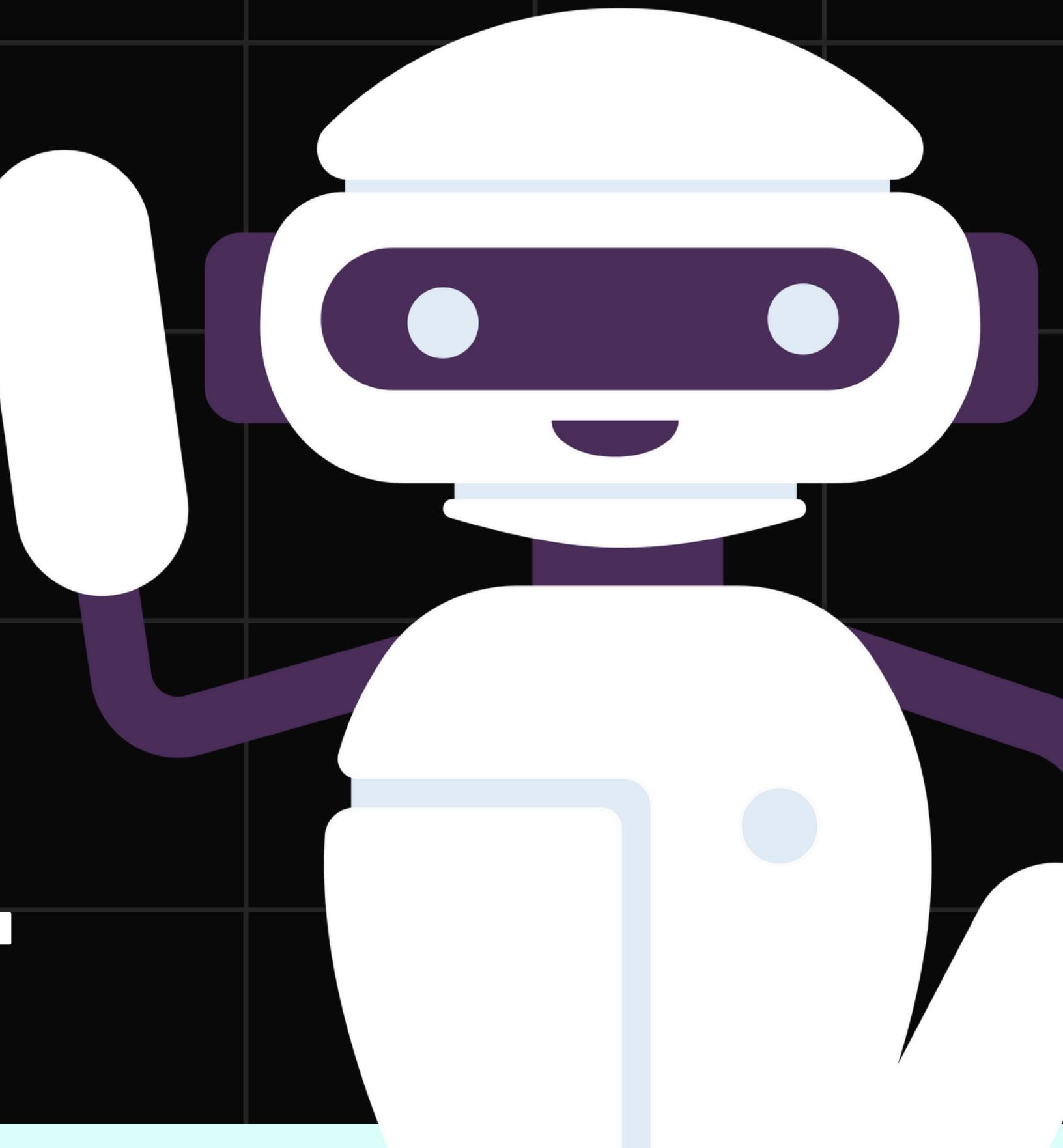
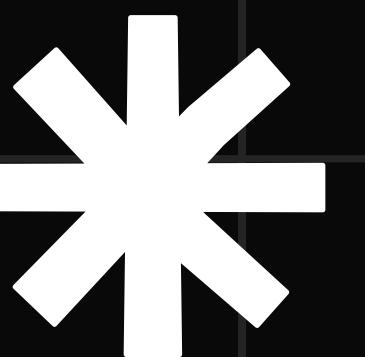


Neural Networks

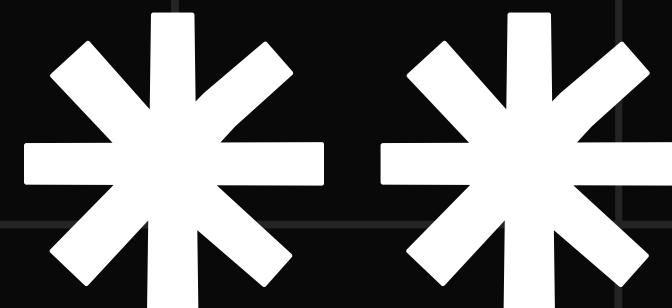
Presented by Ivar Pedro Medrano Callisaya

Antes ¿Qué es la Inteligencia Artificial?

Disciplina científica que se ocupa de crear programas informáticos que ejecutan operaciones comparables a las que realiza la mente humana, como el aprendizaje o el razonamiento lógico.



Inteligencia Artificial



Inteligencia Artificial

Vision Artificial

Robotica

Machine Learning

Aprendizaje No Supervizado
Aprendizaje Supervizado

Deep Learning

Redes Neuronales ANN

CNN

Transformers

RNN

IA generativa

Grandes modelos de lenguaje
LLM

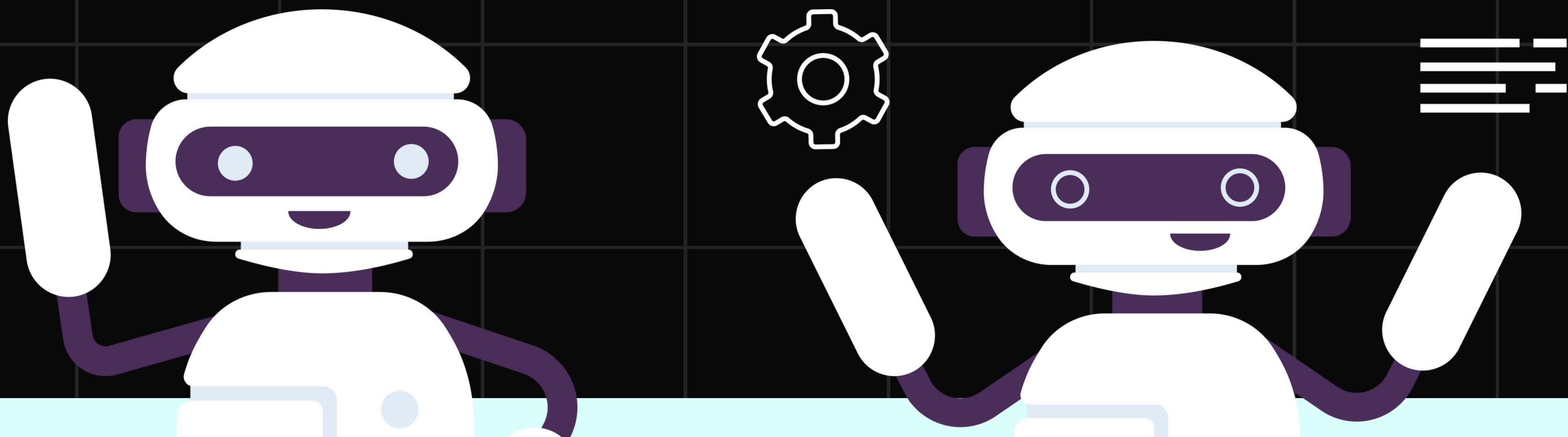
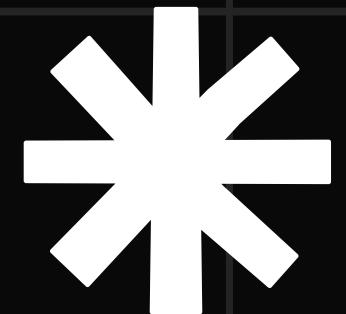
Grandes Modelos de Vision
LVM

Procesamiento del
Lenguaje Natural
NLP

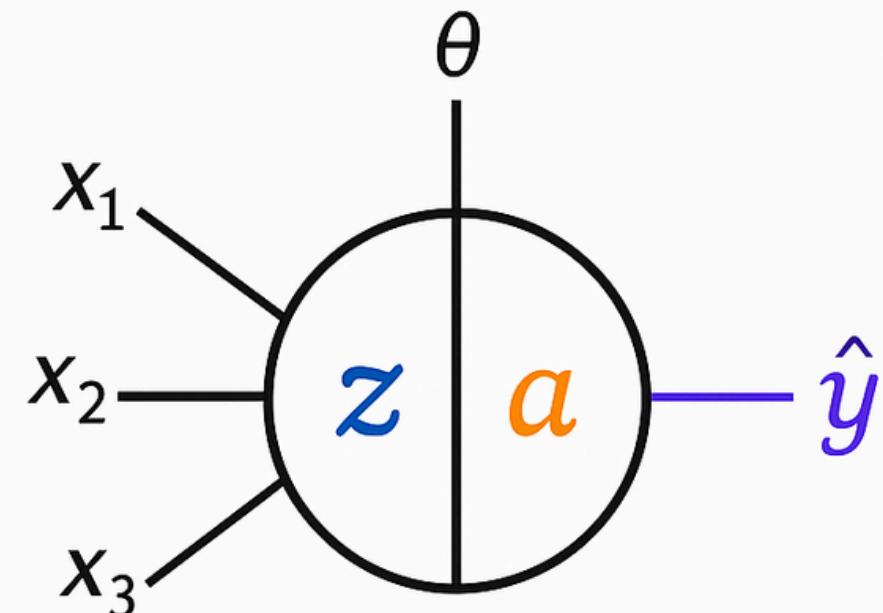
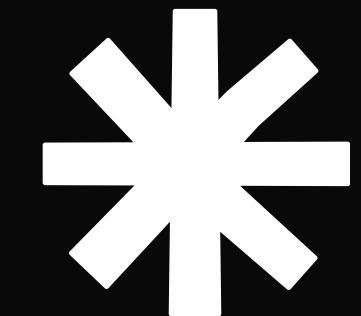
Aprendizaje por
Refuerzo

Chaos

Historia de las Redes Neuronales



Neurona de McCulloch y Pitts (1943): lógica binaria.



$$z(x) = \sum_{i=1}^3 x_i$$

$$a(x) = \begin{cases} 1 & \text{si } z(x) \geq \theta \\ 0 & \text{si } z(x) < \theta \end{cases} \quad \hat{y} = a(z(x)) \quad \vec{x} = (x_1, x_2, x_3)$$

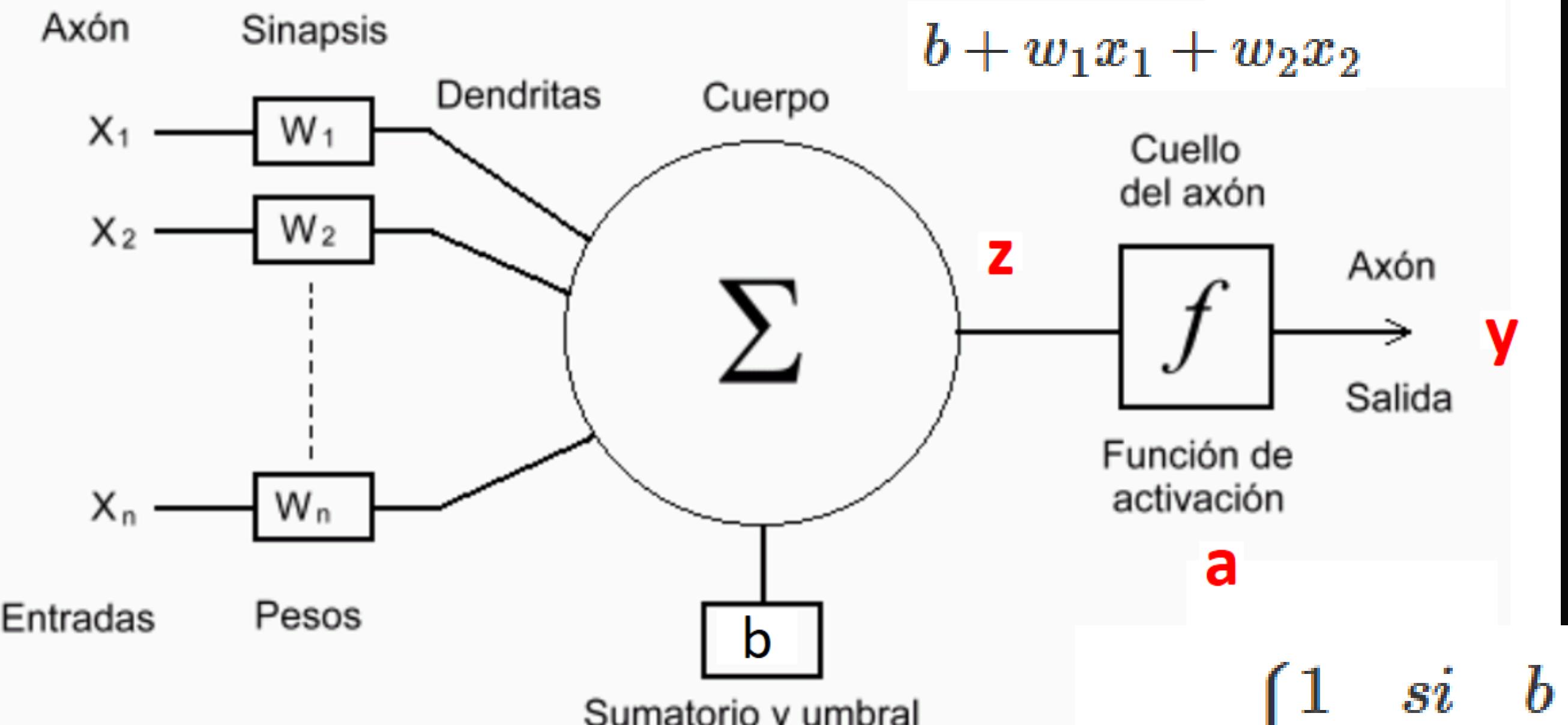
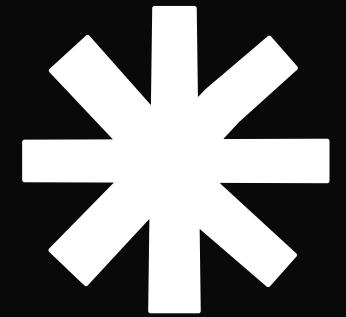
¿Voy a ir al parque de atracciones?

