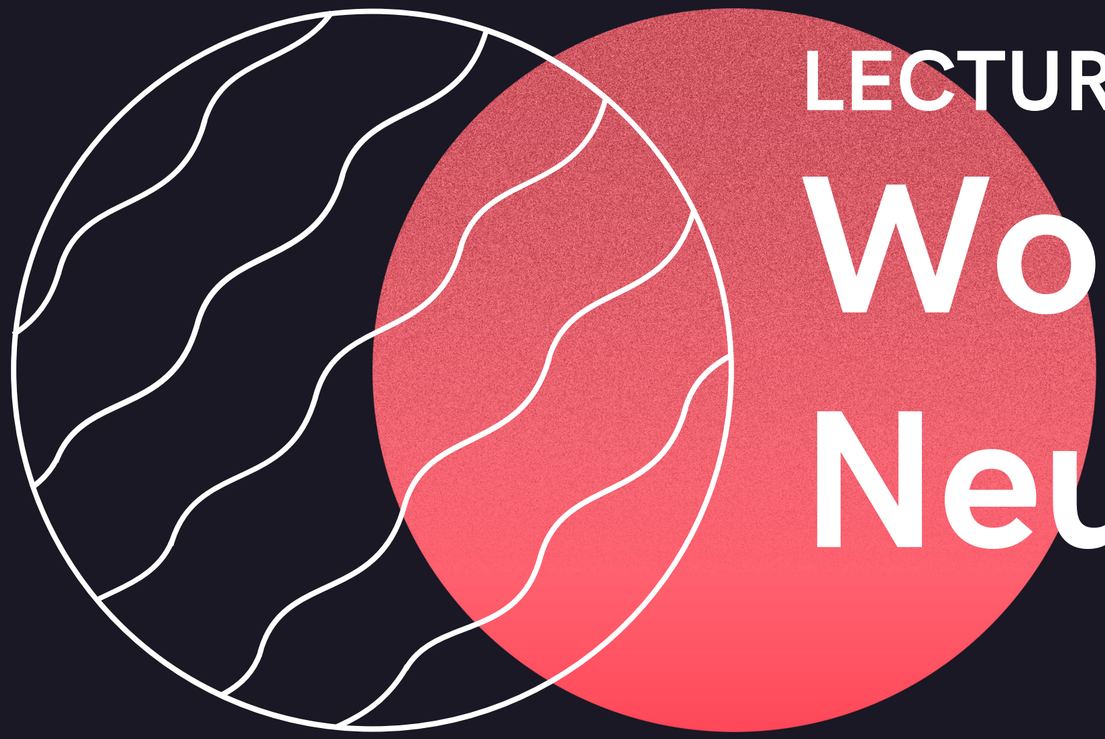


LECTURE - 1

Workshop Neural Networks

SHAPEAI

GETTING STARTED WITH NEURAL NETWORKS

HISTORY

Neural Networks were inspired in the early 1940s by researchers tried to implement the same ideas of neuroscience to computers.

COMMONLY USED IN

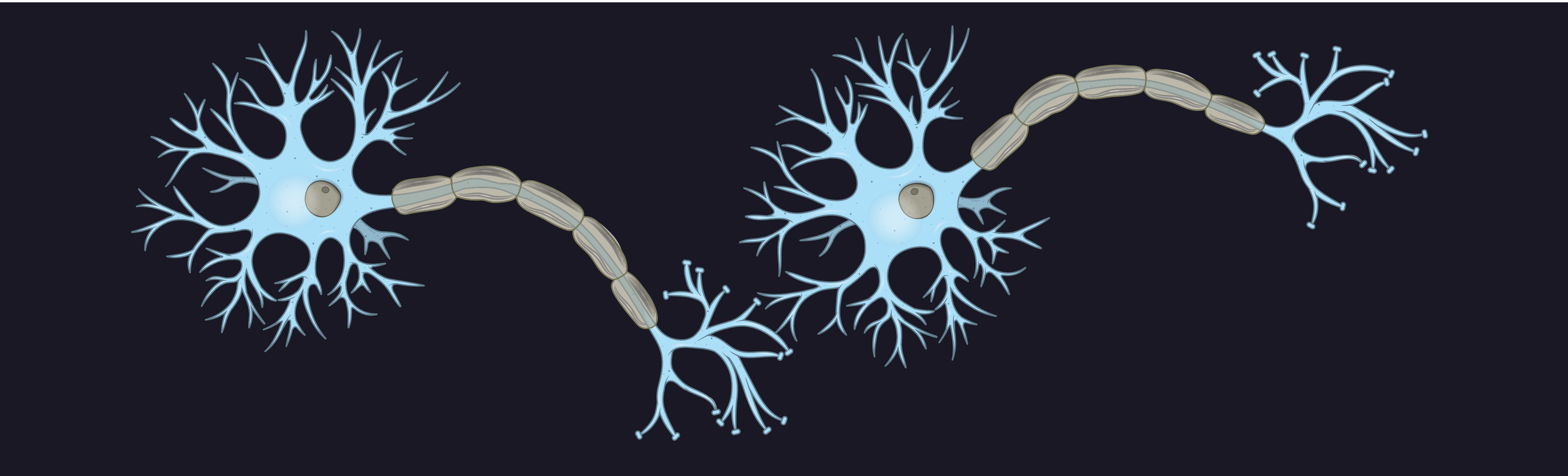
CNNs are commonly used in image search services, self-driving cars, recommendation system, fraud detection, and many more systems.

ALSO USED IN

They are also successful in many other tasks, such as voice recognition and natural language processing. There is just so much to neural networks.

