

From fundamental  
science to understanding  
Artificial Intelligence (AI)



# Agenda

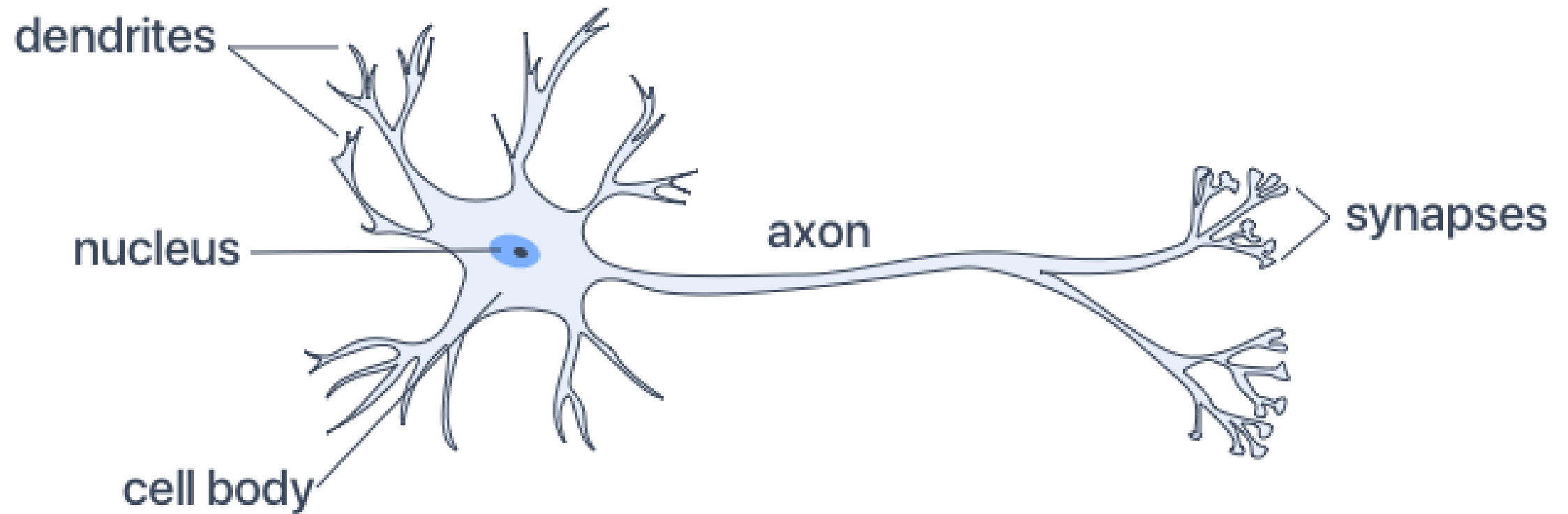
- Introduction
- Understanding an Artificial Neuron through a Biological Neuron
- Mathematics of an Artificial Neuron
- Activation Functions
- Understanding ANN(Artificial Neural Network)

# Introduction

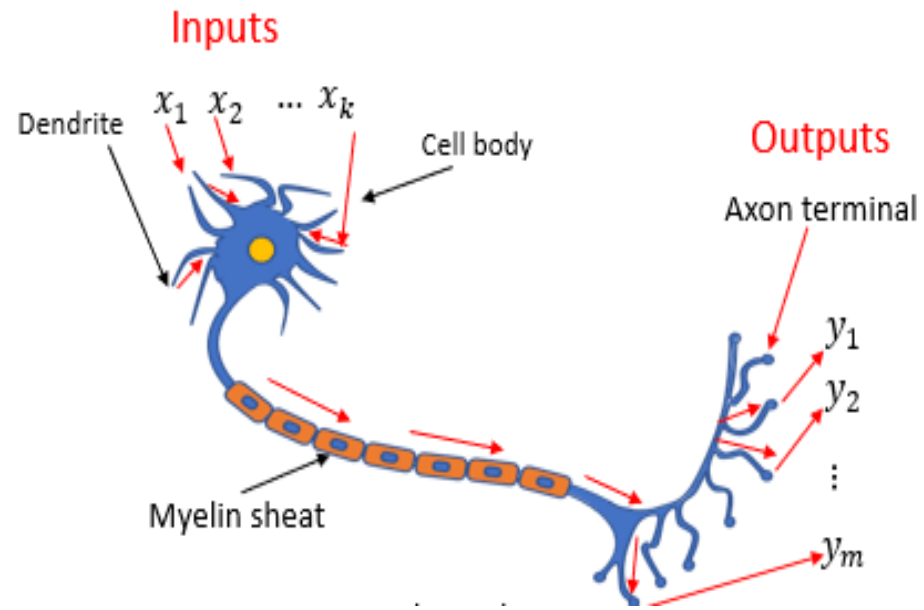
- AI refers to the simulation of human intelligence in machines that are programmed to think and act like humans.