X_1 = ¿Está cerrado?

X_2 = ¿Está despejado?

X_3 = ¿Es fin de semana?

Perceptrón de Rosenblatt (1958): primera red entrenable.



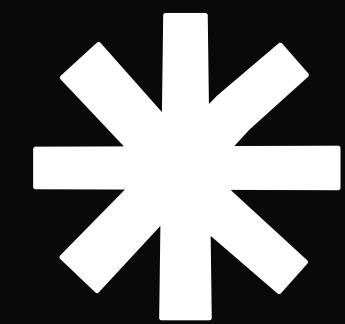
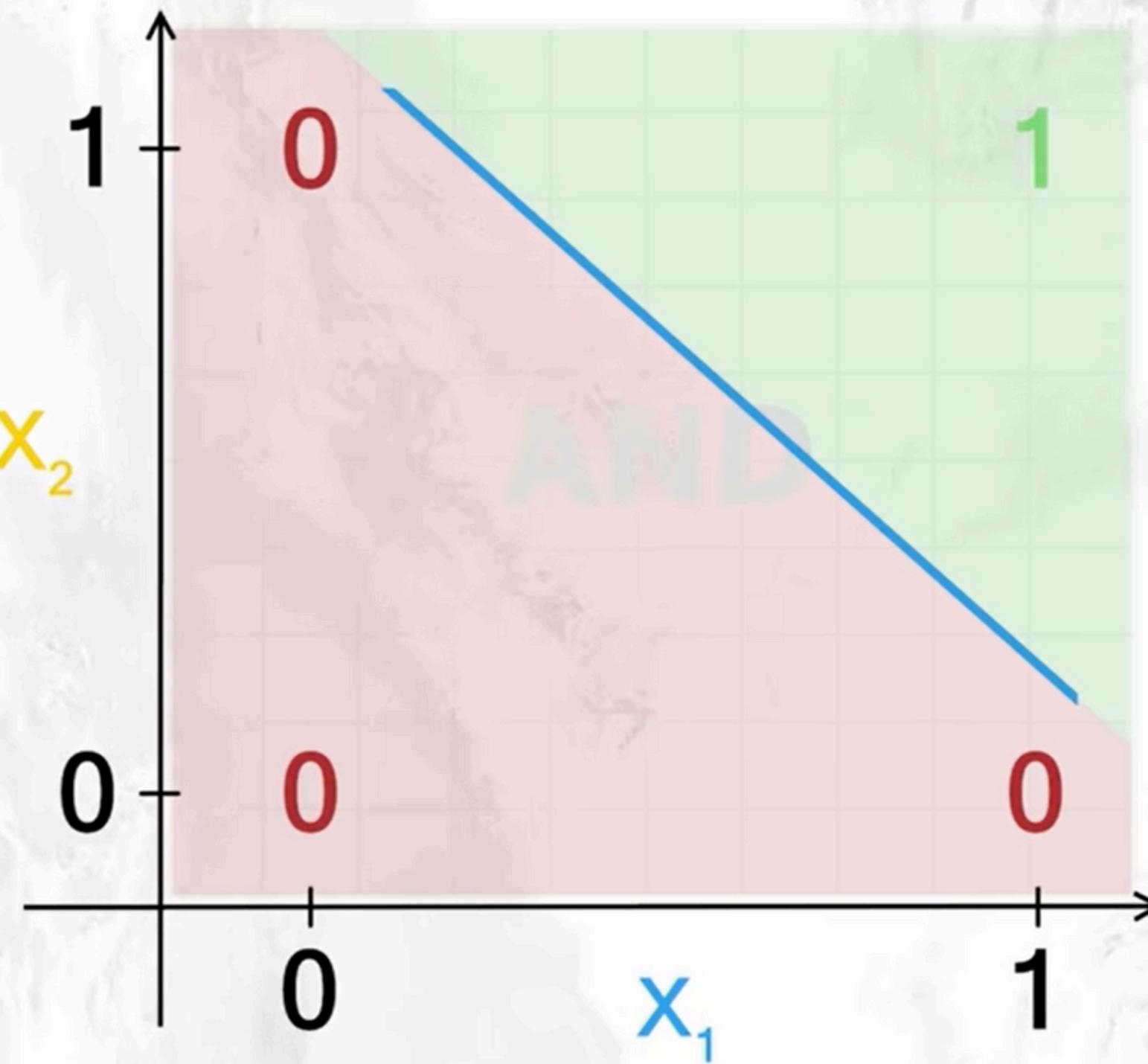
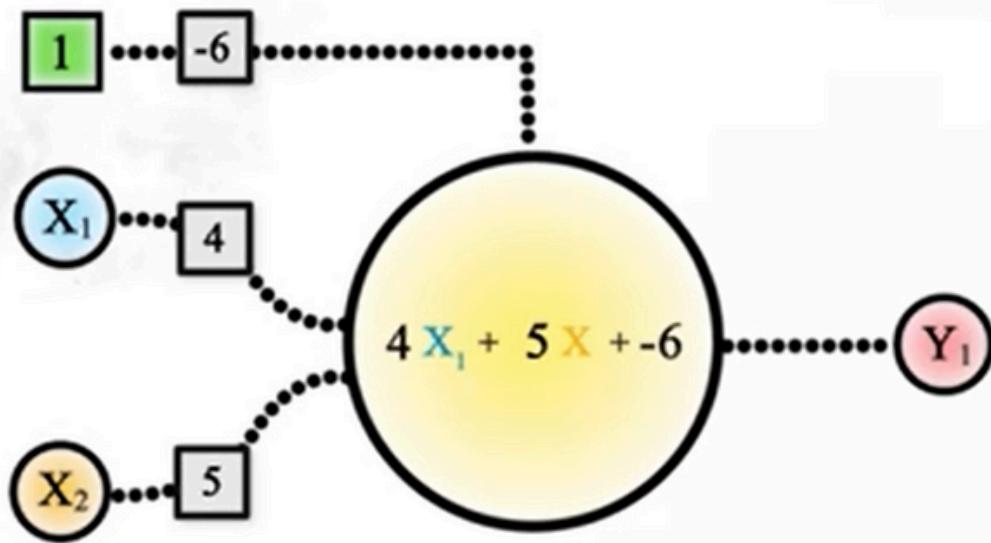
$$b + w_1x_1 + w_2x_2$$

Cuello
del axón
 f
Axón
Salida
Función de
activación

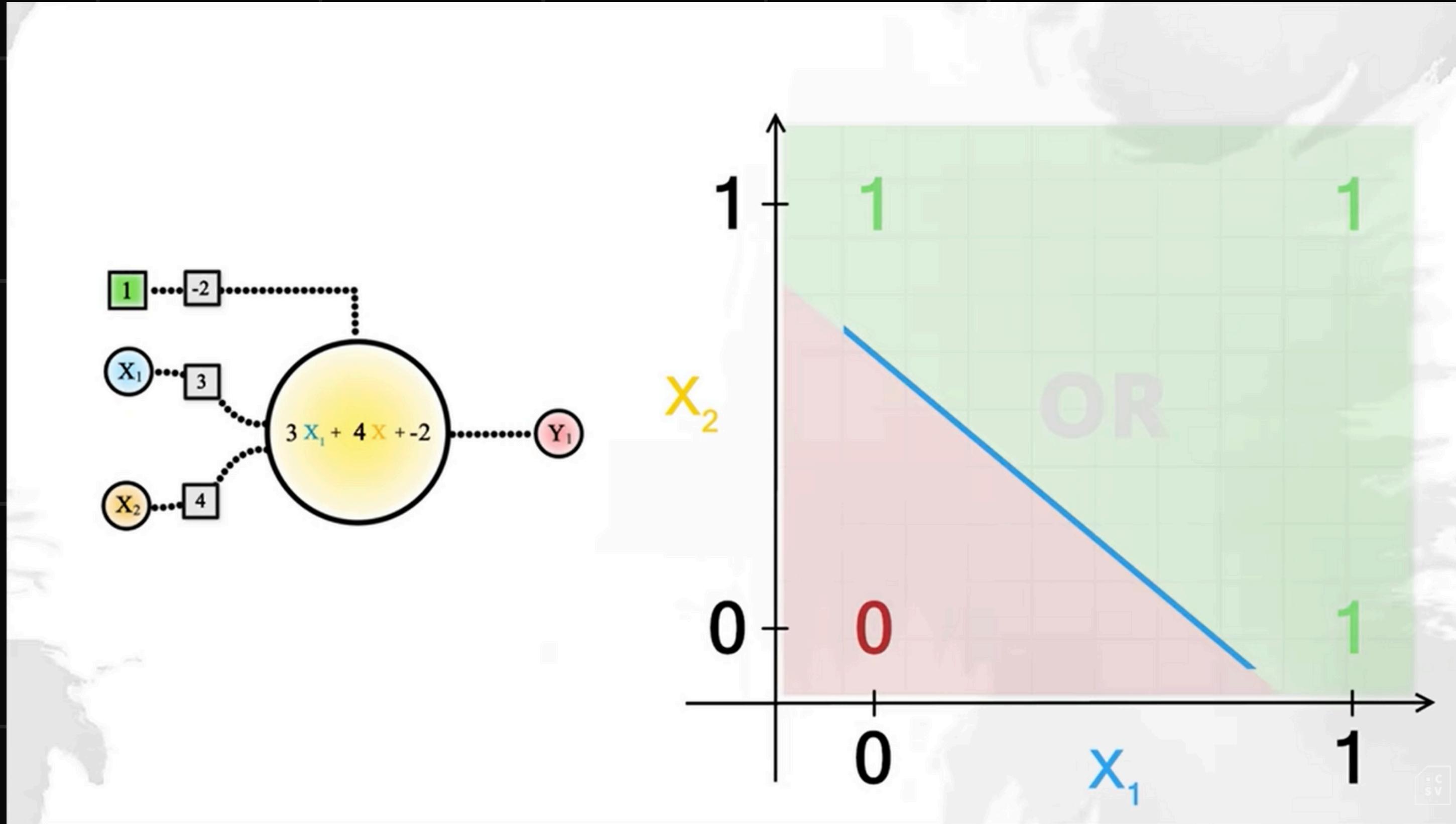
a

$$a = \begin{cases} 1 & \text{si } b + w_1x_1 + w_2x_2 \geq 0 \\ 0 & \text{si } b + w_1x_1 + w_2x_2 < 0 \end{cases}$$