03

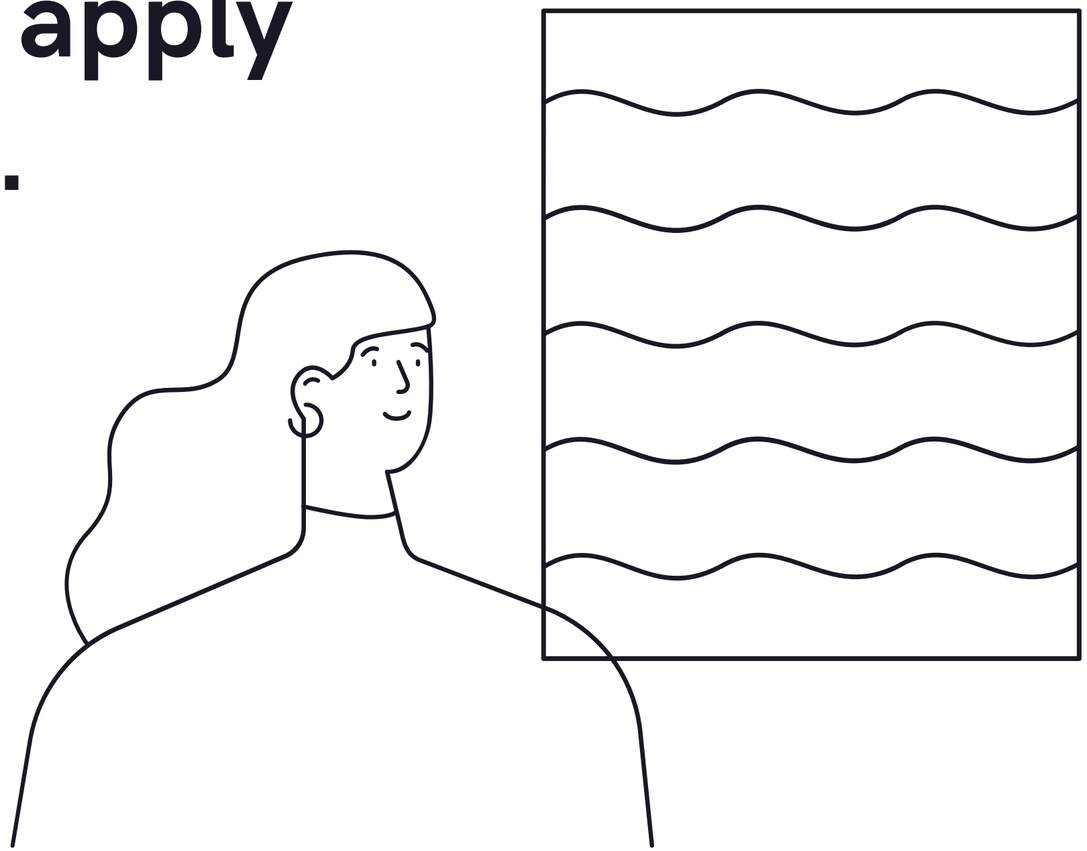
NEURAL NETWORKS

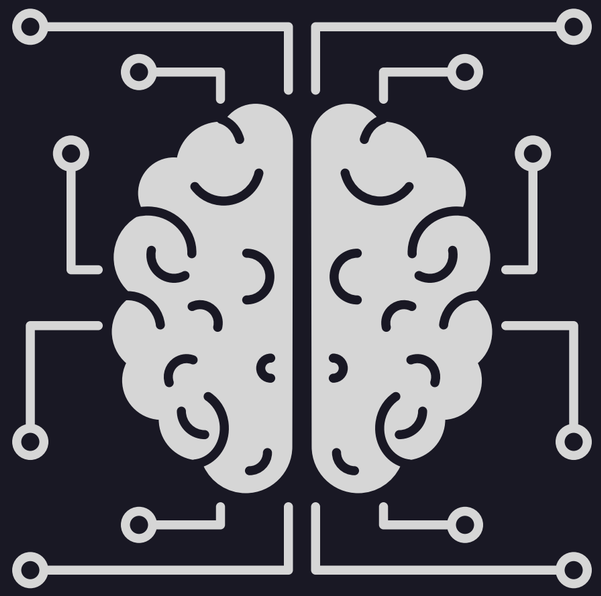


NEURAL NETWORKS

- Neurons are connected to and receive electrical signals from other neurons.
- Neurons process input signals and can be activated.

Then the question arised can we take in this biological idea of How humans learn? and apply that to machines as well.



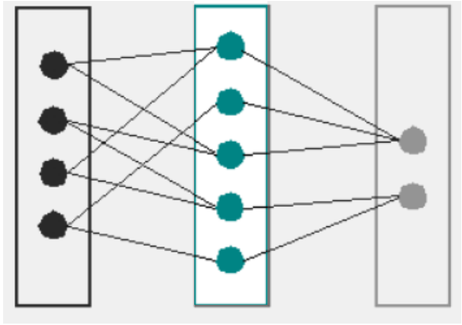


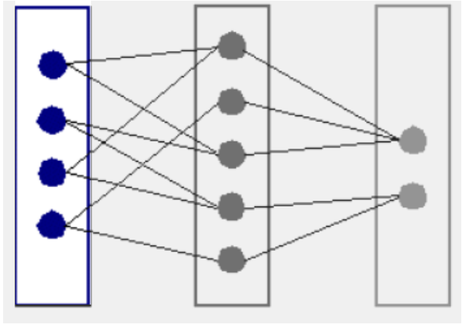
ARTIFICIAL NEURAL NETWORKS

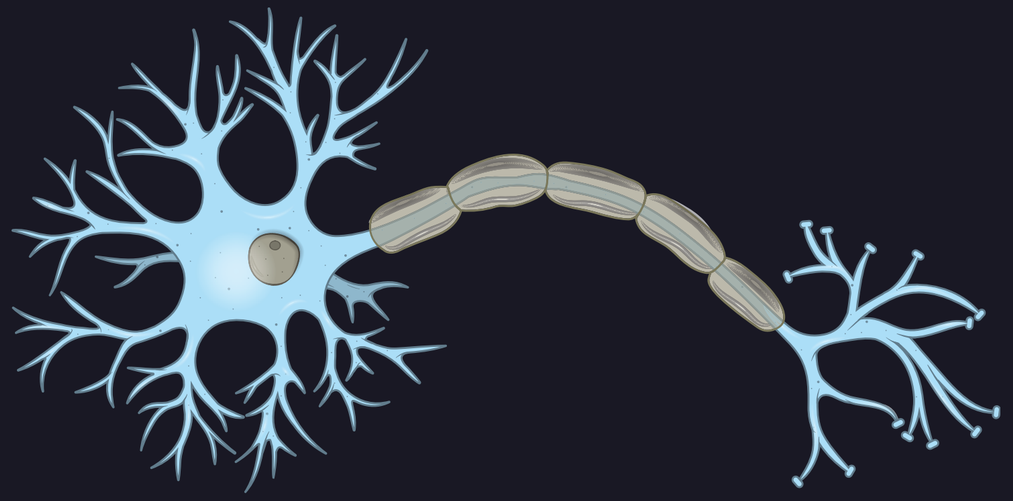
Mathematical Model for learning inspired by biological neural networks

ARTIFICIAL NEURAL NETWORKS

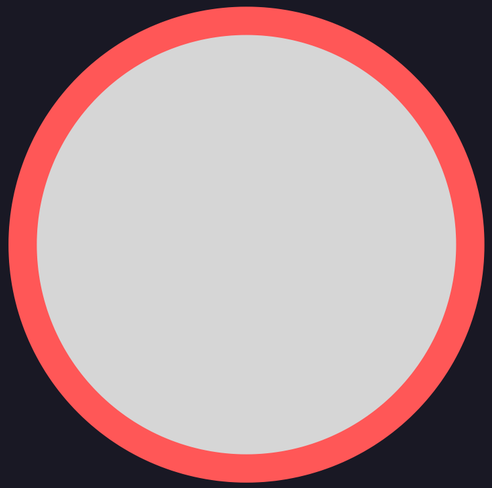
- Model mathematical function from inputs to the outputs based on the structure and parameters of the network.
- Allows for learning the network's parameters based on data.



