NPTEL ONLINE CERTIFICATION COURSES

Course Name: Deep Learning

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Topic

Lecture 19: Neural Network

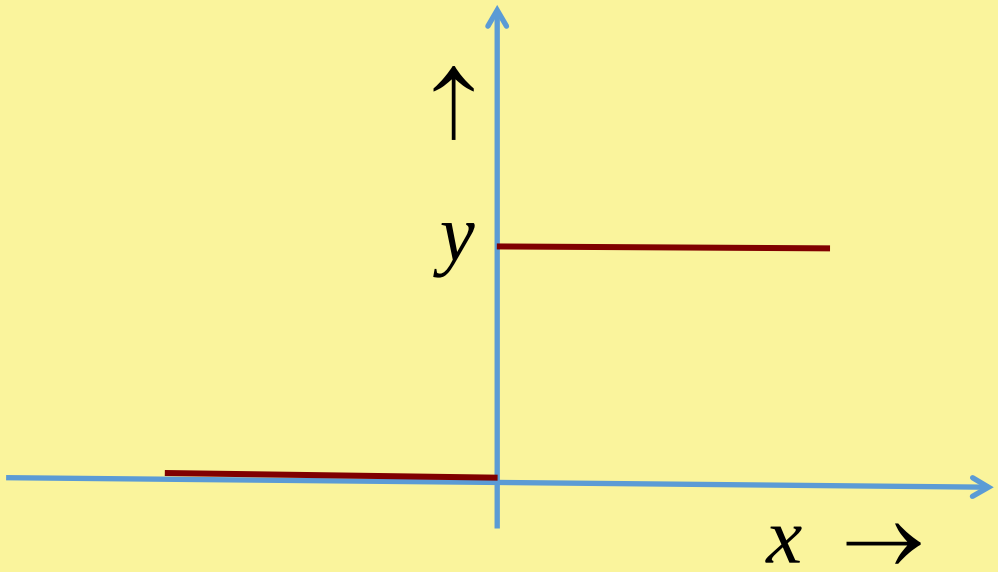
CONCEPTS COVERED

Concepts Covered:

- Nonlinearity
- Neural Network
  - AND Logic
  - OR Logic
  - XOR Logic
- Feed Forward NN
- Back Propagation Learning