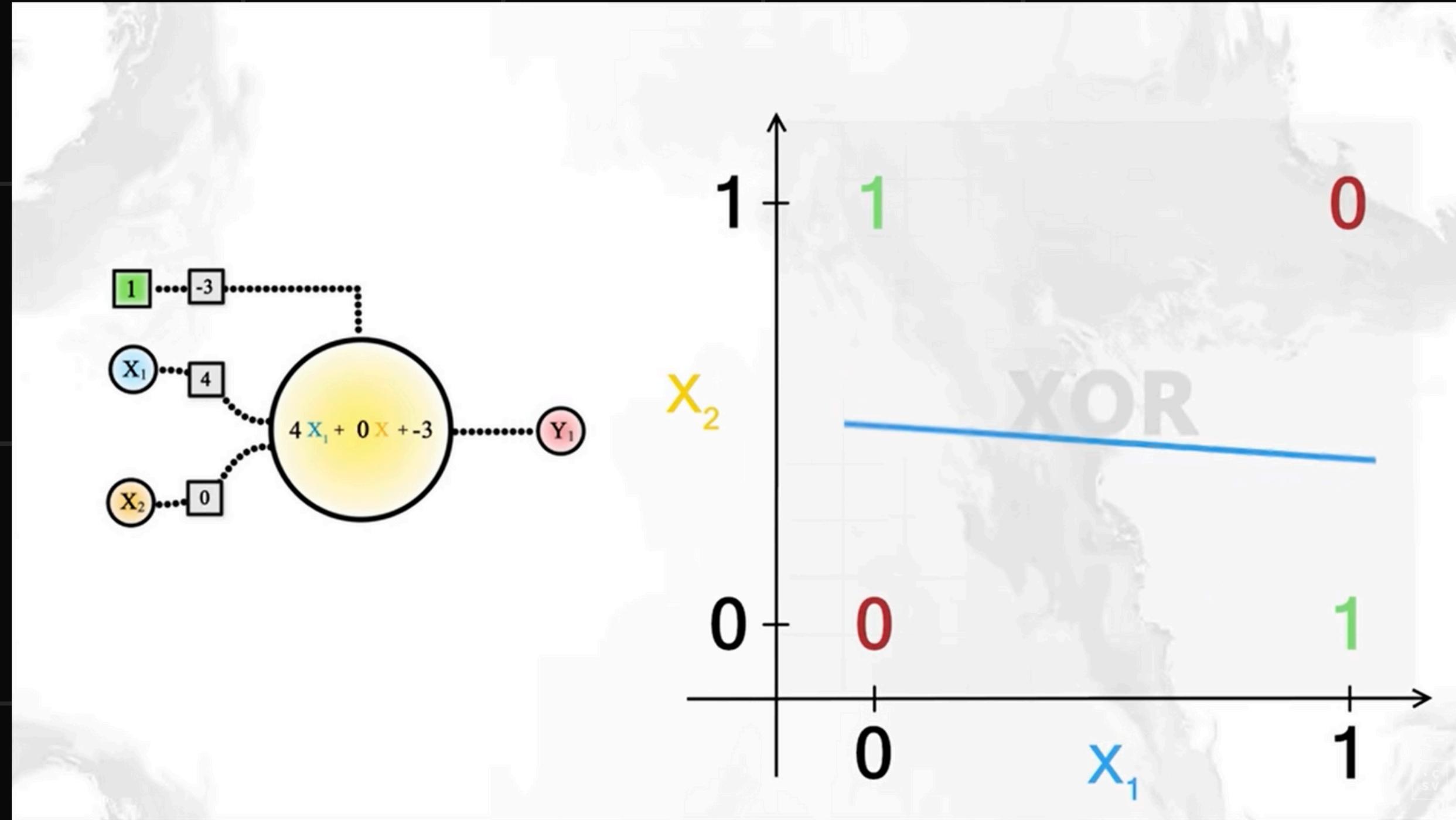
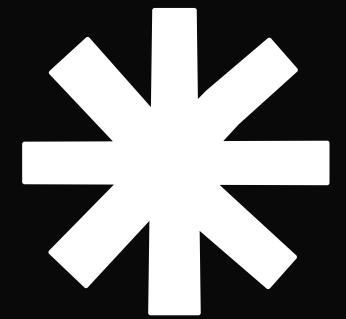
Caso AND



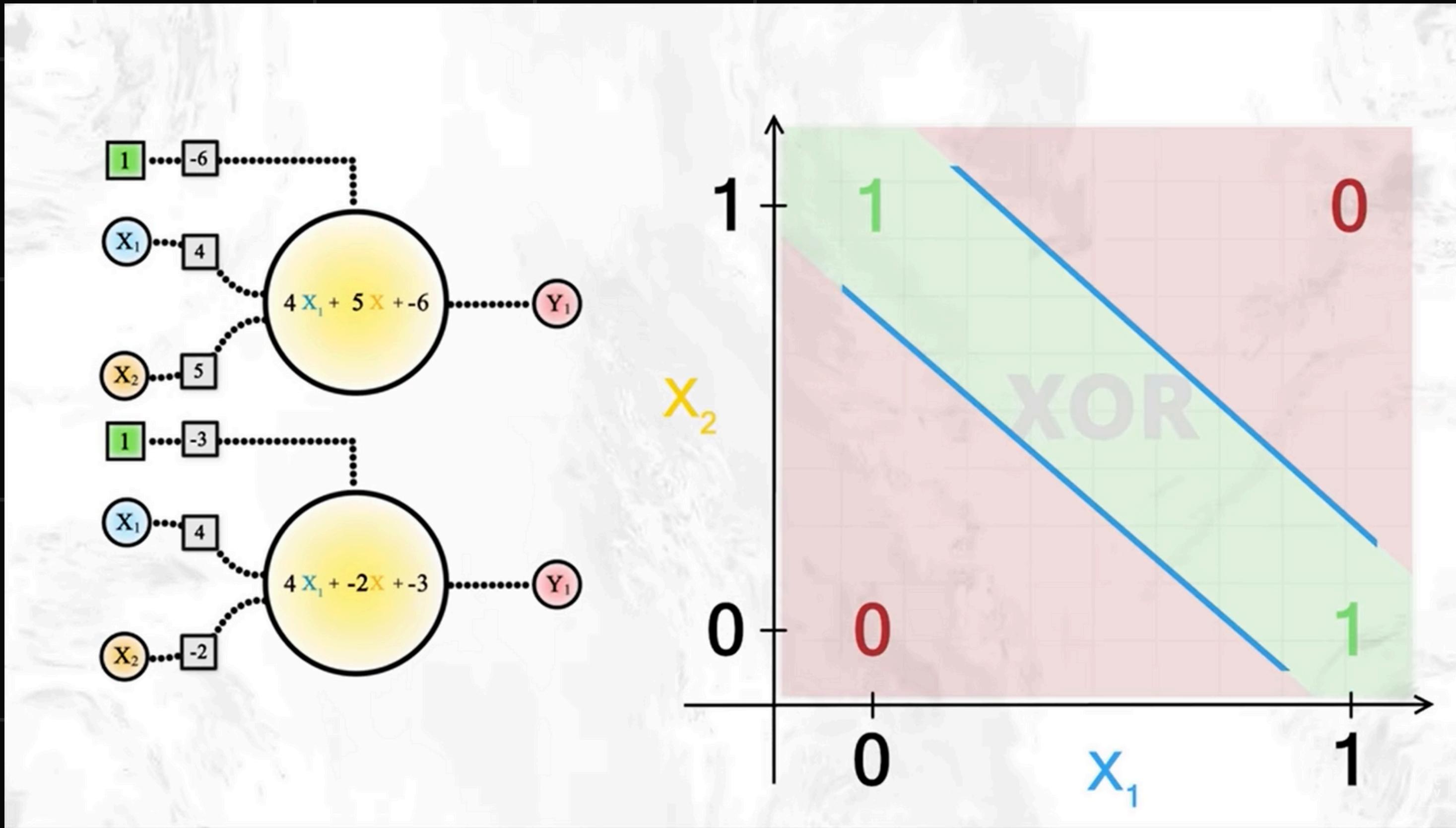
Caso OR



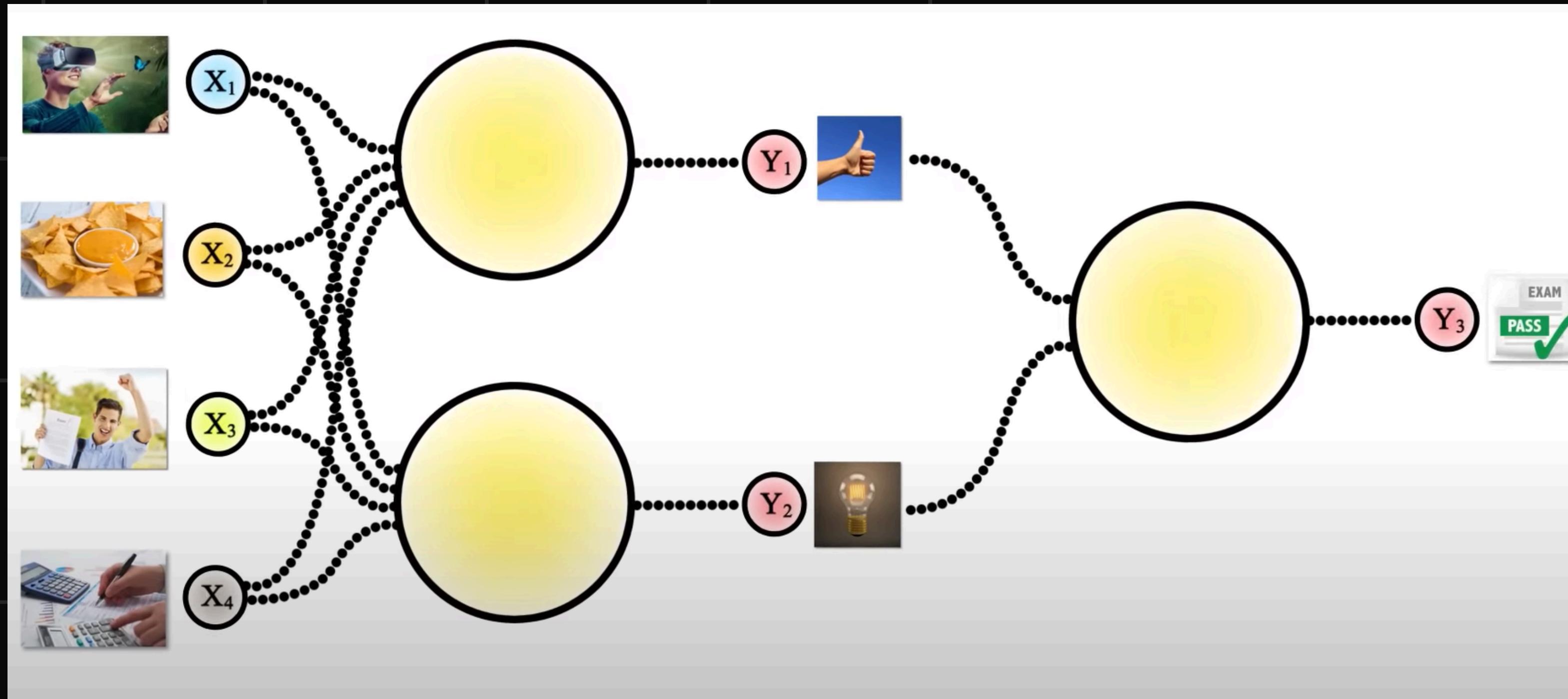
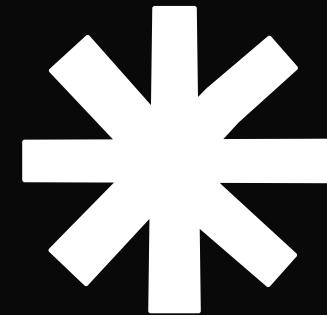
Problemas del perceptrón simple (XOR problem)