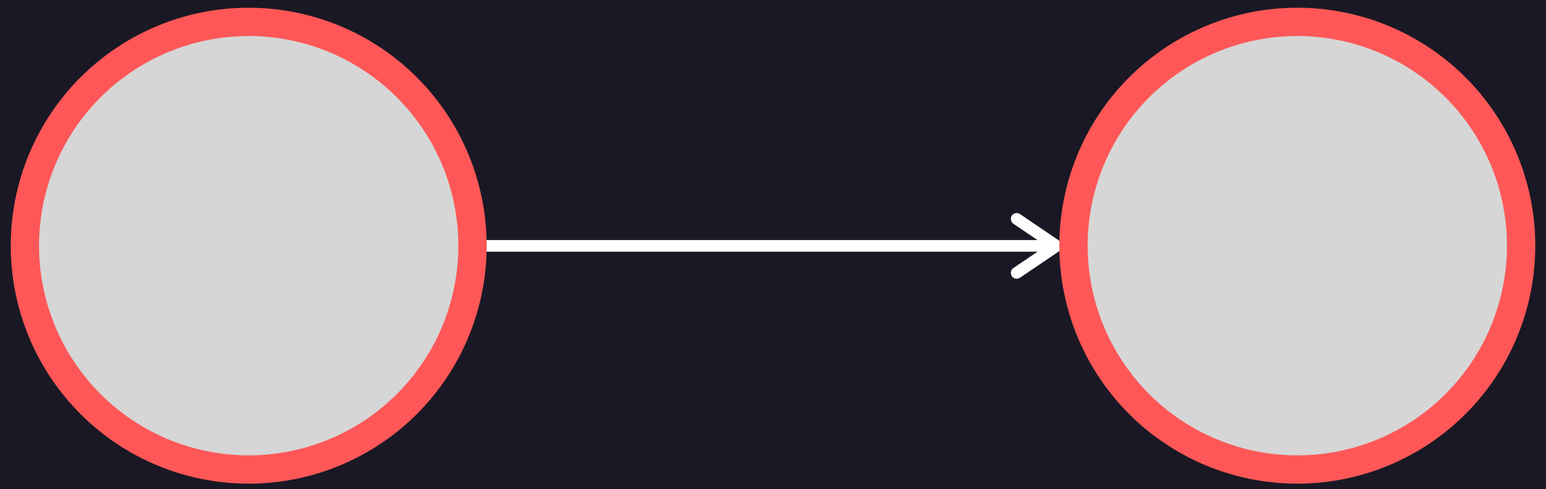




biological neurons



Neuron / Units



These Neurons can be
connected to one another

$(x1, x2)$ ⟶

Using some input attributes predict death in titanic.

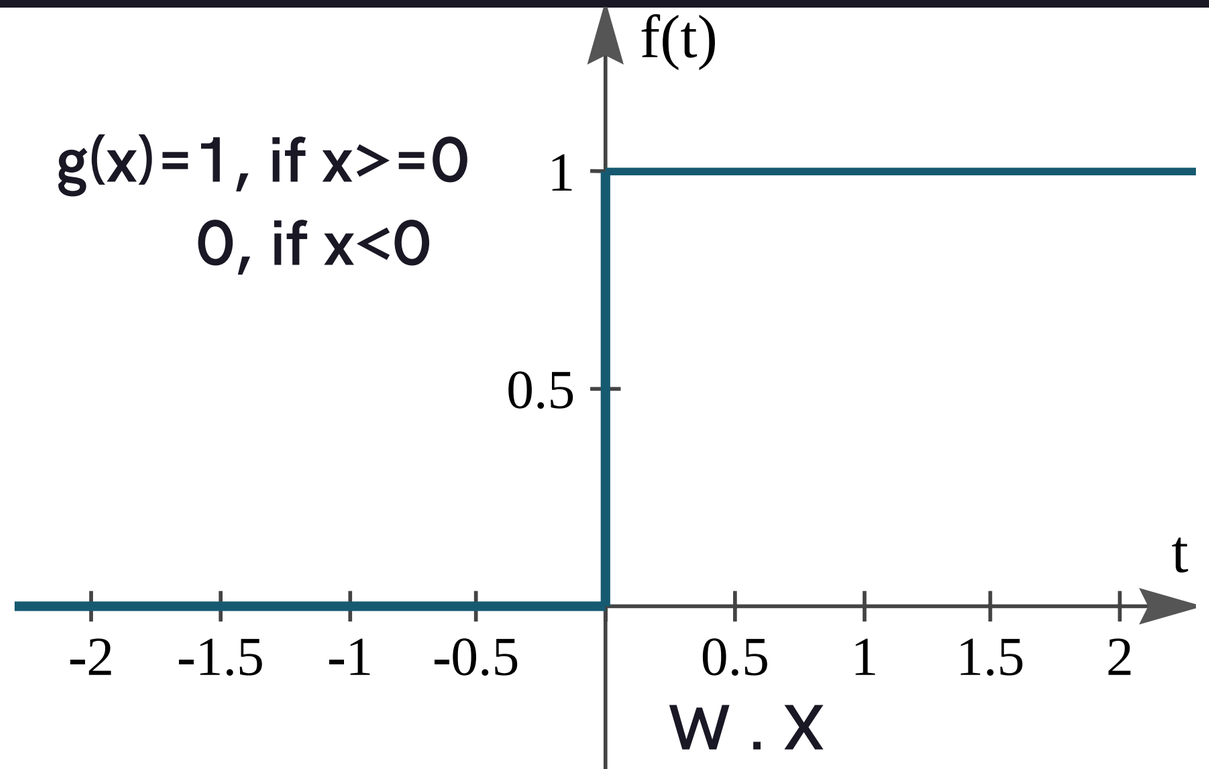
$$h(x1, x2) = w_0 + w_1 x_1 + w_2 x_2$$

In order to determine this hypothesis function we just need to determine what these wights should be.