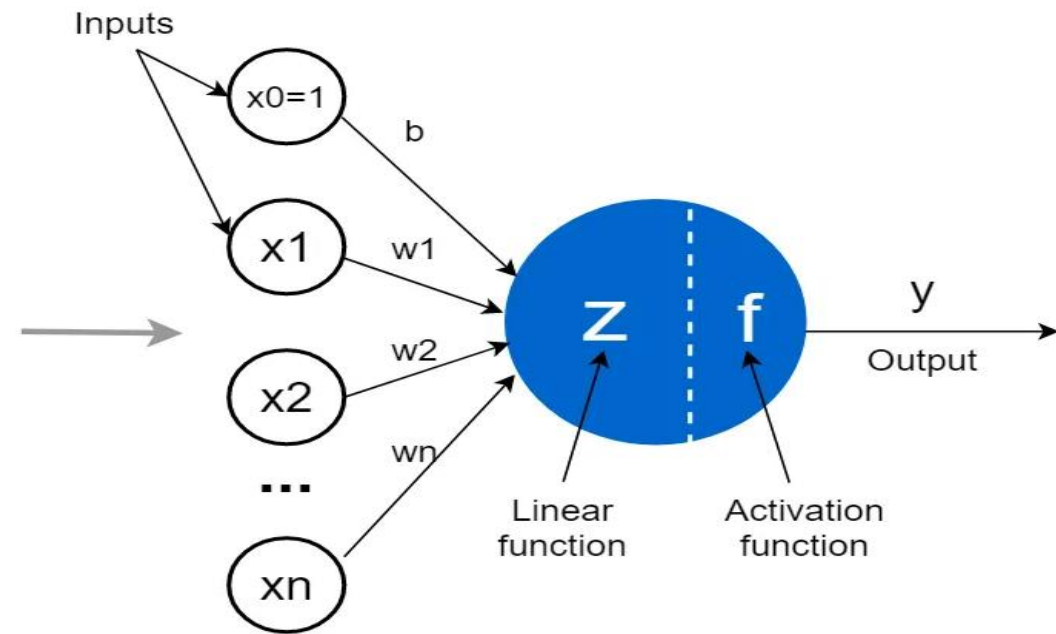
# Biological Neuron



# Artificial Neuron



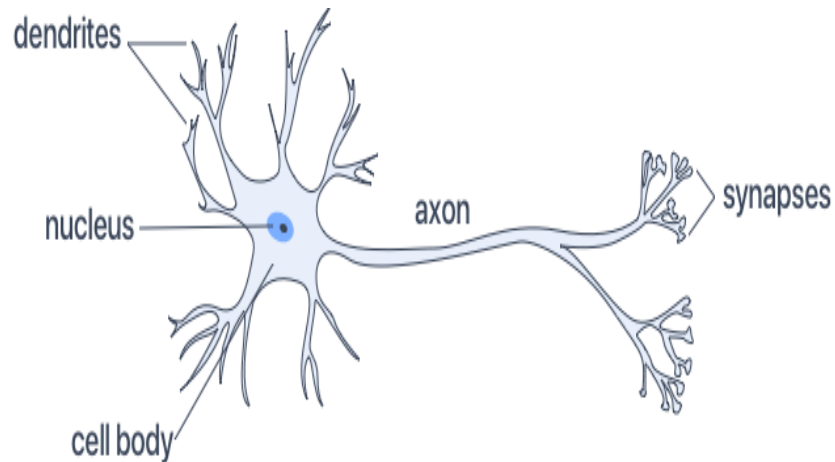
(Biological Neuron)