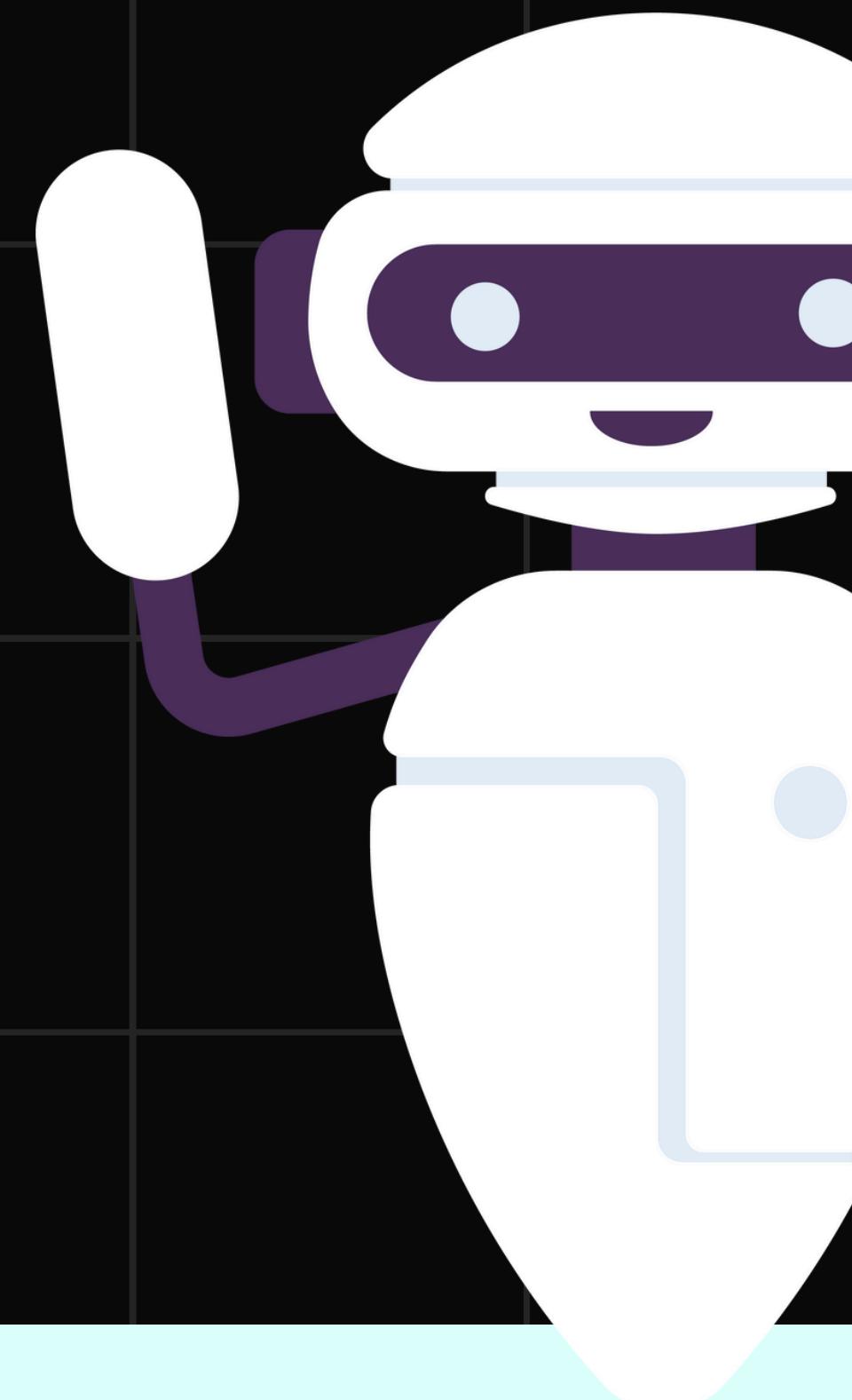
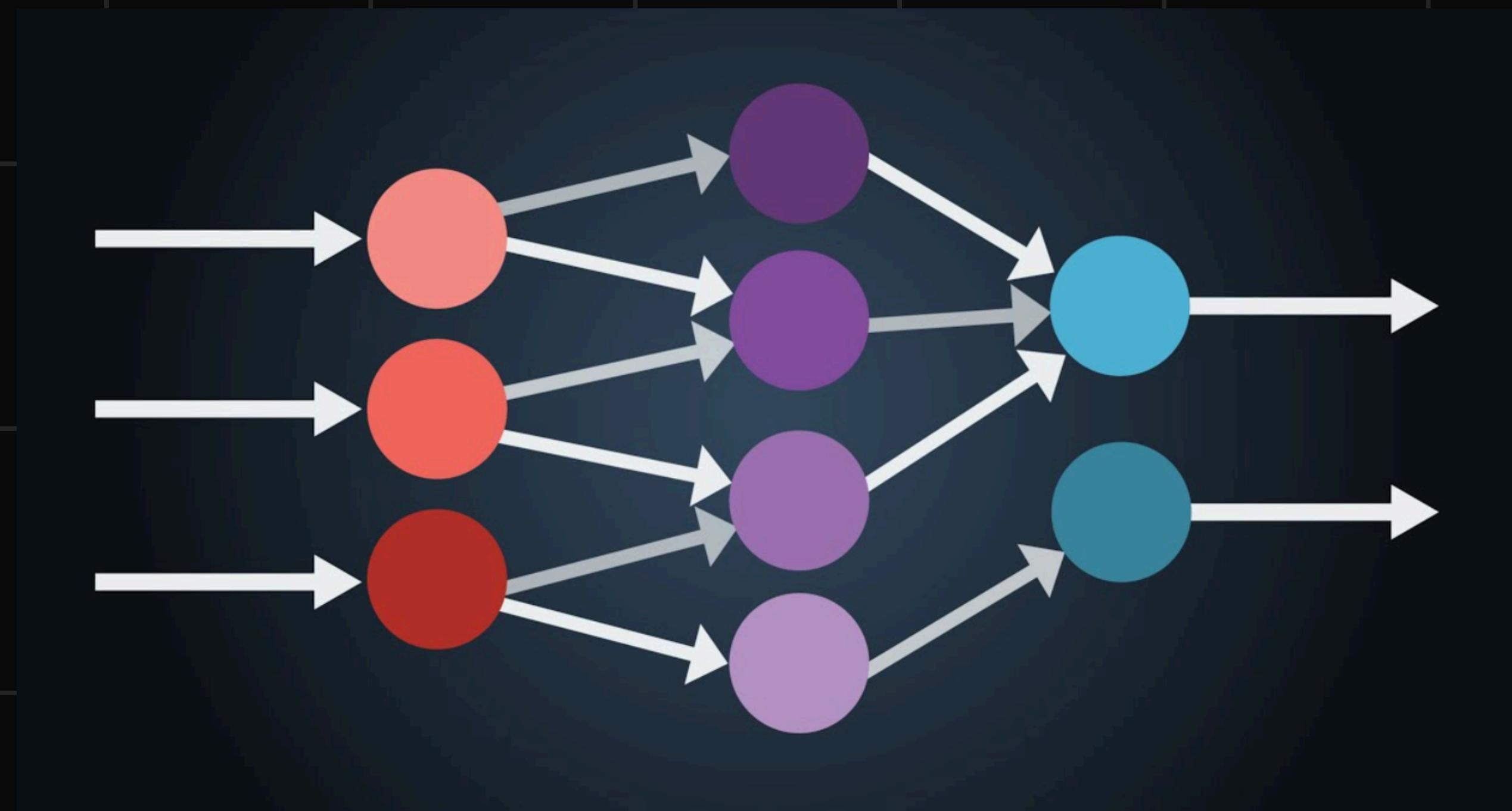
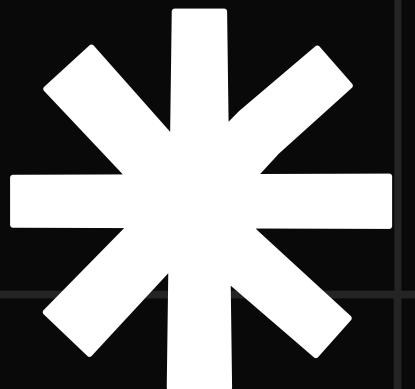
Caso XOR Solución



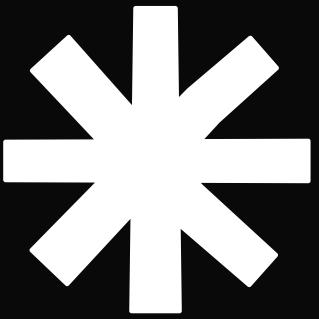
Red Neuronal



Deep Learning: Redes Neuronales

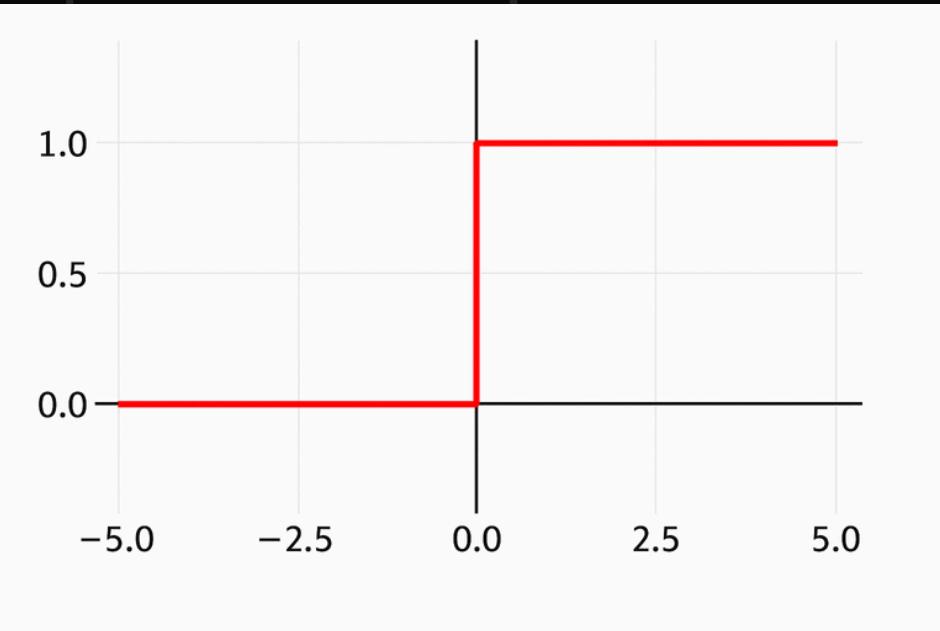


$$\begin{array}{c} \text{L} \\ | \\ \text{---} \\ | \\ \text{L} \end{array} + \begin{array}{c} \text{L} \\ | \\ \text{---} \\ | \\ \text{L} \end{array} + \begin{array}{c} \text{L} \\ | \\ \text{---} \\ | \\ \text{L} \end{array} + \begin{array}{c} \text{L} \\ | \\ \text{---} \\ | \\ \text{L} \end{array} + \begin{array}{c} \text{L} \\ | \\ \text{---} \\ | \\ \text{L} \end{array} = \begin{array}{c} \text{L} \\ | \\ \text{---} \\ | \\ \text{L} \end{array}$$

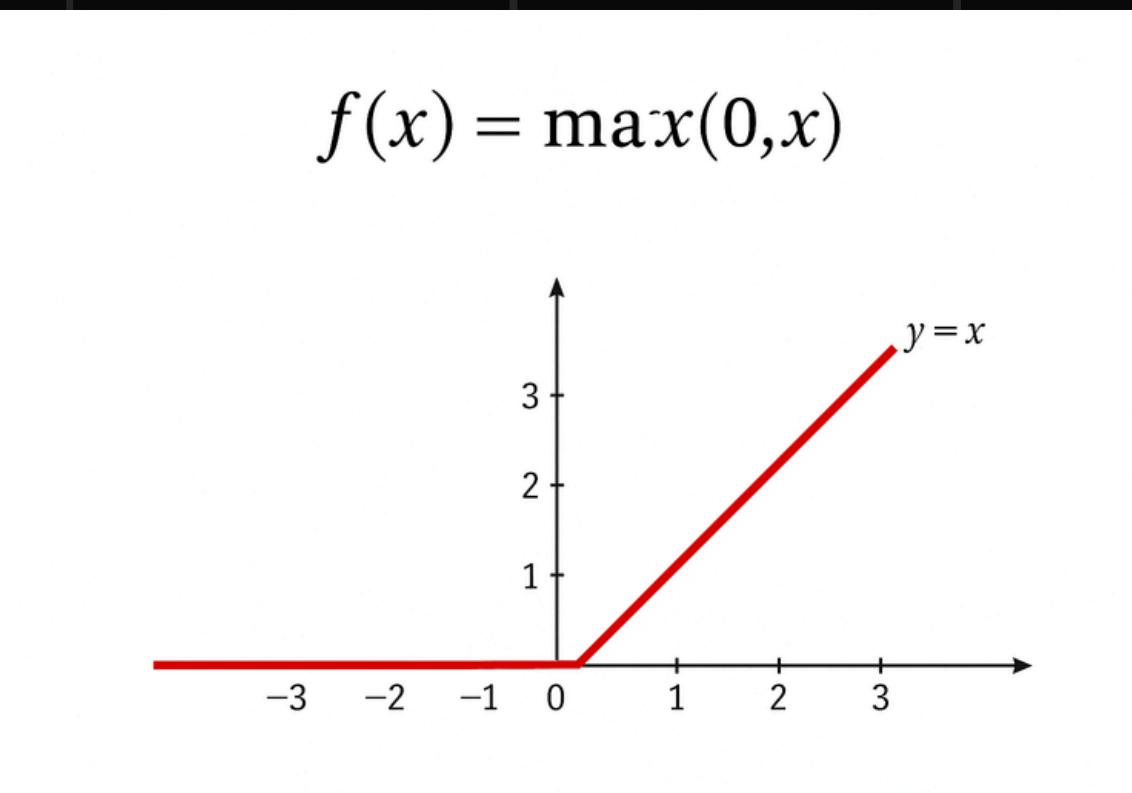


Funciones de Activación

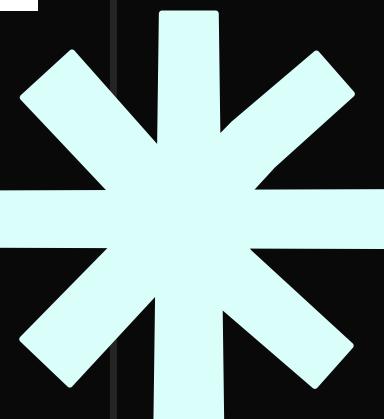
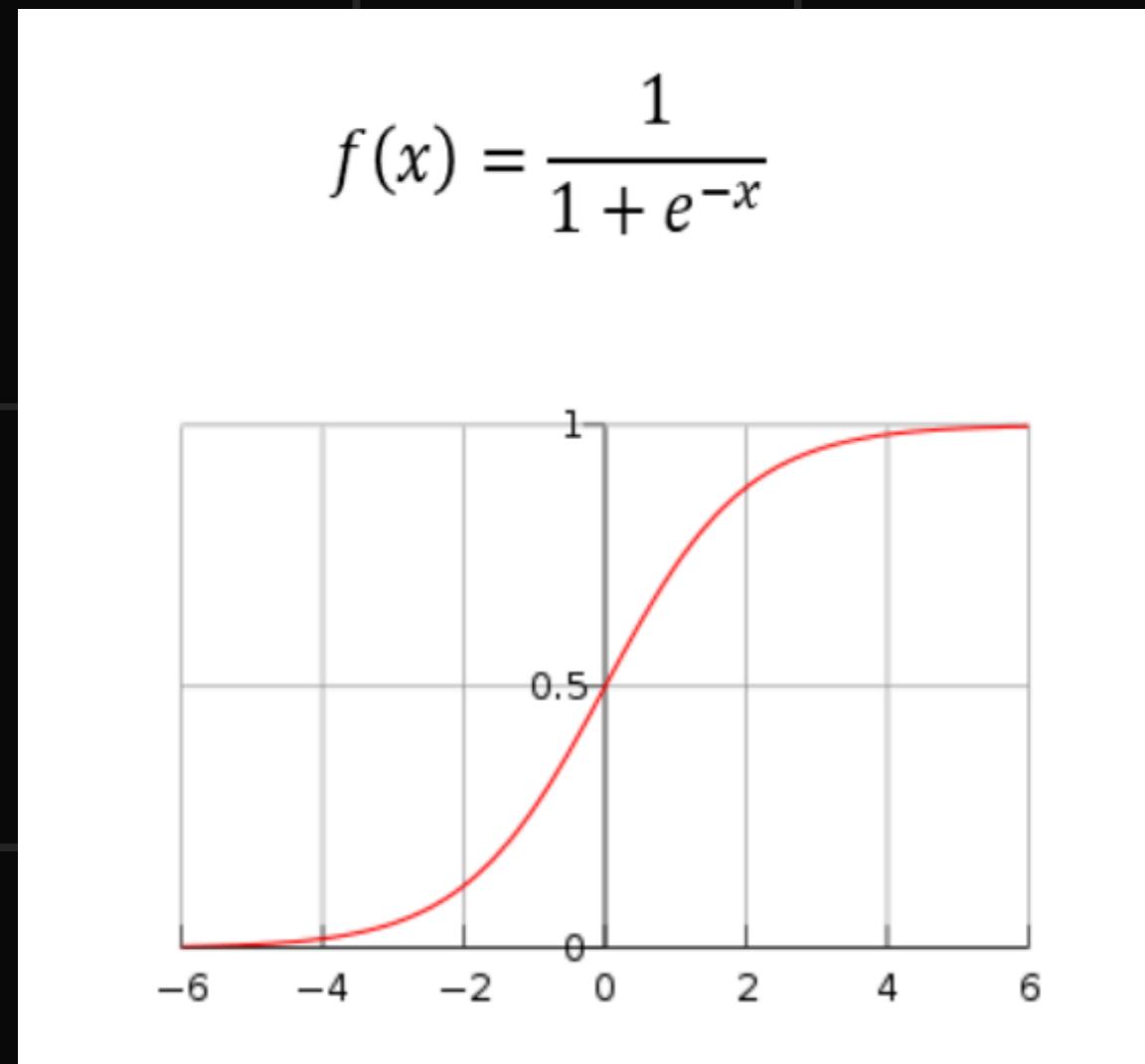
Funcion Escalón