ACTIVATION FUNCTION

Step Function

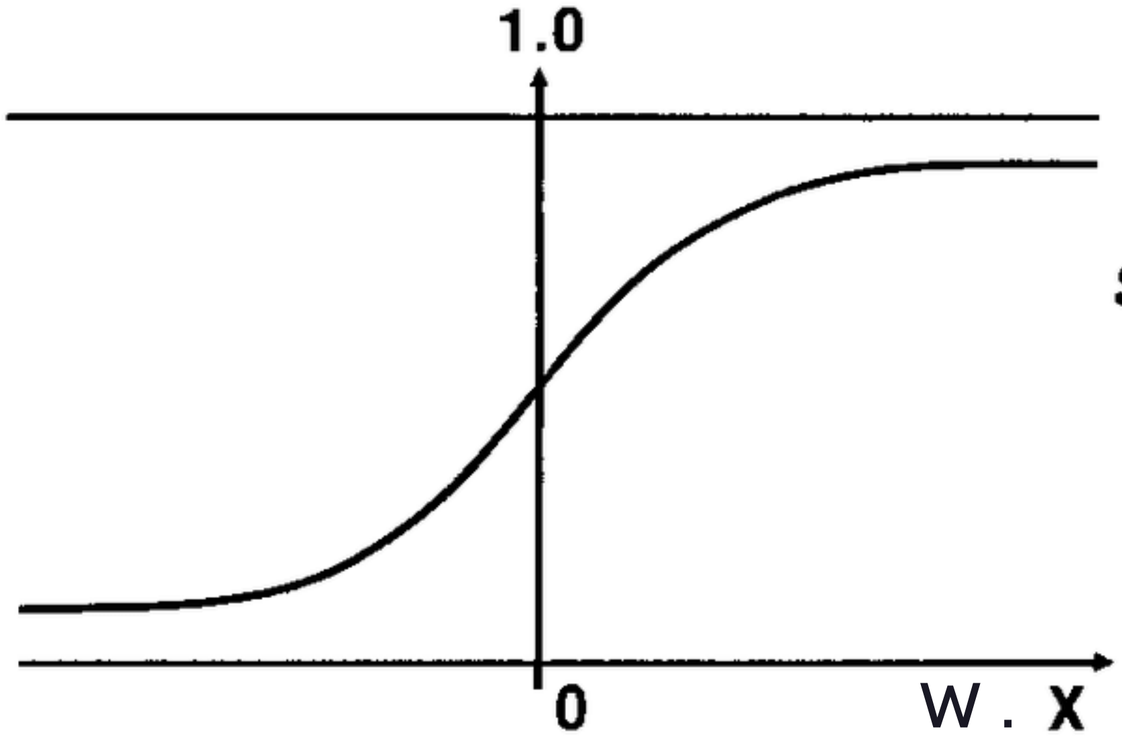
At the end of the day we need to do some classification ie. will a person live or die if they were on titanic. And hence we will have to define some type of threshold.



ACTIVATION FUNCTION

Sigmoid Function

There will some times were we don't want 0 or 1 we want somewhere in between like the probability of a persons death on titanic.