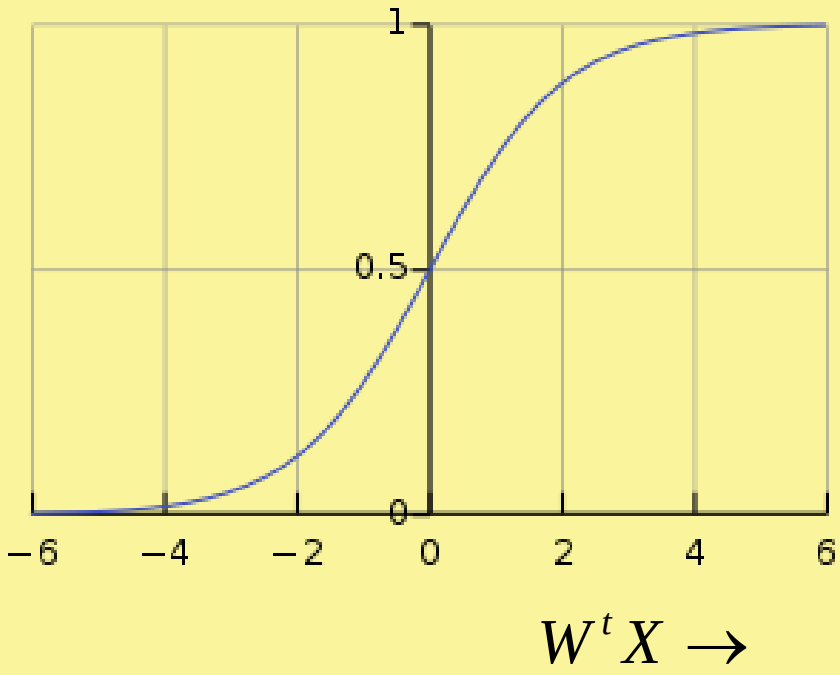
Threshold

$$y = \begin{cases} 1 & x \geq 0 \\ 0 & x < 0 \end{cases}$$



Logistic Regression

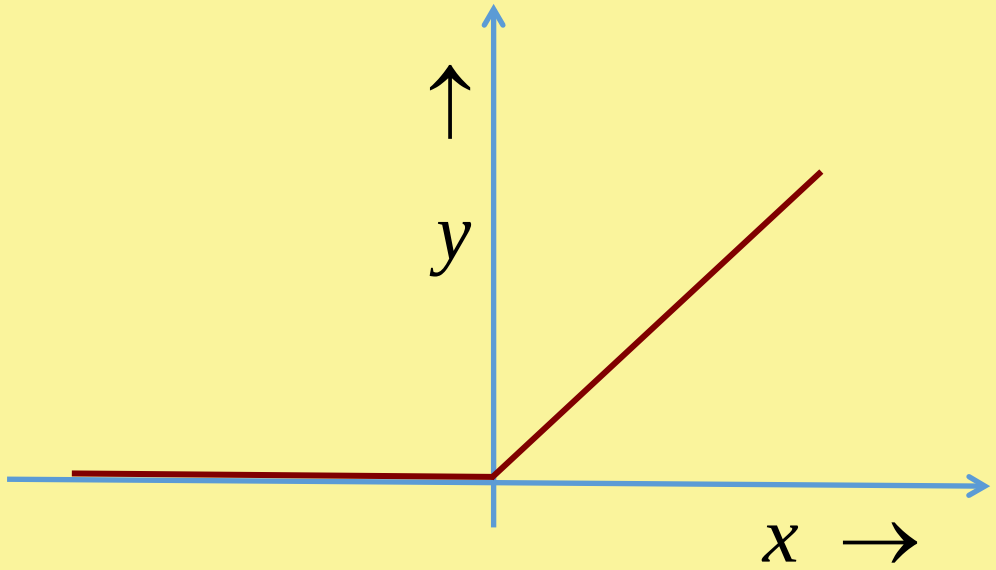
$$\sigma(W^t X) = \frac{1}{1+e^{-W^t X}} \Rightarrow \sigma(W^t X)$$