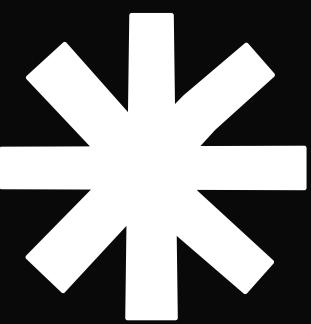


Funcion ReLu

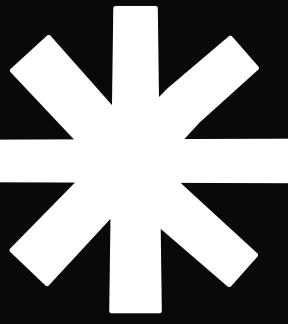
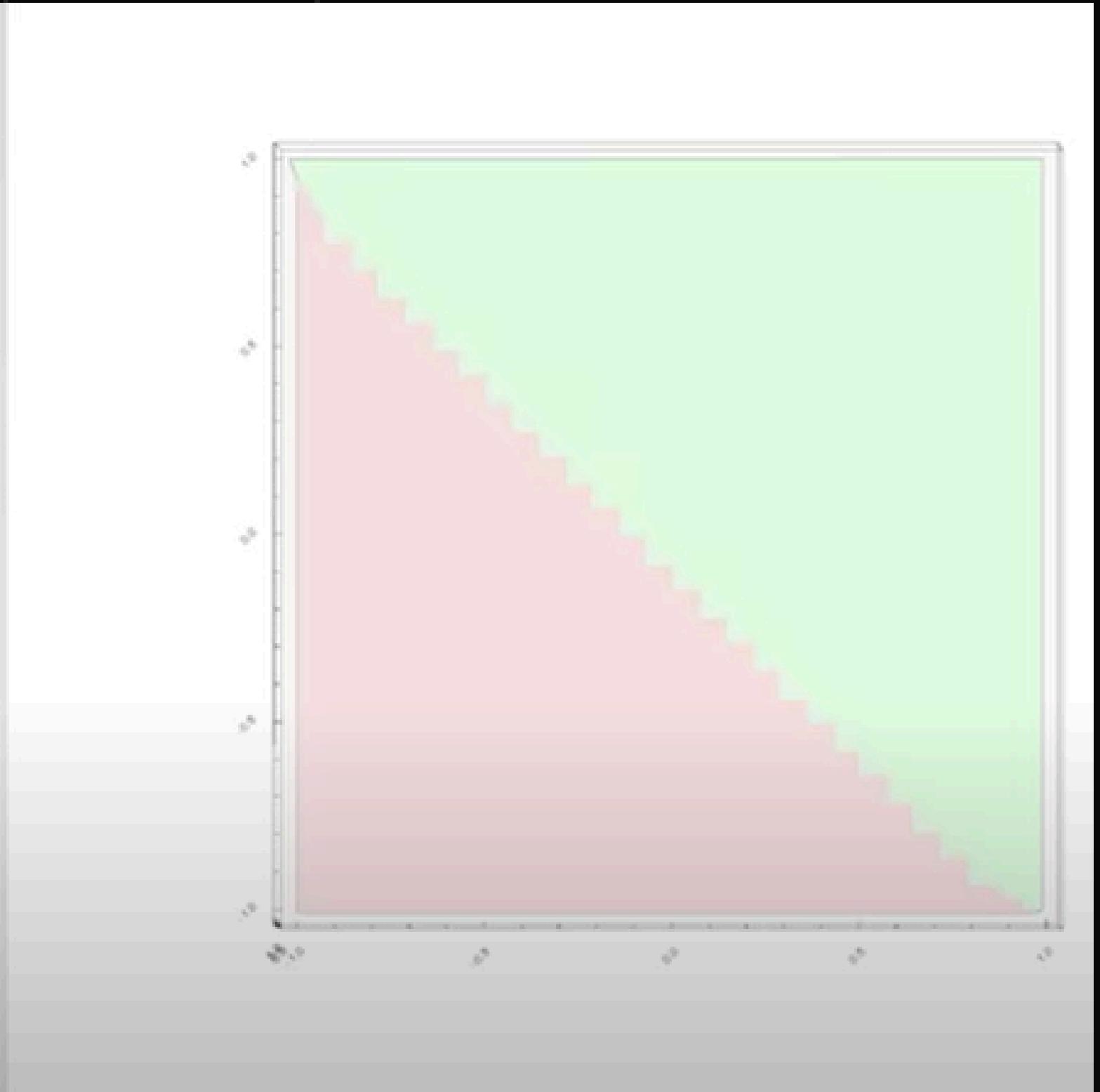
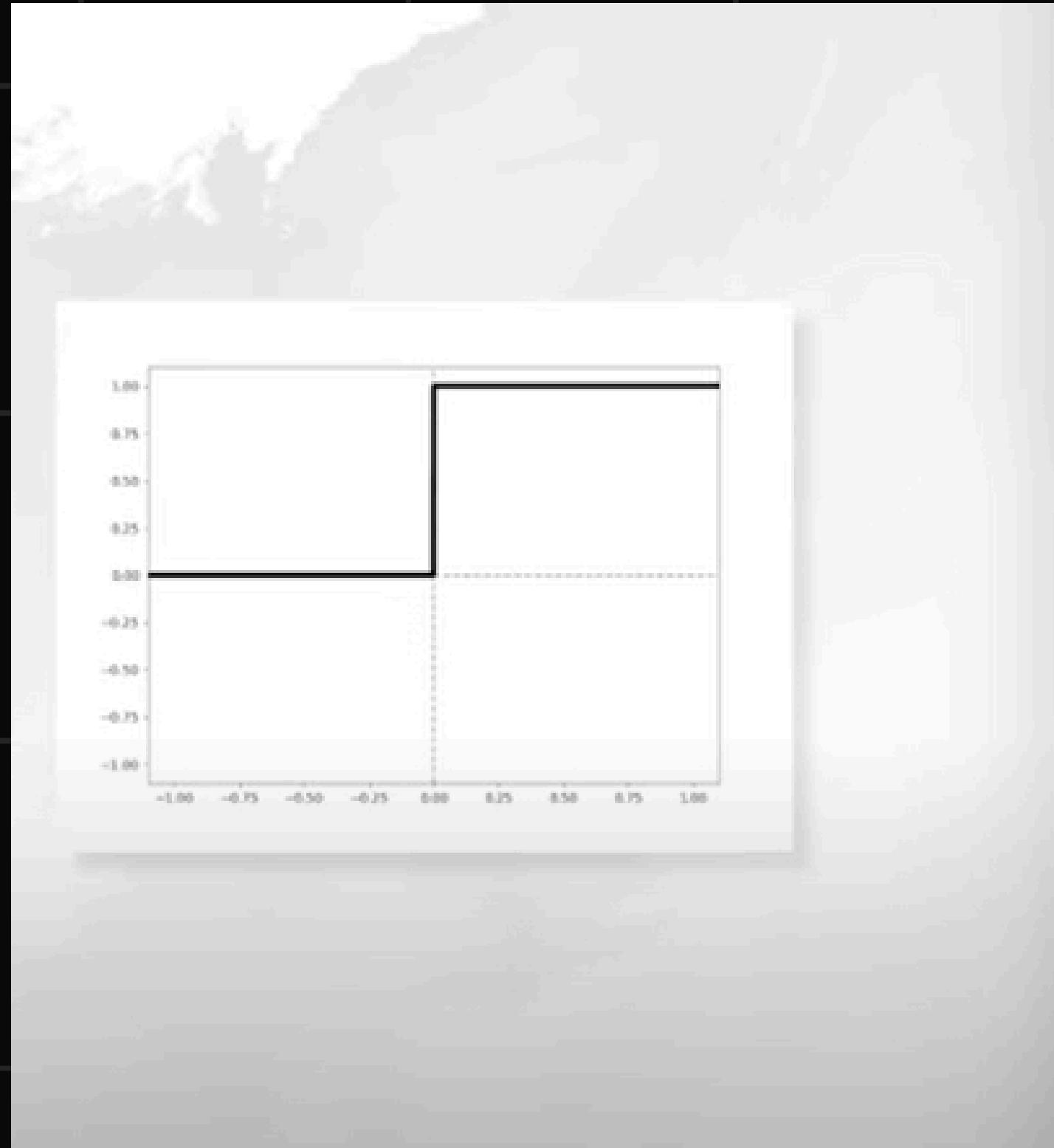


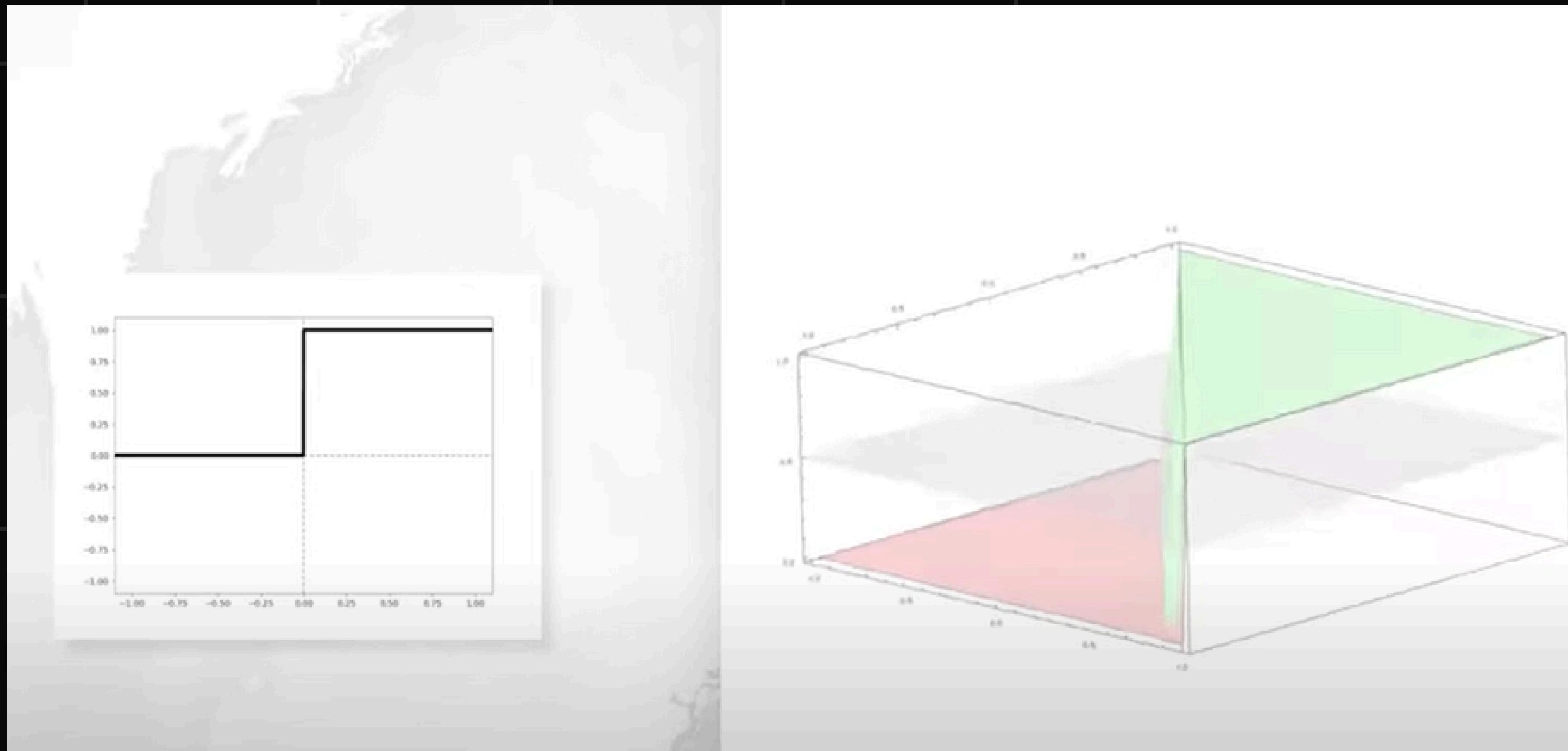
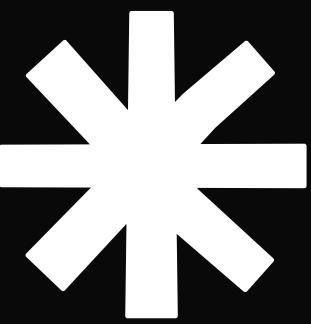
Funcion Sigmoidal