(Artificial Neuron)

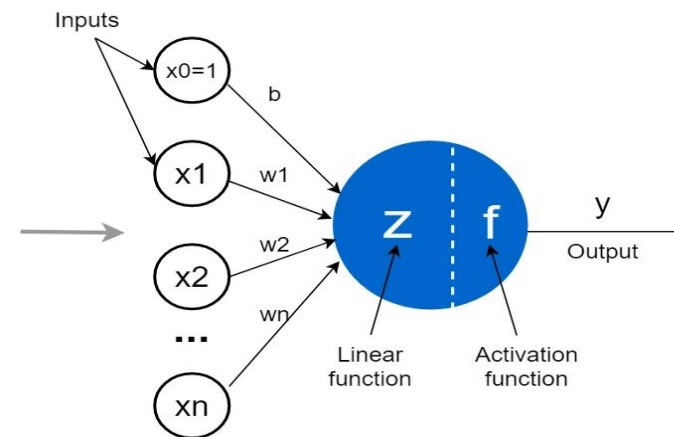
## Biological Neuron

- Dendrites
- Cell Nucleus
- Axon
- Synapses(Connection with other neurons)

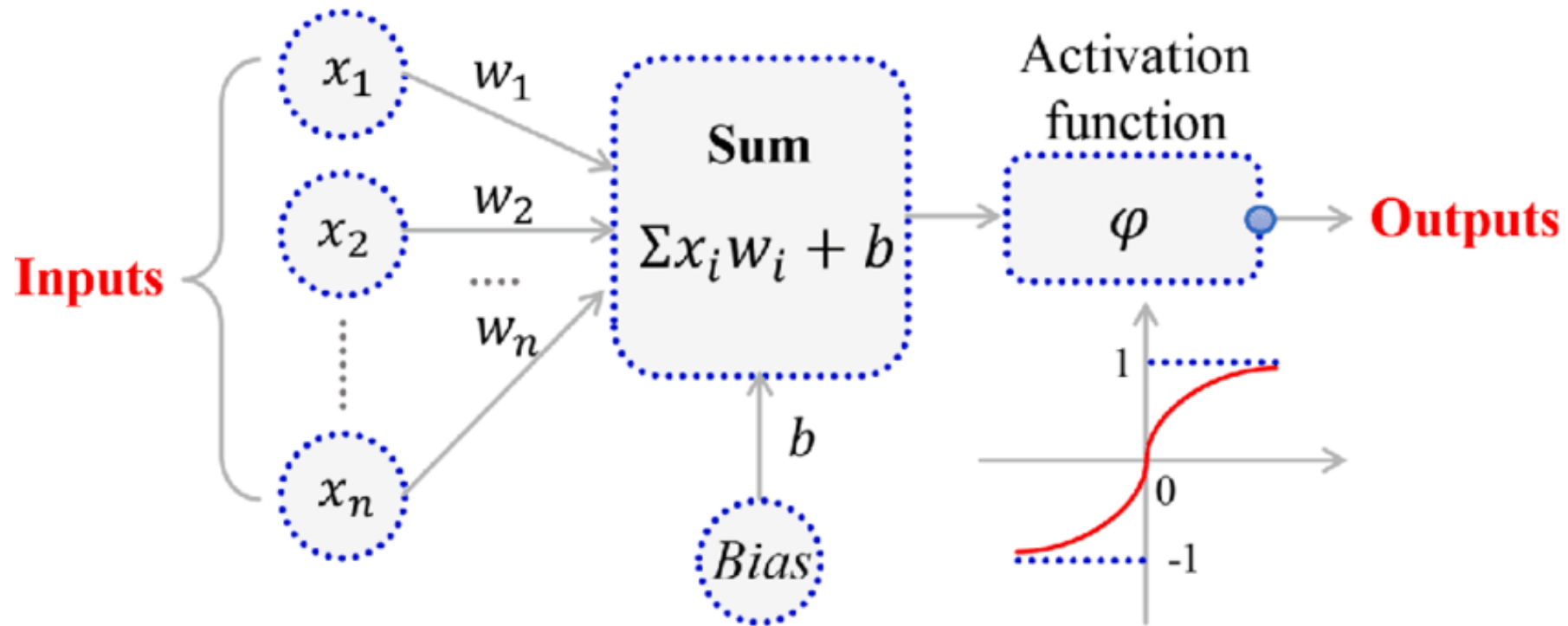


## Artificial Neuron

- Input
- Node
- Output
- Interconnections



# Mathematics of an Artificial Neuron



# Activation Function

- The activation function decides whether a neuron should be activated or not by calculating the weighted sum and further adding bias to it.

