1}, x_t] + b_o)$$

$$c_t = f_t \times c_{t-1} + i_t \times i_t$$

\Rightarrow final



Hi How many — ? LSTM



is good

LSTM \rightarrow This

N < 0.5 > P

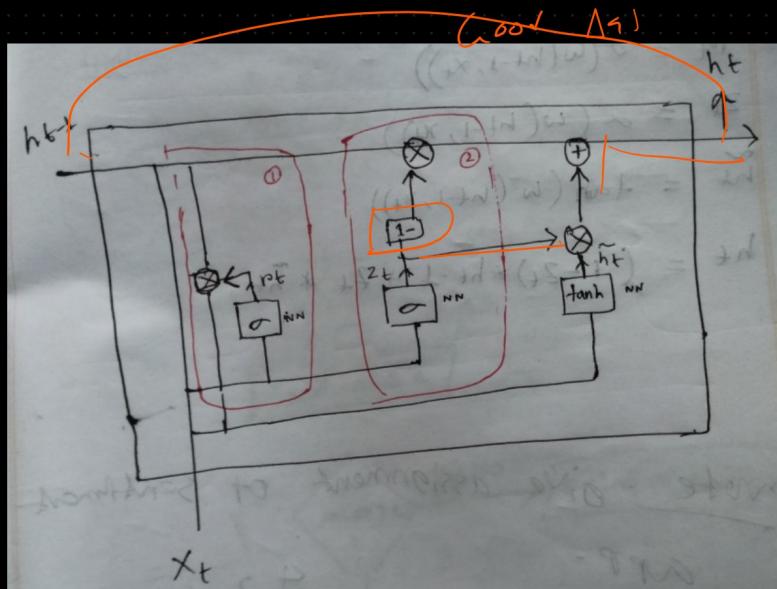
softmax

0 \rightarrow 0.99

0 \rightarrow 0.88

0 \rightarrow 0.72

Crated Recurrent Unit



| -

Inp / -

$x_t \rightarrow \text{Input}$
 $h_{t-1} \rightarrow \text{prev output as input}$

- ① forget gate
- ② update gate

RNN



Bi-RNN

How are you?



LSTM, GRU