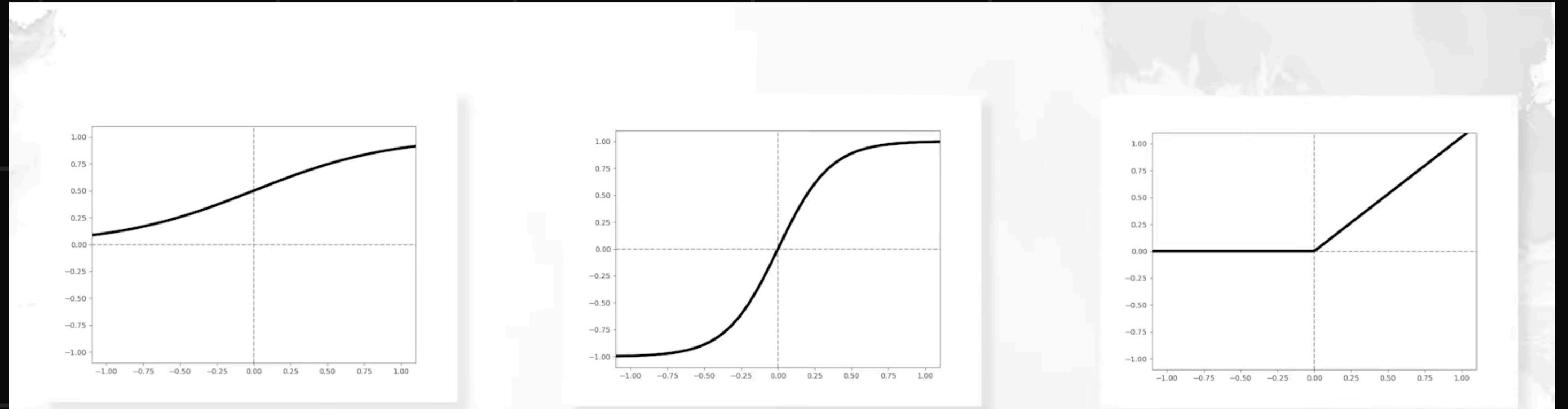




$$\text{Graph 1} + \text{Graph 2} + \text{Graph 3} + \text{Graph 4} + \text{Graph 5} \neq \text{Graph 6}$$



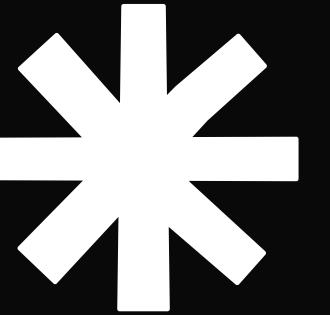
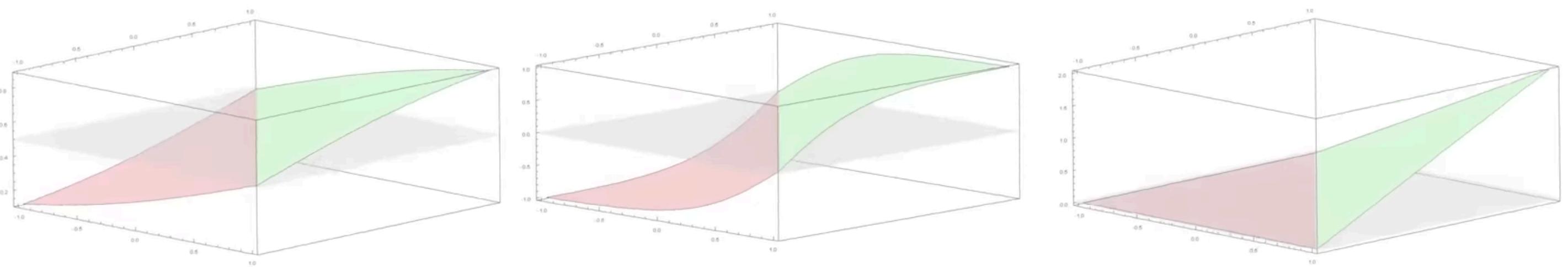


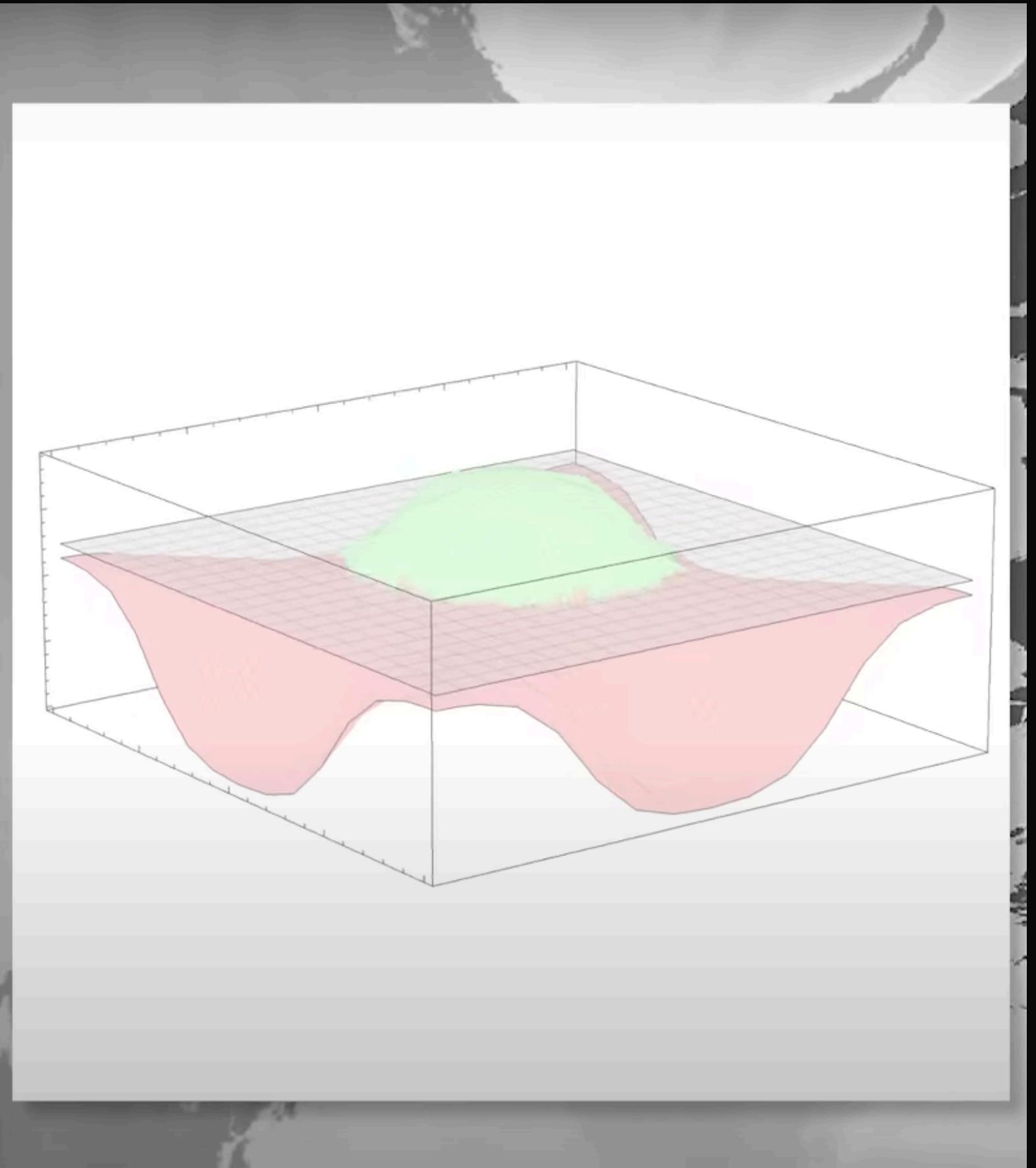
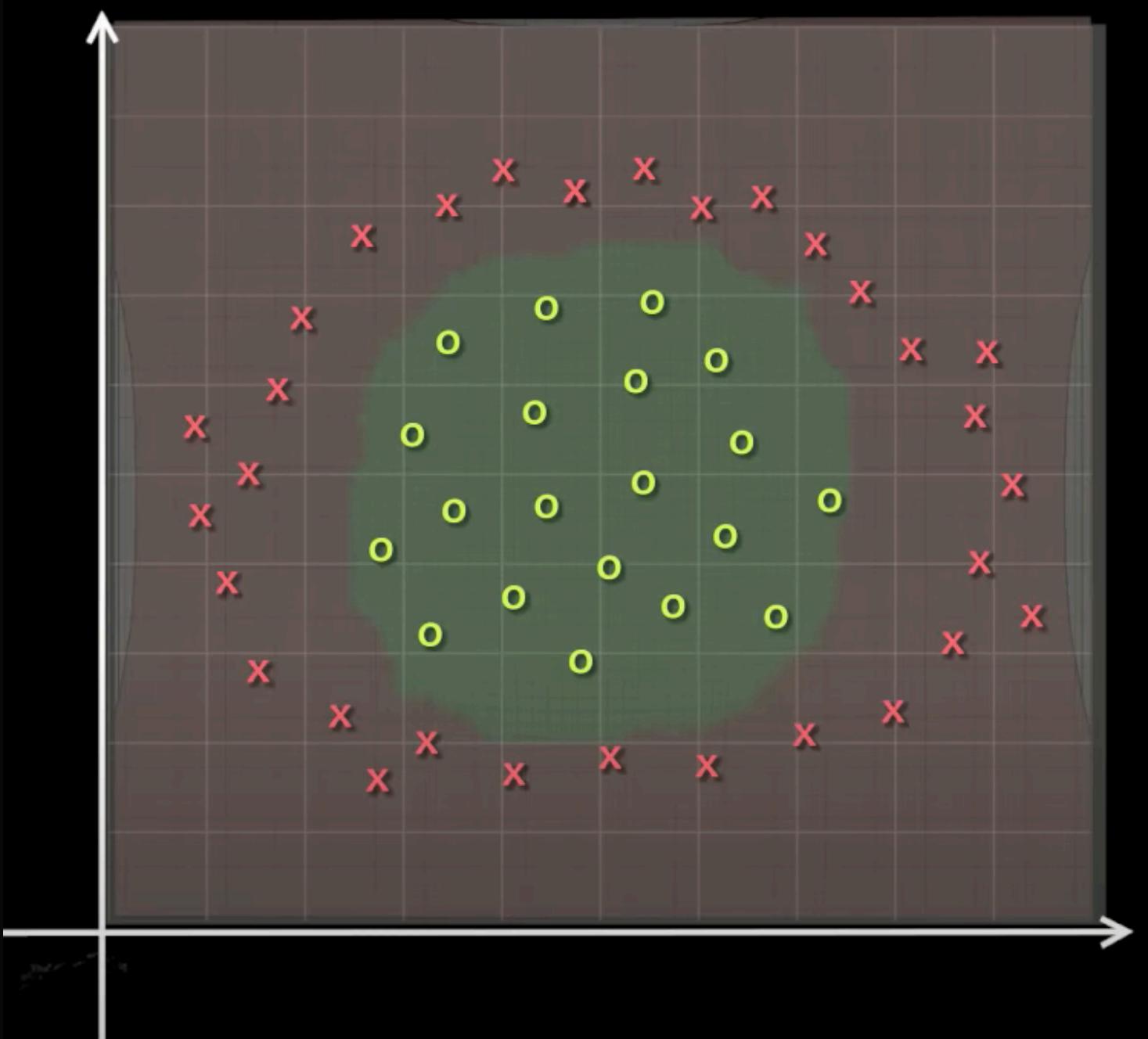