Nonlinearity

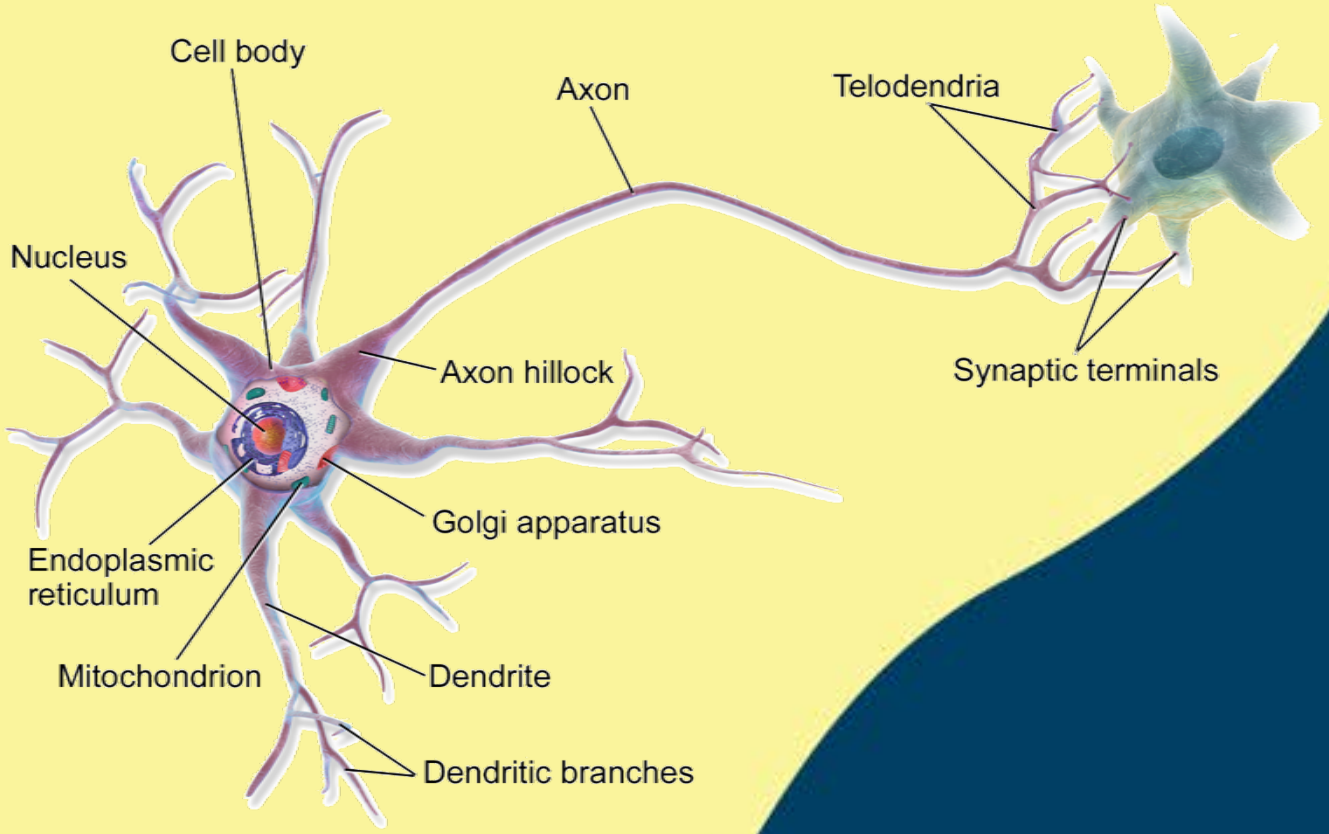
ReLU : Rectified Linear Unit

$$y = \max(0, x) \Rightarrow$$

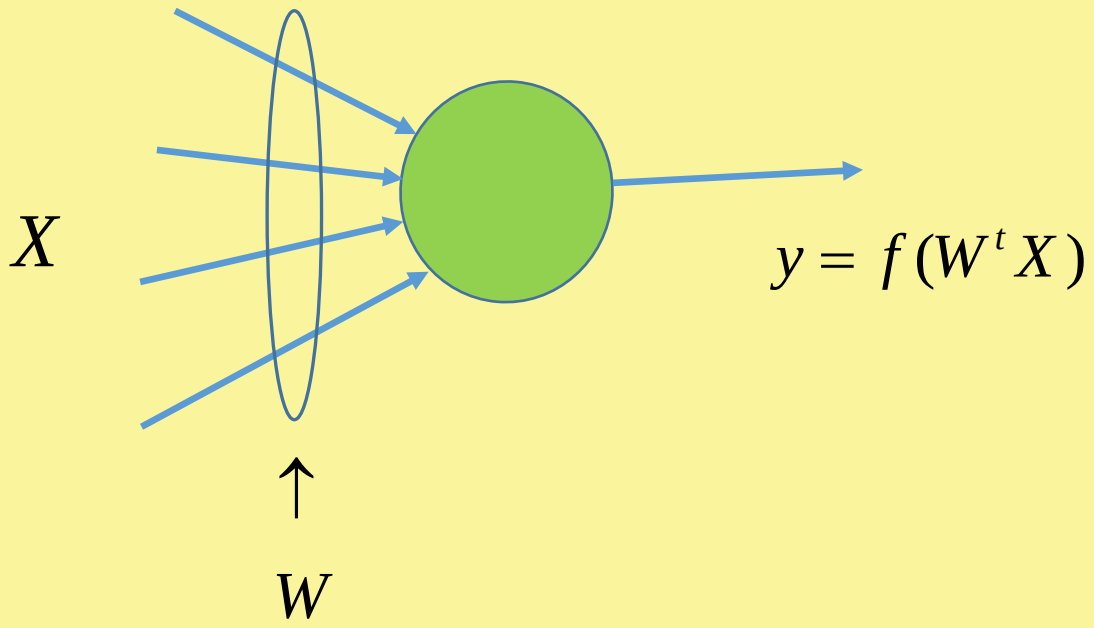


Neuron

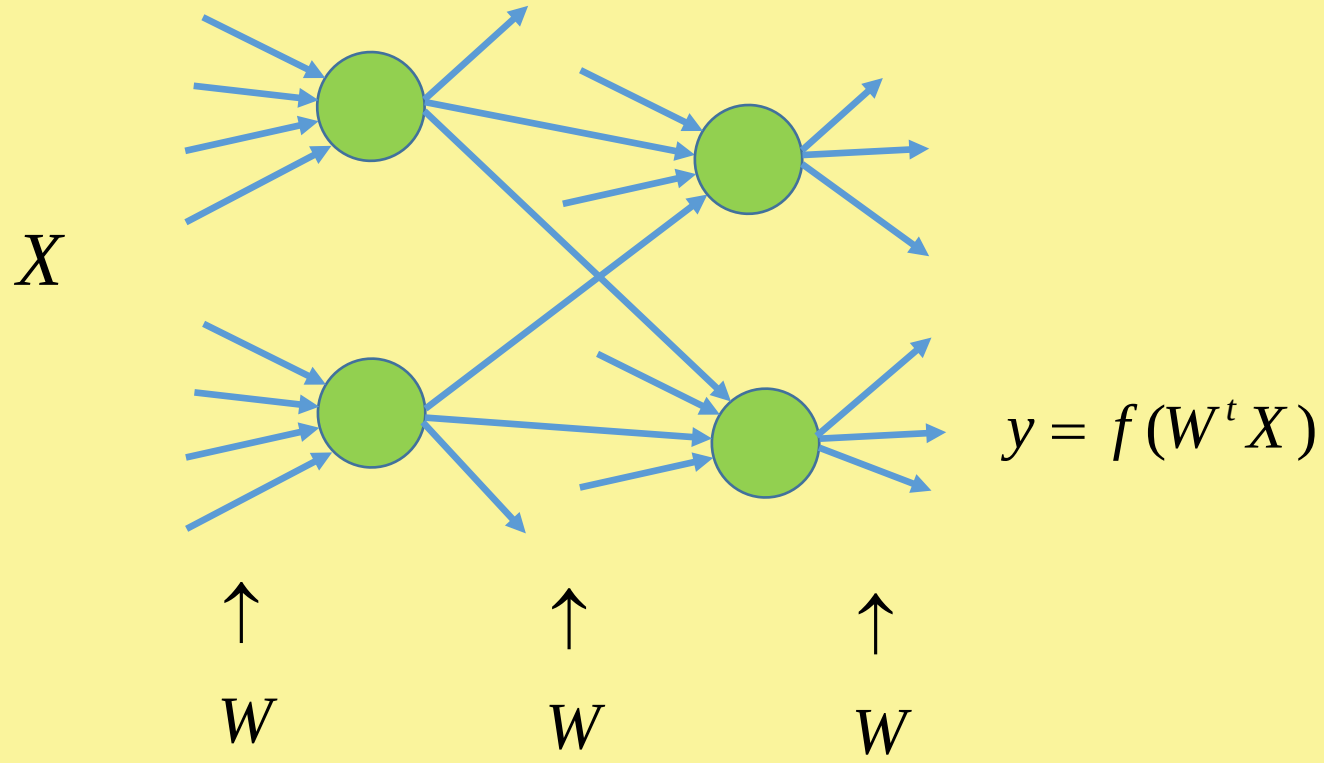
- **Dendrite:** receives signals from other neurons
- **Synapse :** point of connection to other neurons
- **Soma :** processes the information
- **Axon :** transmits the output of this neuron.