## Purpose of Activation Function

- Introduce non-linearity into the output of a neuron.
- The activation function does the non-linear transformation to the input making it capable to learn and perform more complex tasks.



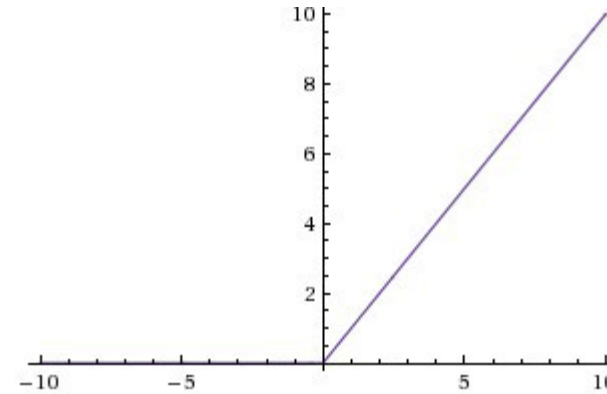
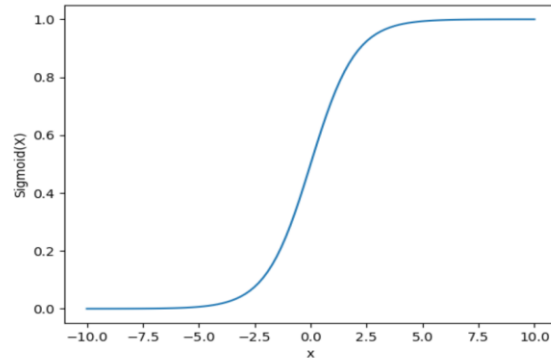
# Variants of activation function:

<https://www.desmos.com/calculator>

- Linear :  $f(x) = x$

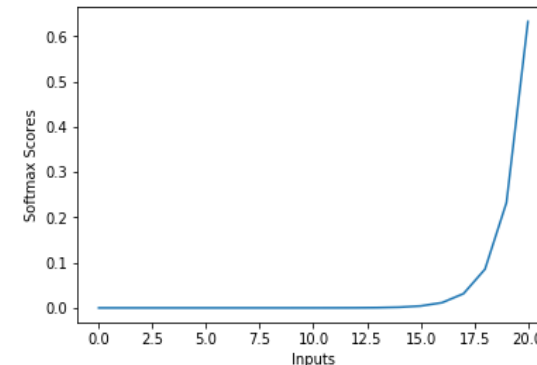
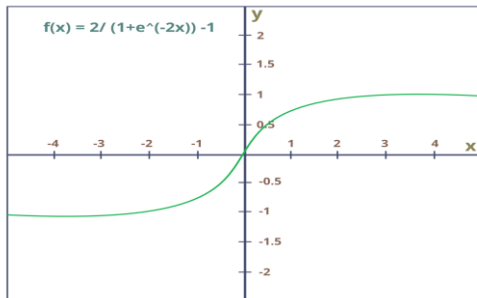
- Relu :  $f(x) = \max(0, x)$