S I G M O I D E

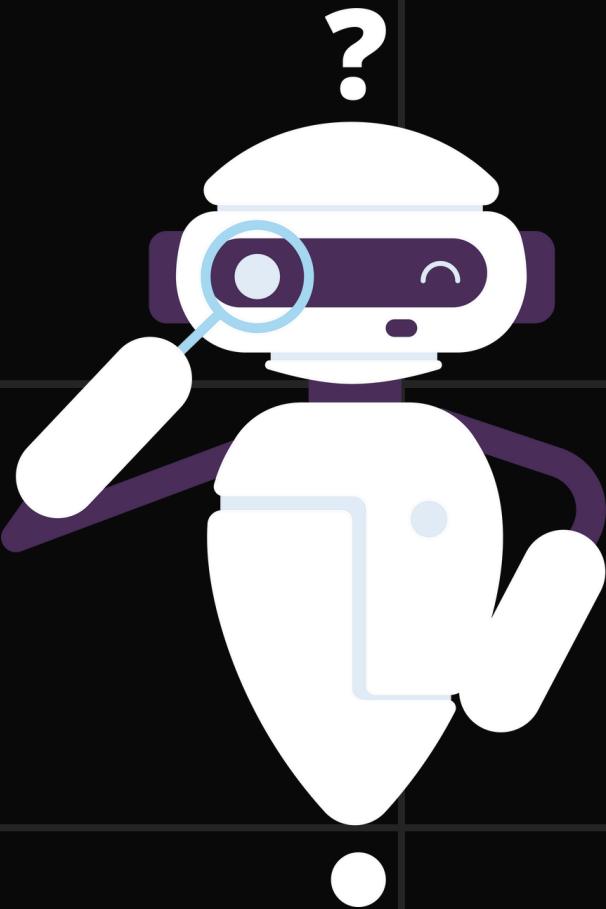
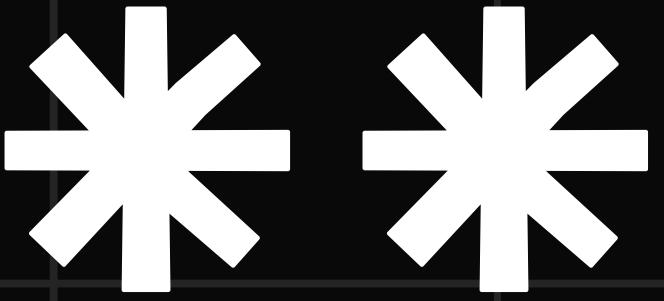
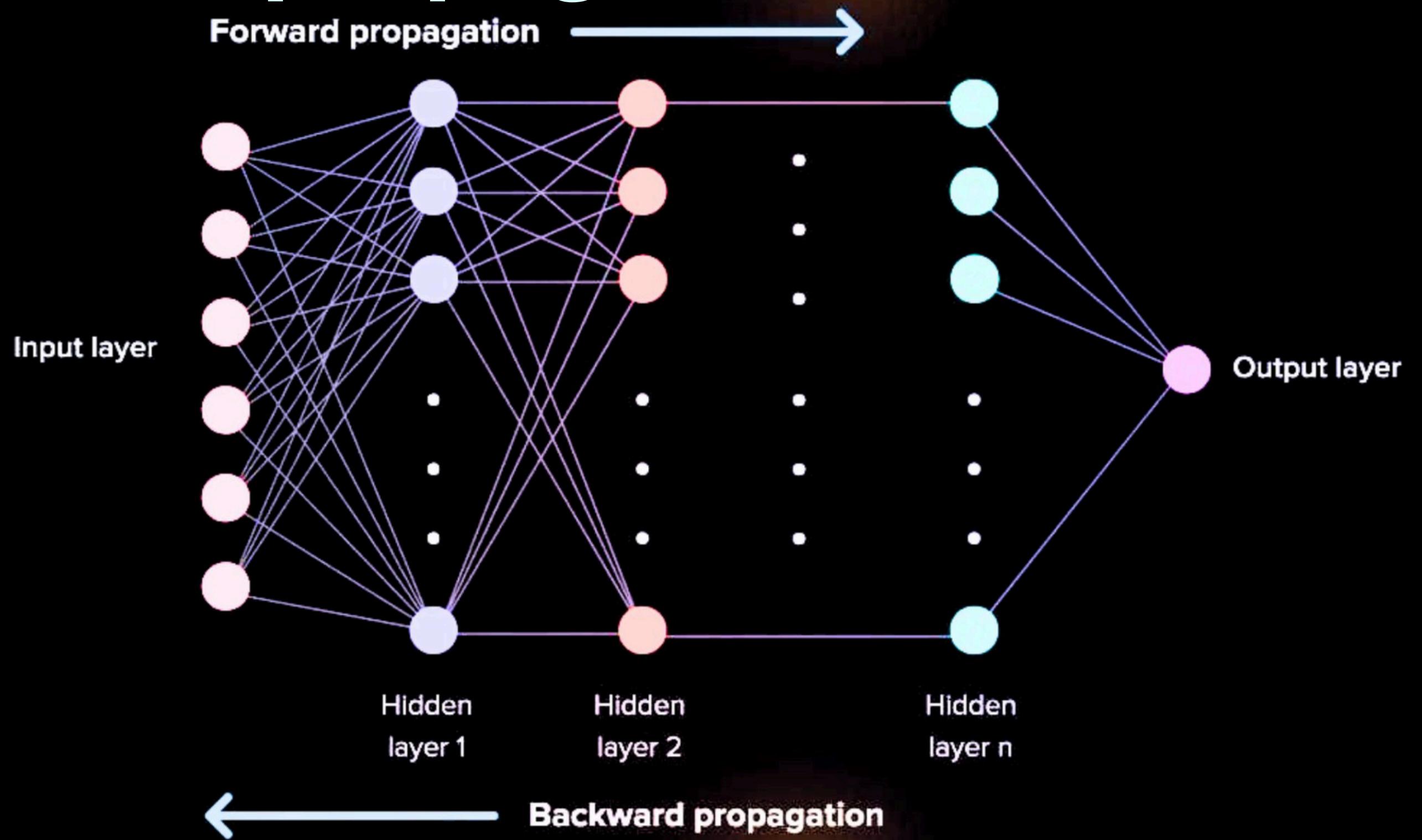
T A N H

R E L U

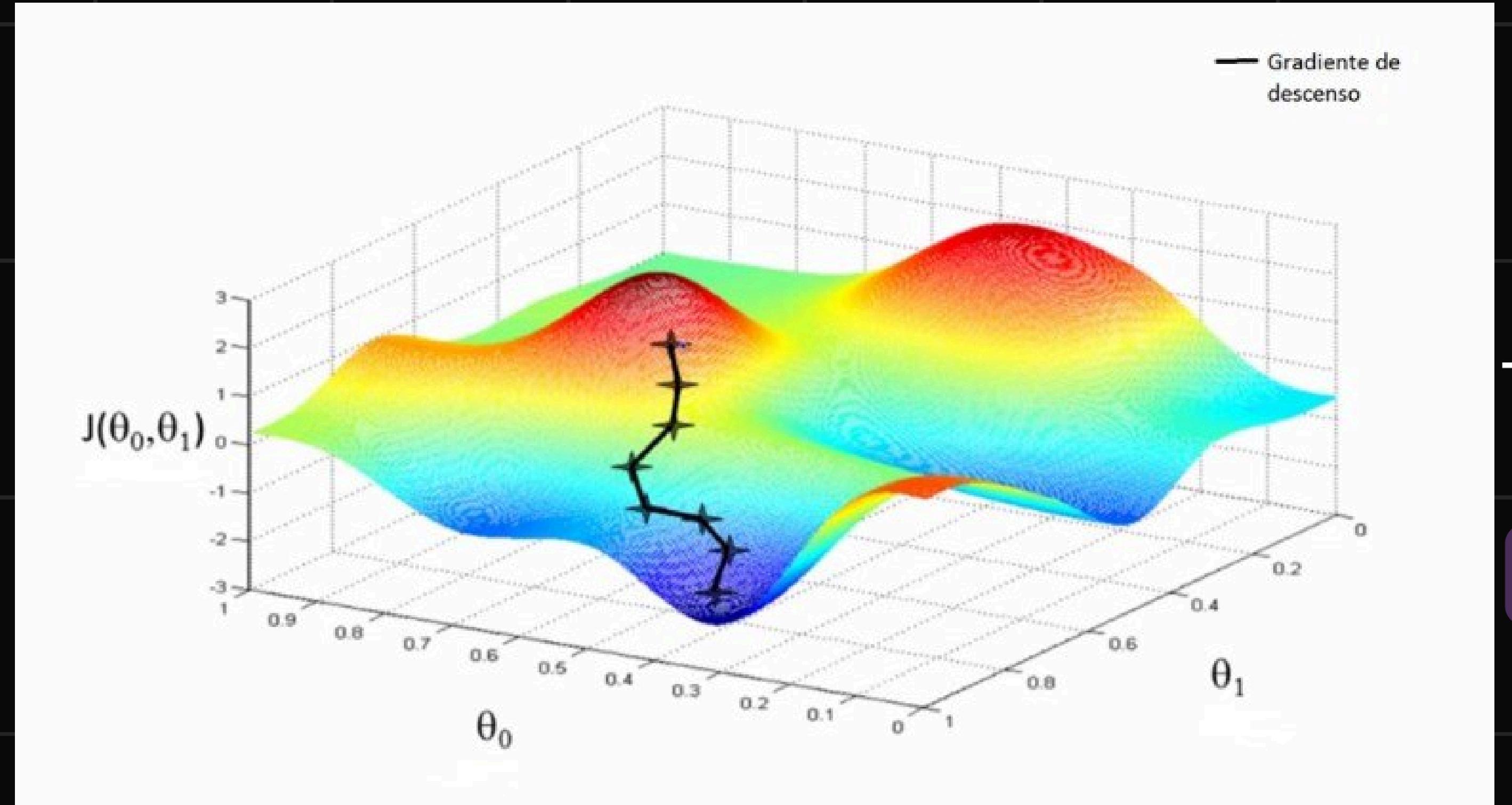




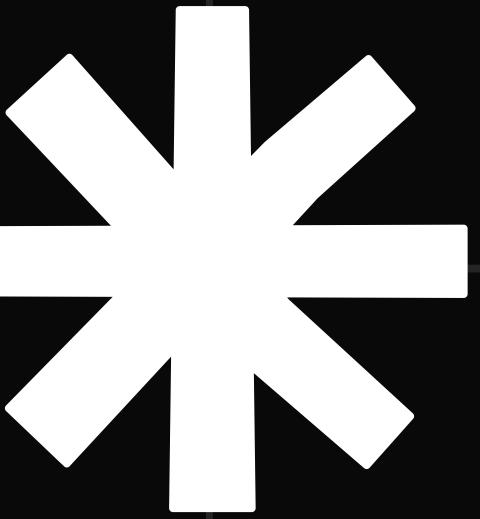
Forward Propagation y Backpropagation



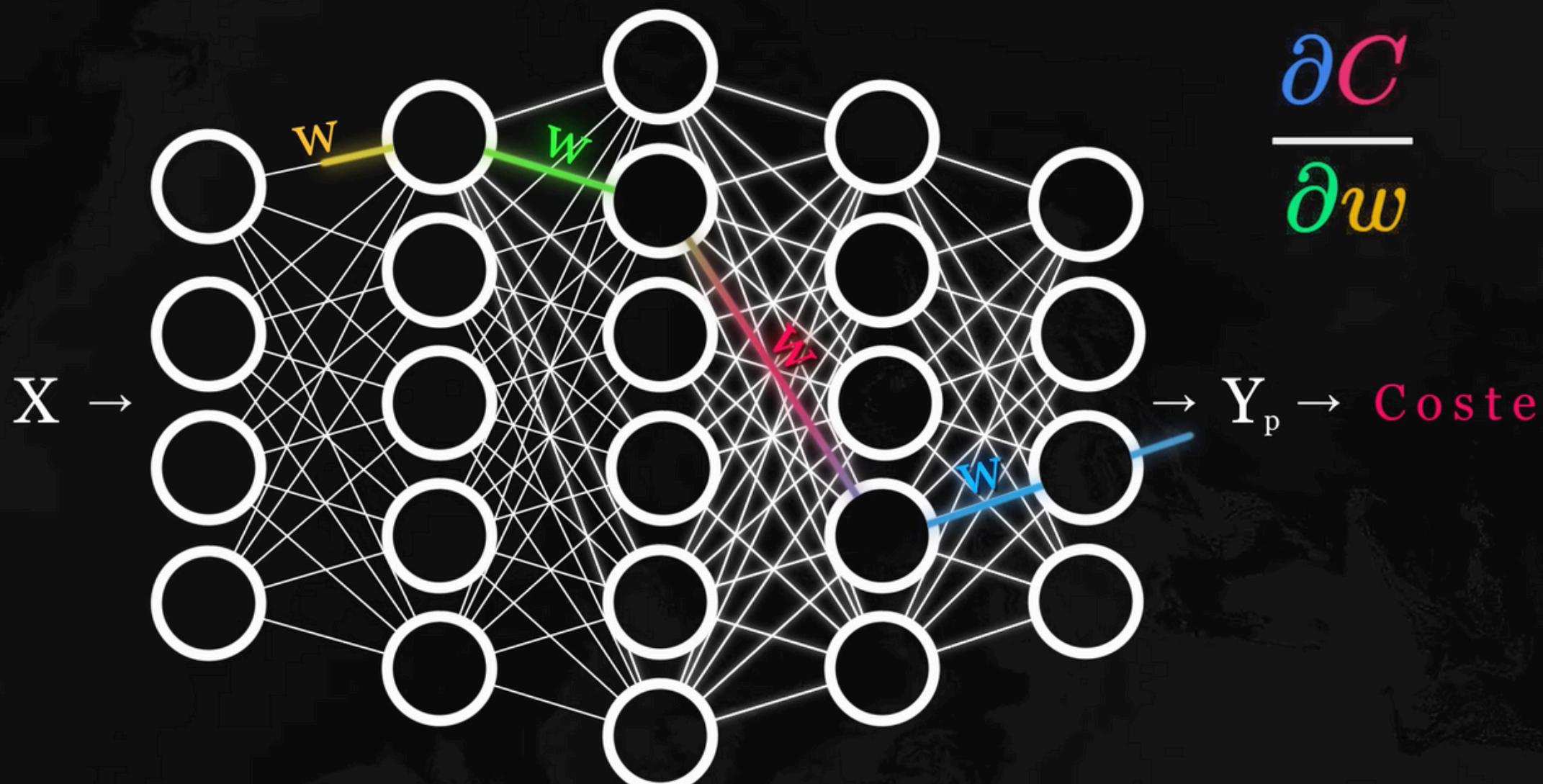
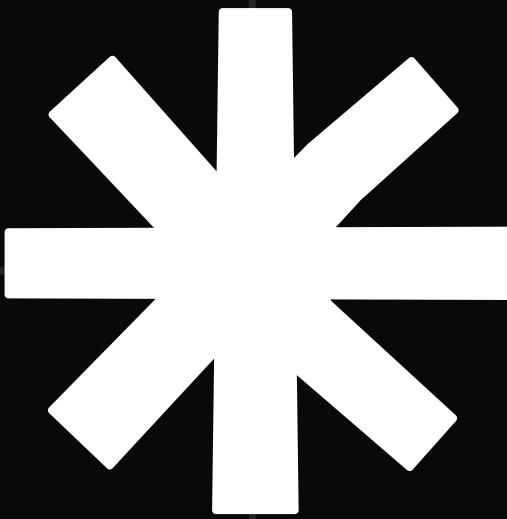
Descenso de Gradiente