Neuron

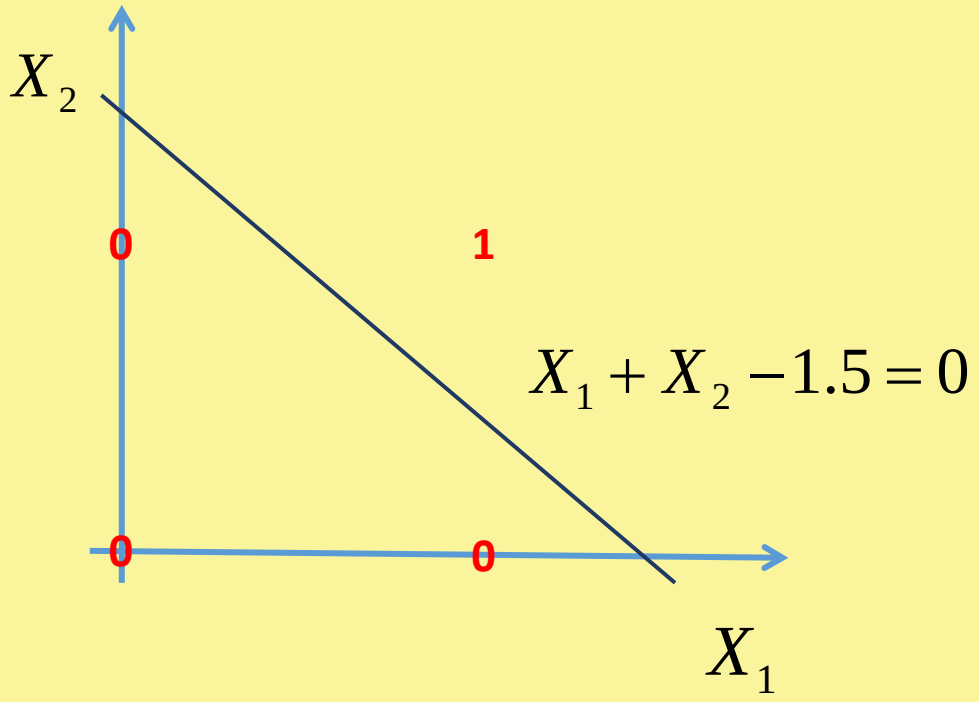


Neural Network



AND Function

X_1	X_2	y
0	0	0
0	1	0
1	0	0
1	1	1

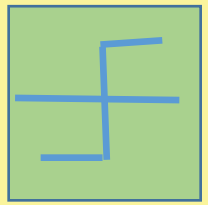


AND Function

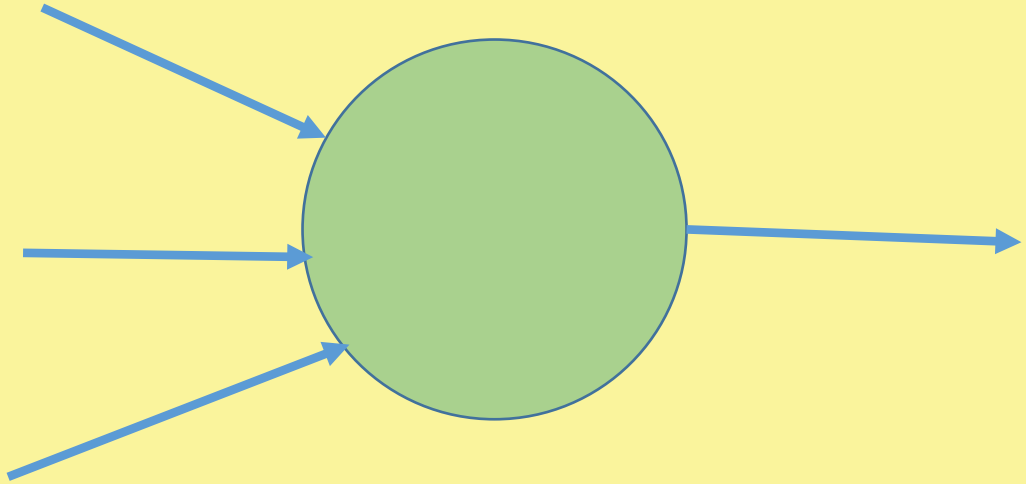
$$W = \begin{bmatrix} -1.5 \\ 1 \\ 1 \end{bmatrix}$$