- Sigmoid :  $f(x) = 1/(1 + e^{-x})$



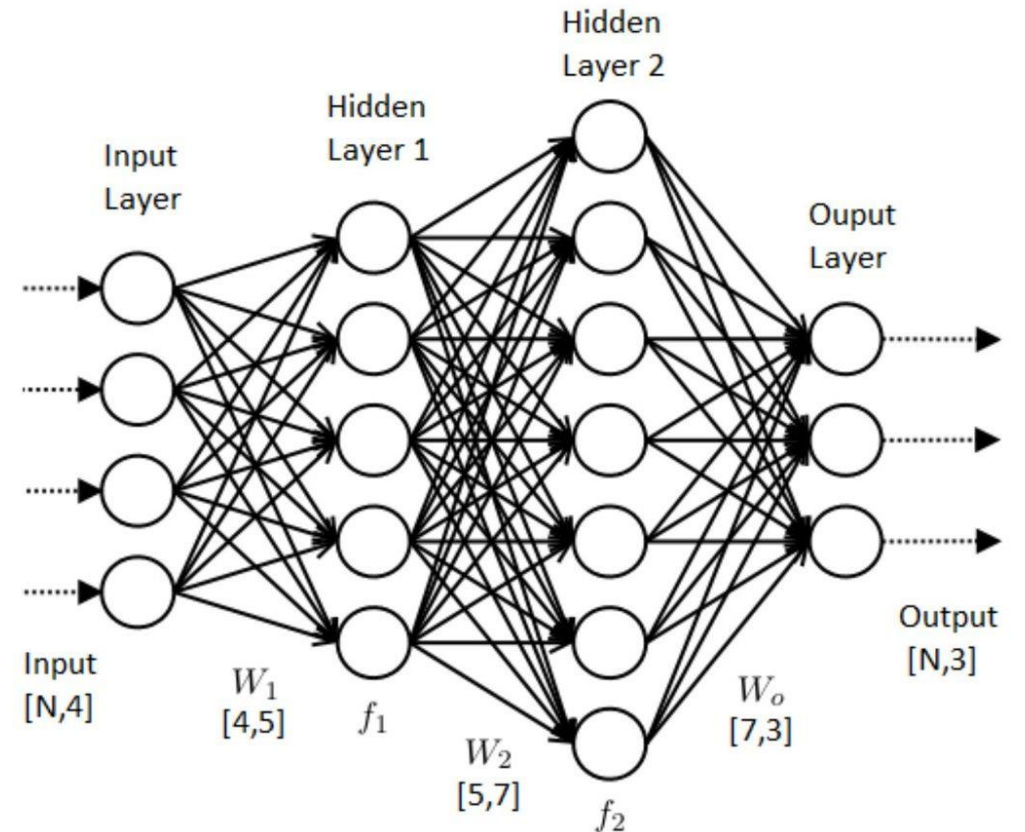
- Softmax :  $f_i(x) = \frac{\exp(x_i)}{\sum_j \exp(x_j)}$

- Tanh :  $f(x) = \tanh(x) = \frac{2}{1+e^{-2x}} - 1$



# Artificial Neural Network (ANN)

- ANN's are a network of fully connected artificial-neurons which are conceptually derived from biological-neurons.
- ANN is a computational model that consists of artificial-neurons that receive inputs and deliver outputs based on their predefined activation functions.



# Tensorflow Playground & Other resources



<https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAIQw7AJahcKEwiArof6bOAAxUAAAAAHQAAAAAQAg&url=https%3A%2F%2Fplayground.tensorflow.org%2F&psig=AOvVaw0ZxnPnZQyWuhxRZRDIloe-&ust=1690720766447209&opi=89978449>



[Visualization of a fully connected neural network, version 1 - YouTube](#)