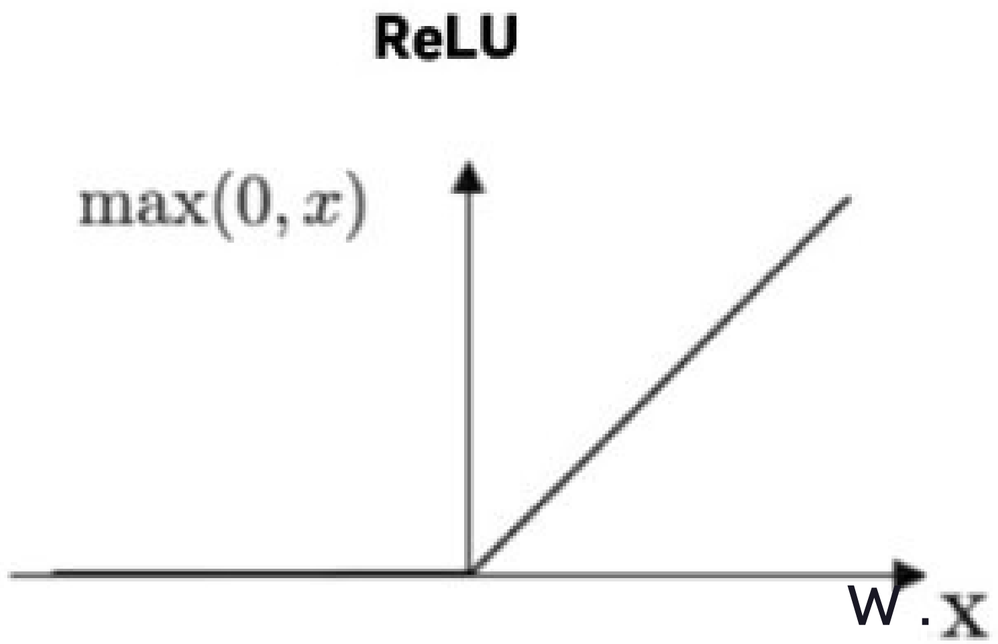
Sigmoid

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

ACTIVATION FUNCTION

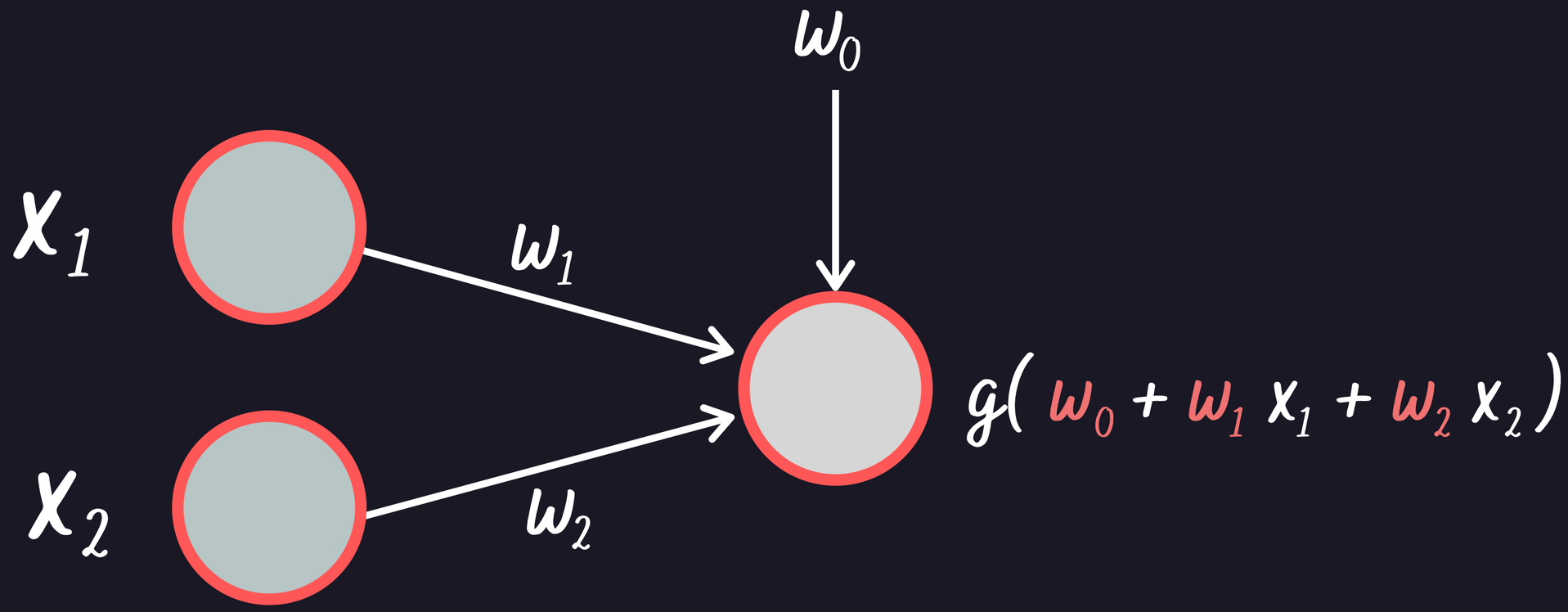
ReLU Function

This is an other activation function where in if w.x is positive then it remains unchanged while if it is negative then it becomes 0.



$$h(x1, x2) = g(w_0 + w_1 x_1 + w_2 x_2)$$

Activation function can be thought of as an other function g() that is applied to the result of all of this computation.

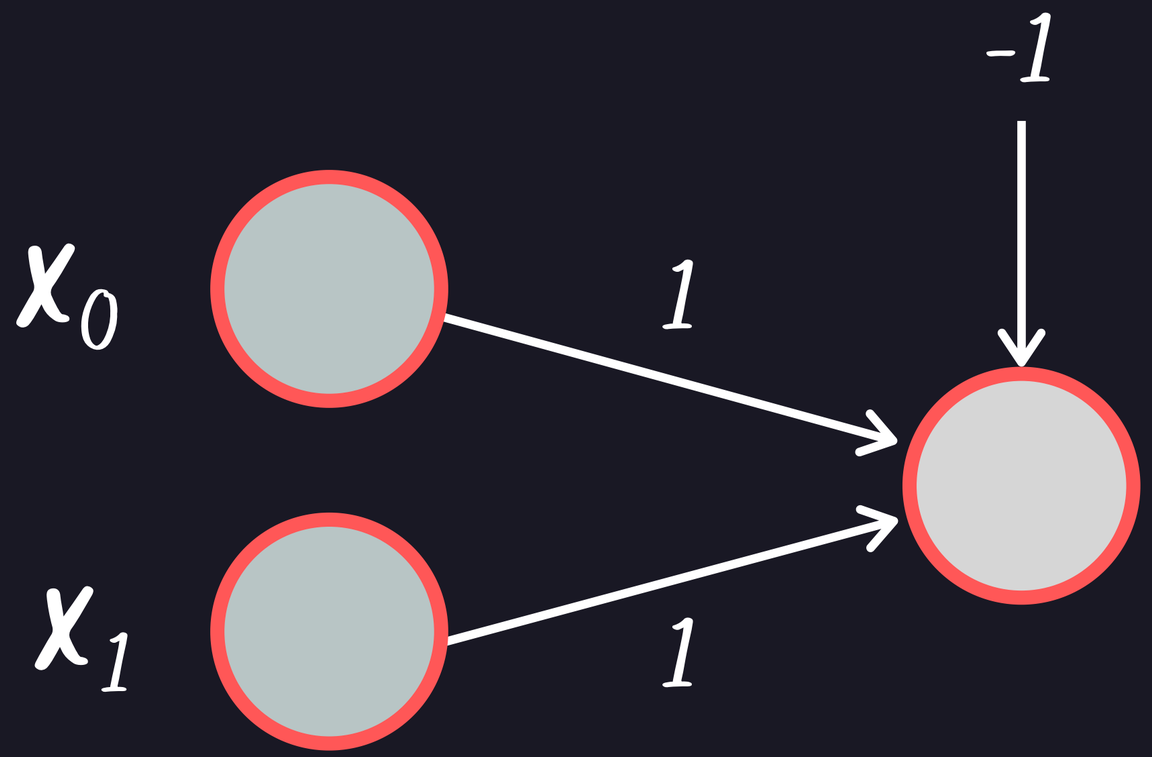


We will represent the above mathematical formula using a structure like this.