$$X = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

AND Function

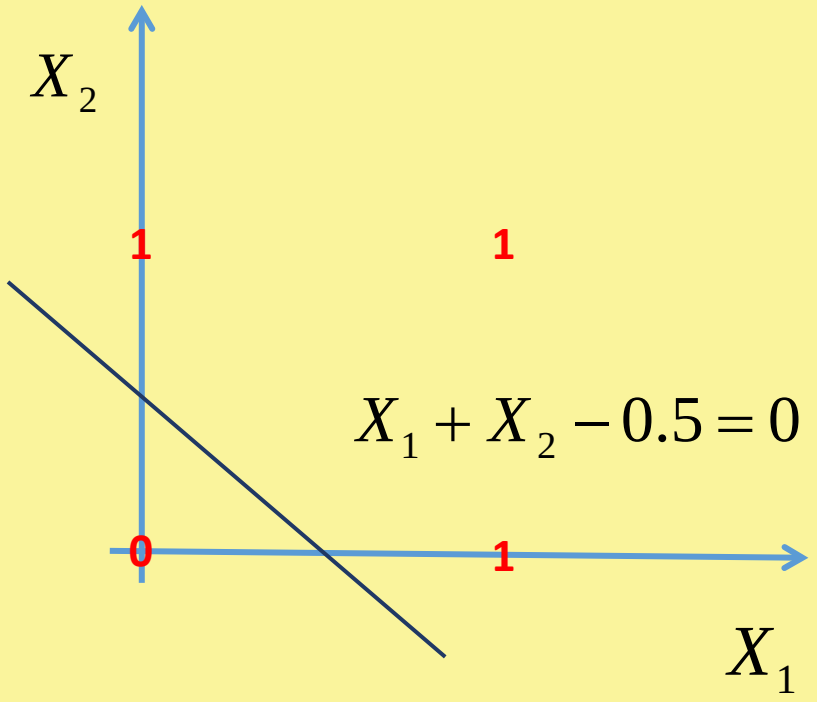
$$X^t W = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} -1.5 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} -1.5 \\ -0.5 \\ -0.5 \\ 0.5 \end{bmatrix} \Rightarrow$$  $$\Rightarrow \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

AND Function



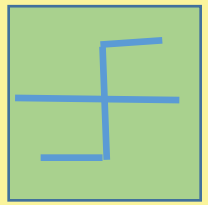
OR Function

X_1	X_2	y
0	0	0
0	1	1
1	0	1
1	1	1



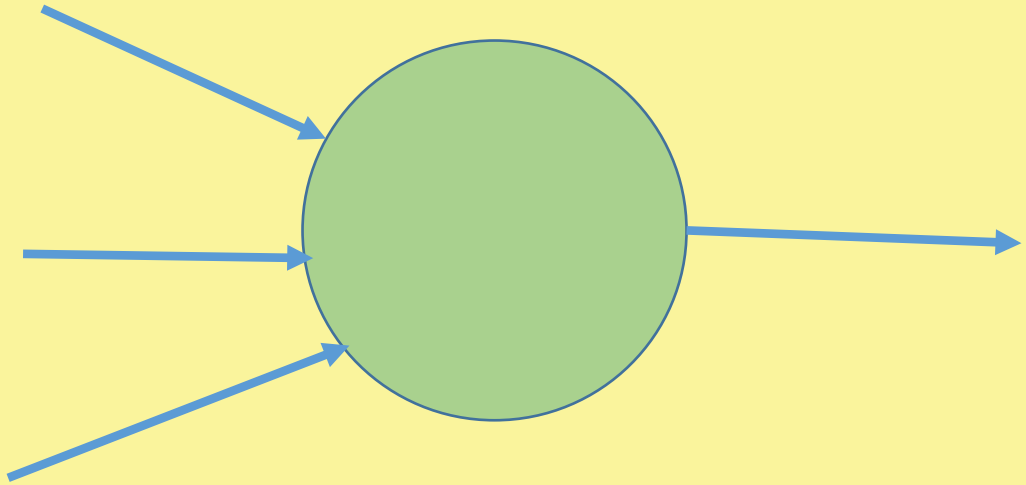
OR Function

$$X^t W = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} -0.5 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} -0.5 \\ 0.5 \\ 0.5 \\ 1.5 \end{bmatrix} \Rightarrow$$



$$\Rightarrow \begin{bmatrix} 0 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

OR Function



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Thank you