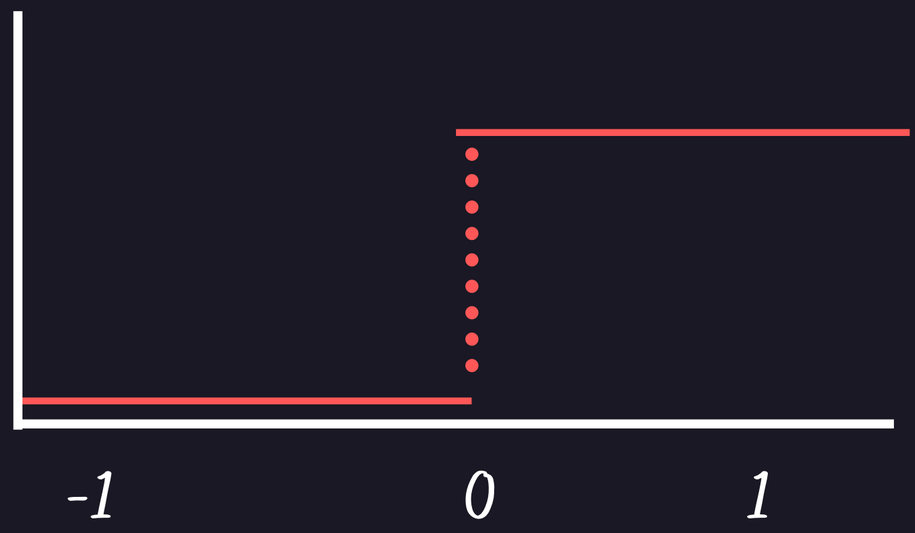
OR FUNCTION

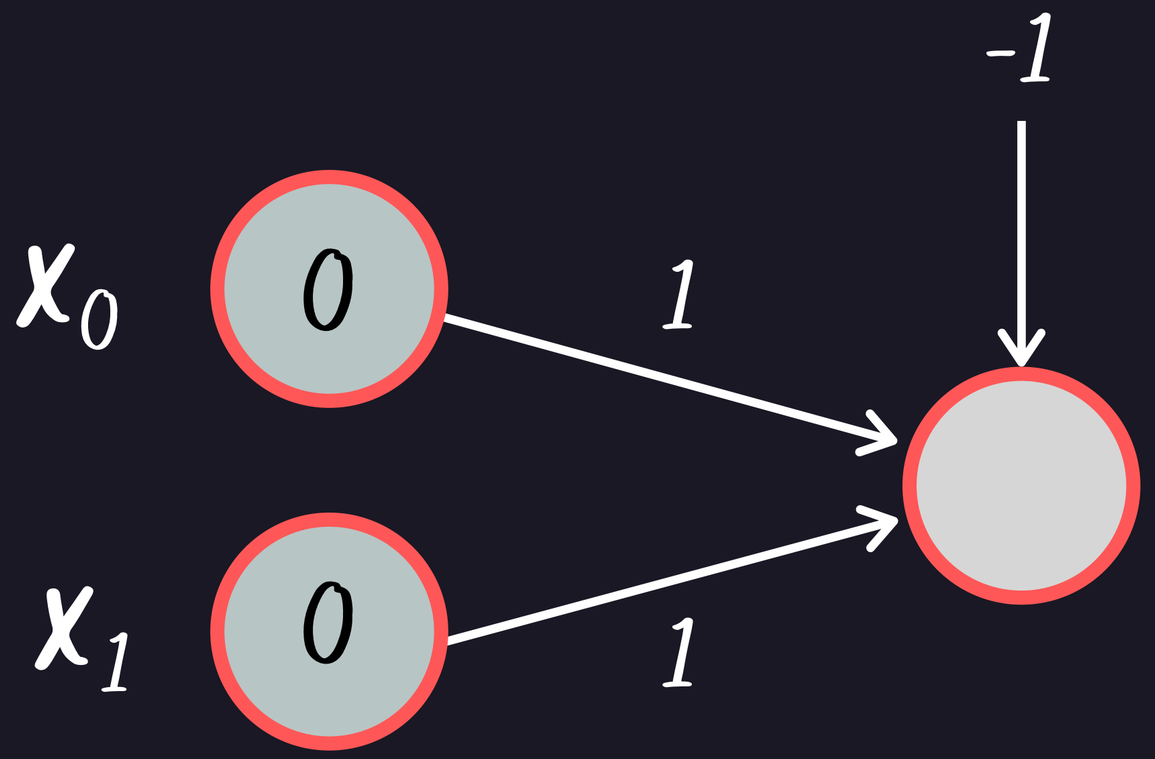
Taking a simple example of OR function to understand neural networks.

Input	Input	Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	w_0

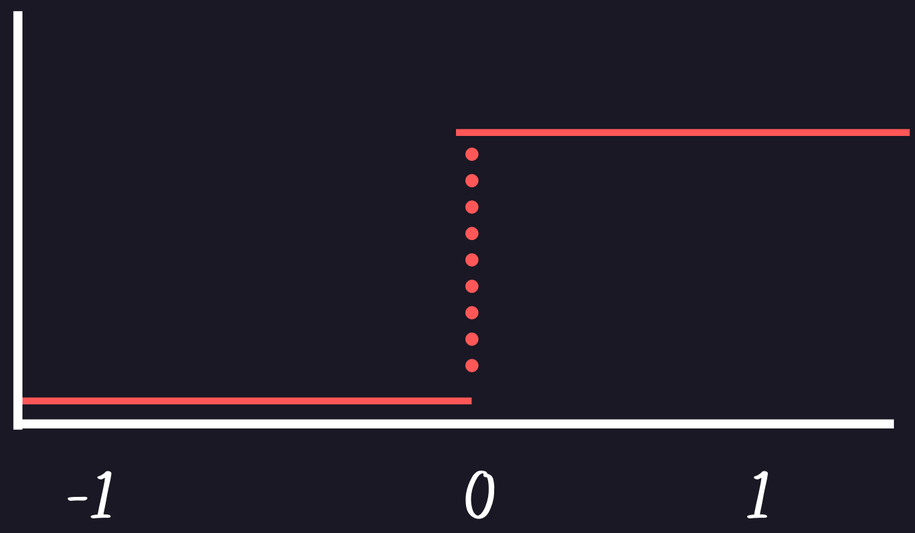


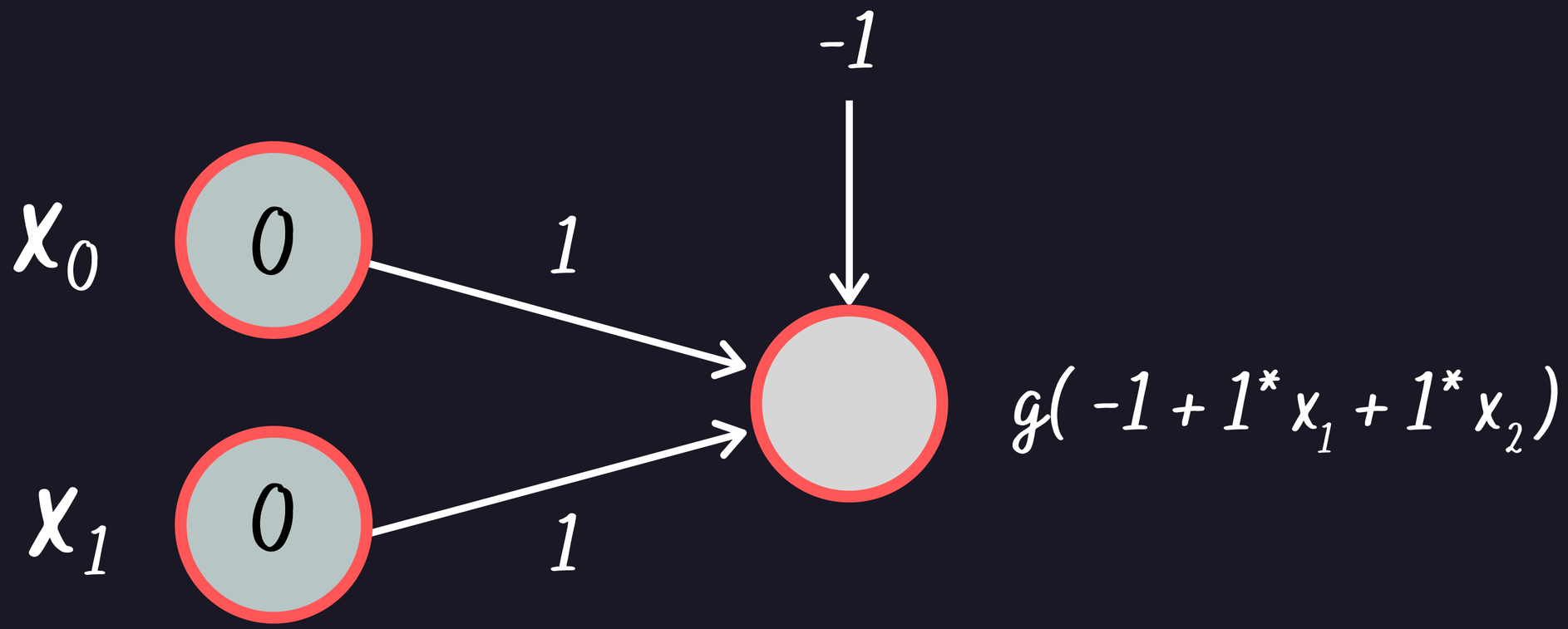
$$g(-1 + 1^* x_1 + 1^* x_2)$$

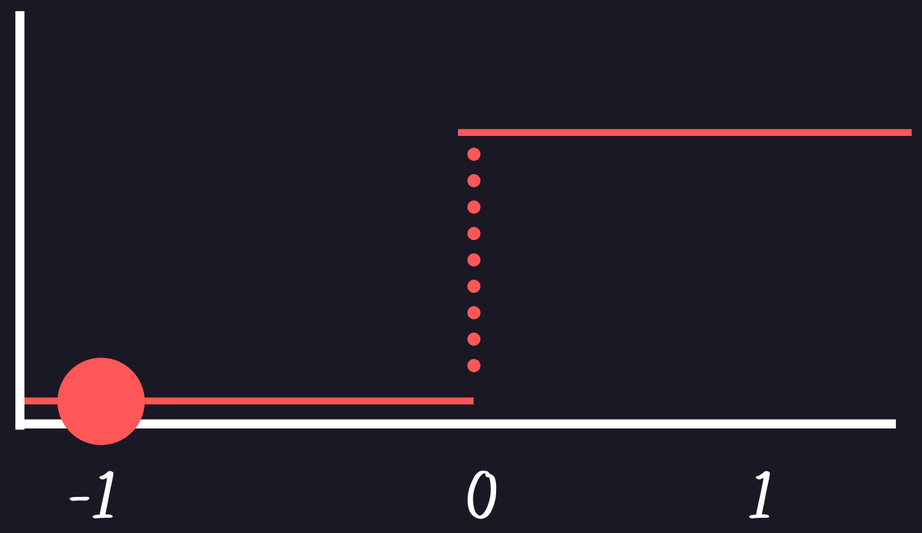


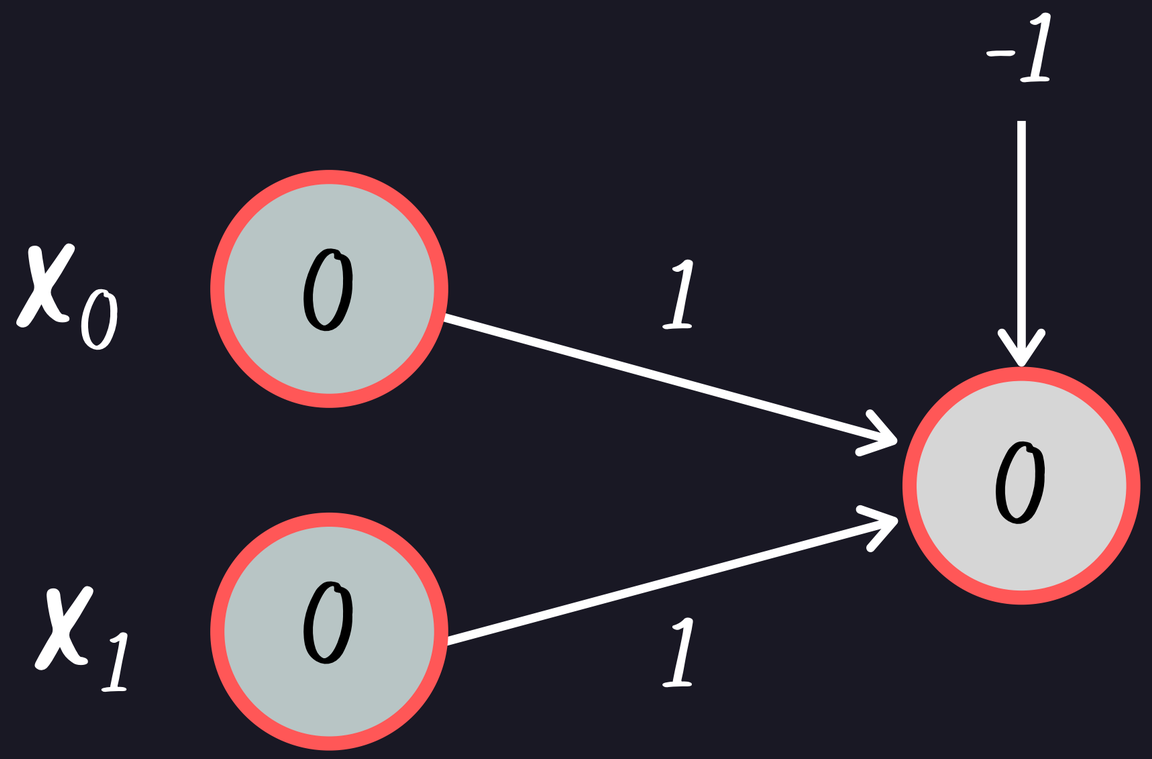


$$g(-1 + 1^* x_1 + 1^* x_2)$$

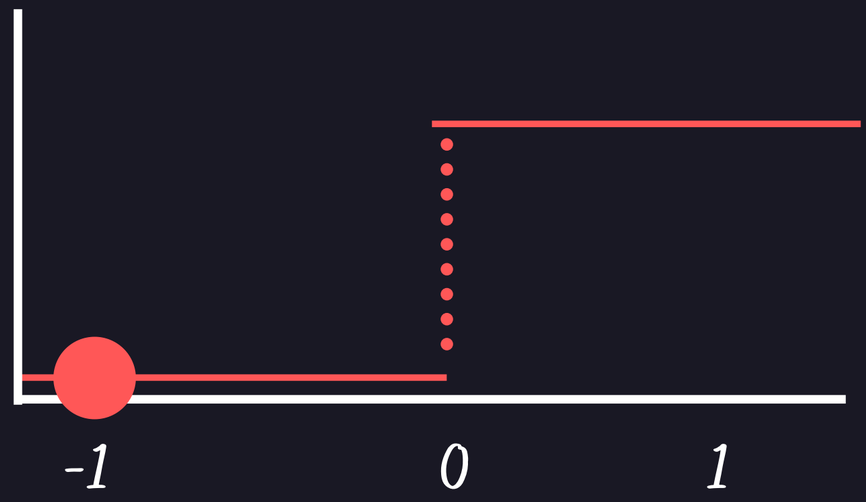



-1
x_0
0
1
x_1
0
1
$g(-1 + 1^* x_1 + 1^* x_2)$

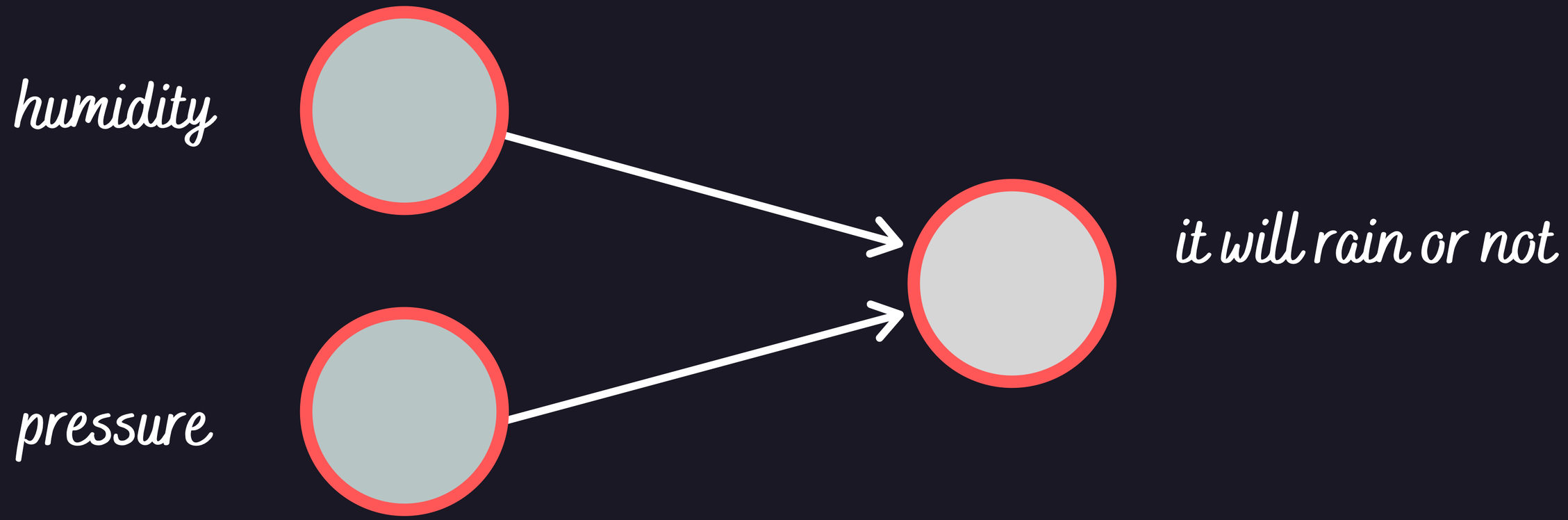

-1
0
1



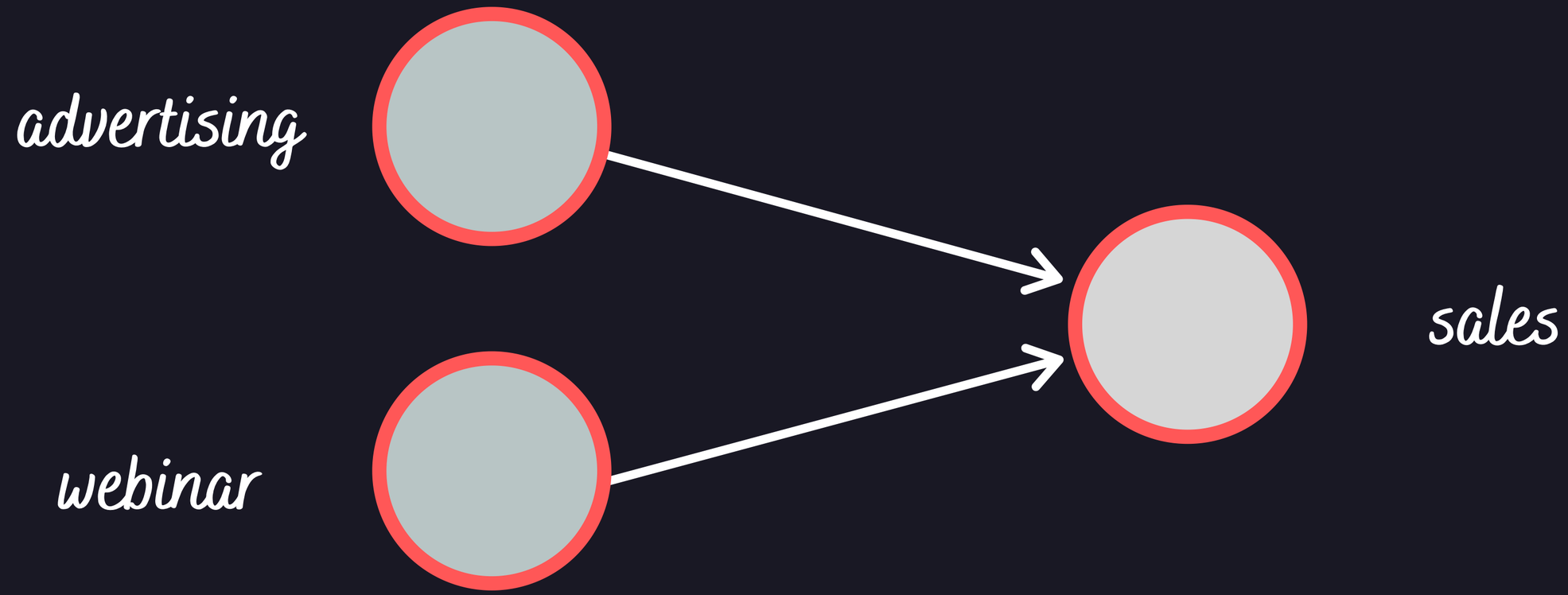
$$g(-1 + 1^* x_1 + 1^* x_2)$$



CLASSIFICATION



REGRESSION



COMPLEX NEURAL NETWORKS

DEEP NEURAL NETWORKS

FEED-FORWARD NEURAL NETWORKS

- Neural Networks that has connections in only one direction.
- Such that the inputs move from the input to the hidden layers and then to the output. They propagate only in one direction.

LOSS FUNCTION

Loss (x, y, w)

A Loss function quantifies how unhappy you would be if you used 'w' to make a prediction on x when the correct output is y.

TYPES OF LOSSES

$y-y'$

Residual loss

$(y-y')^2$

Squared Loss

$|y-y'|$

Absolute loss

W1 VS W2 PLOT

GRADIENT DESCENT

THANKS

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