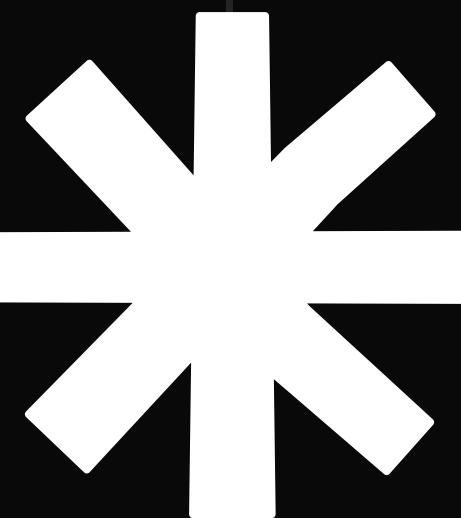
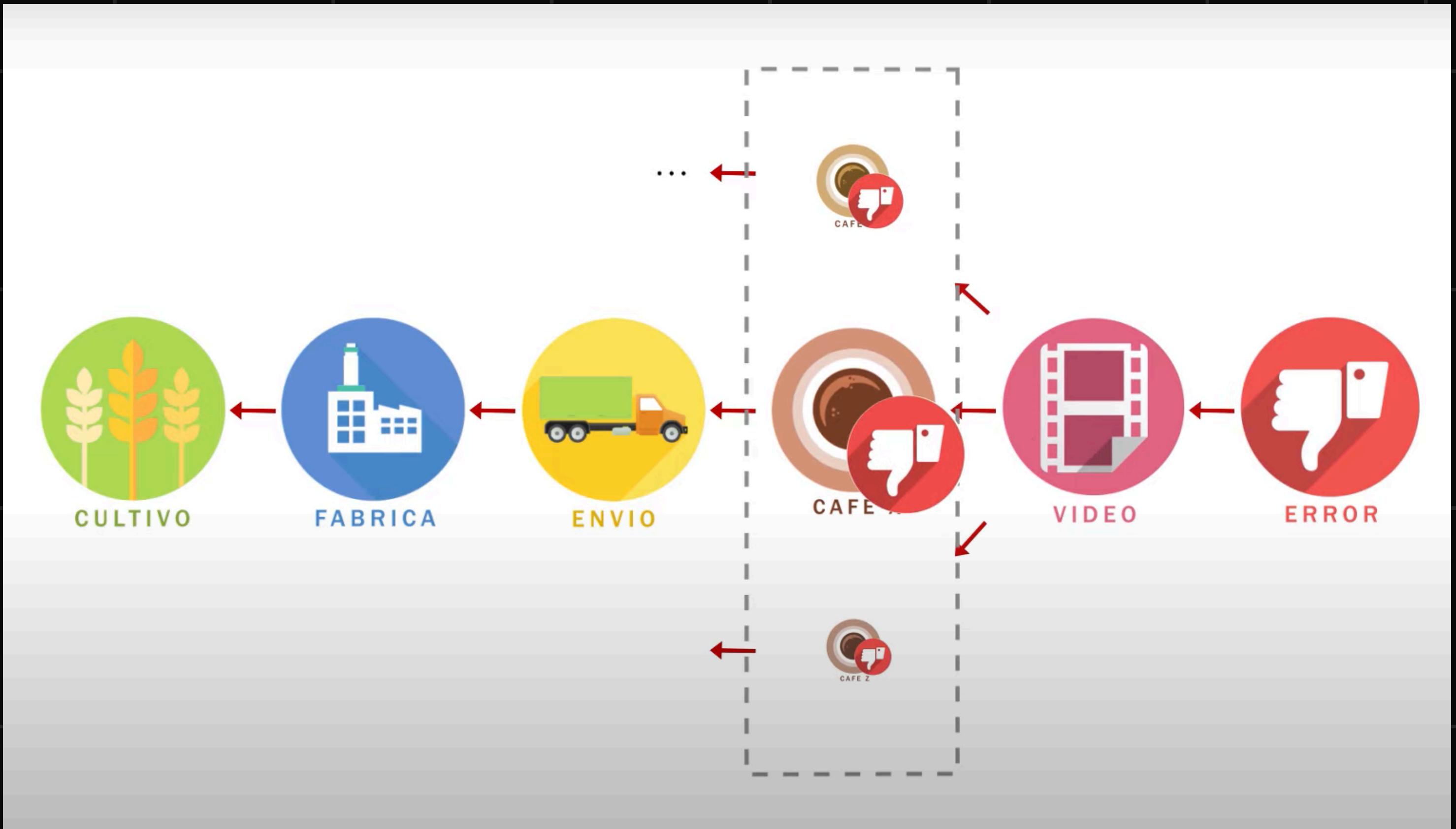
— Gradiente de
descenso



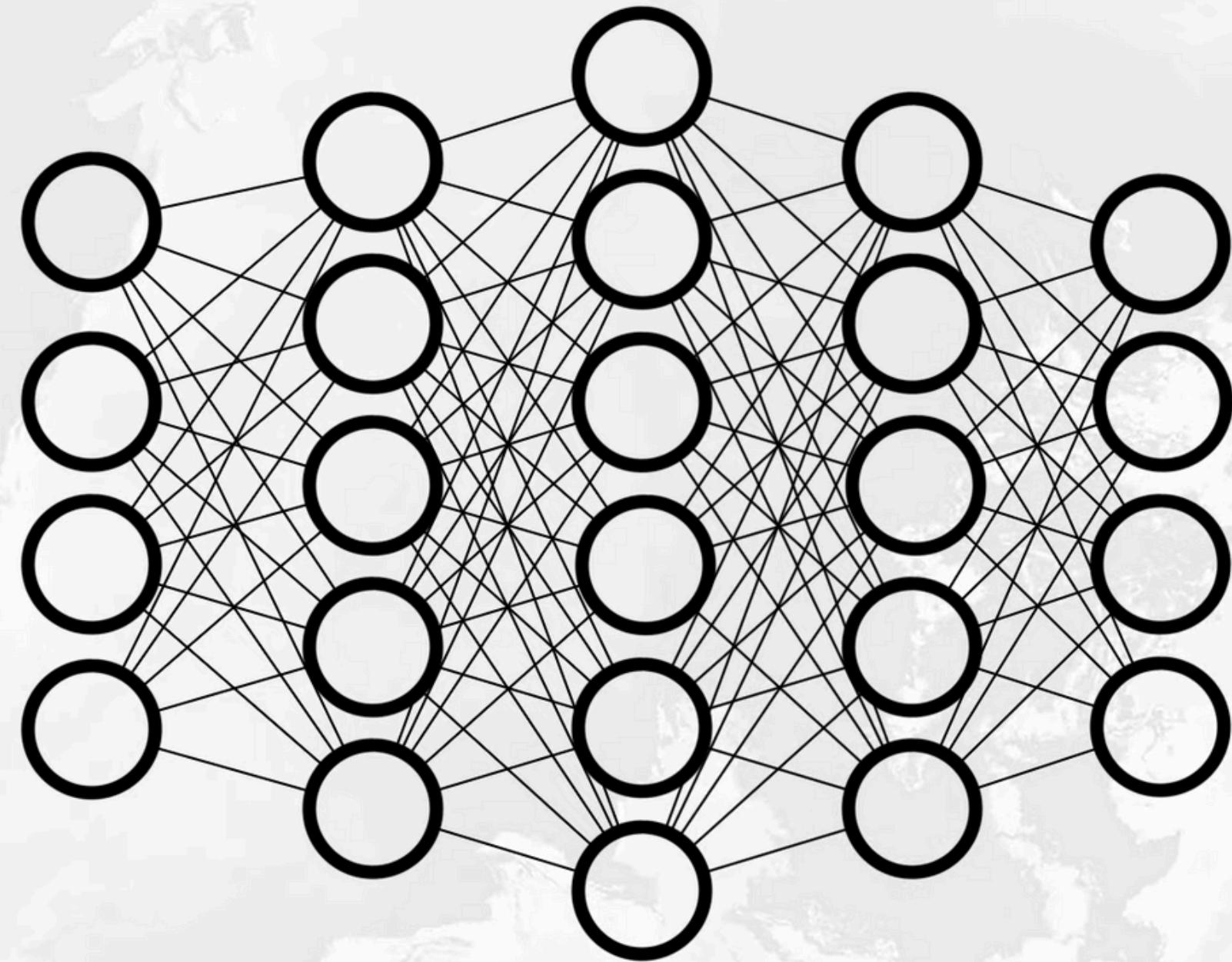
Retropropagacion de Errores



Cadena de Responsabilidades



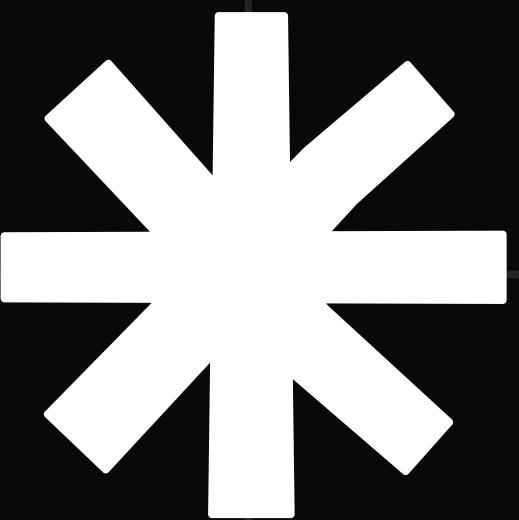
Matemáticas de Backpropagation



L capas

DERIVADAS DE LA
ULTIMA CAPA

$$\frac{\partial C}{\partial b^L} \quad \frac{\partial C}{\partial w^L}$$



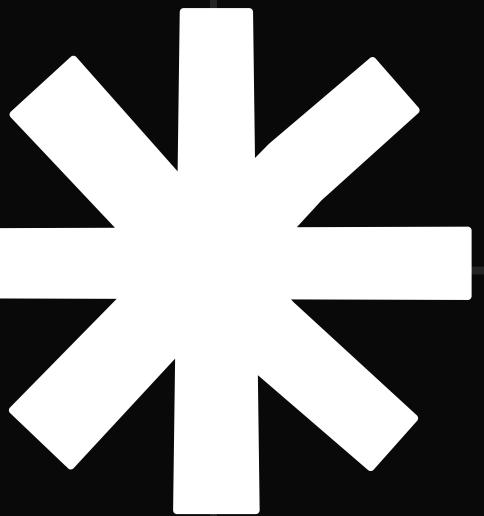
Derivadas de la Ultima Capa

$c(a(z^L)) = \text{ERROR}$

RESULTADO DE LA SUMA PONDERADA
FUNCION DE ACTIVACION
FUNCION DE COSTE

$$z^L = w^L x + b^L$$

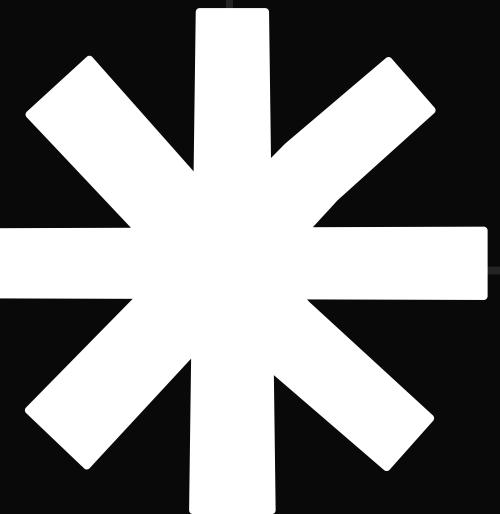
Derivada Parcial Funcion Coste



$$\frac{\partial C}{\partial w^L} = \frac{\partial C}{\partial a^L} \cdot \frac{\partial a^L}{\partial z^L} \cdot \frac{\partial z^L}{\partial w^L}$$

$$\frac{\partial C}{\partial b^L} = \frac{\partial C}{\partial a^L} \cdot \frac{\partial a^L}{\partial z^L} \cdot \frac{\partial z^L}{\partial b^L}$$

Matemáticas de Backpropagation



δ^L

W^L

DERIVADA DE LA
FUNCION DE ACT.

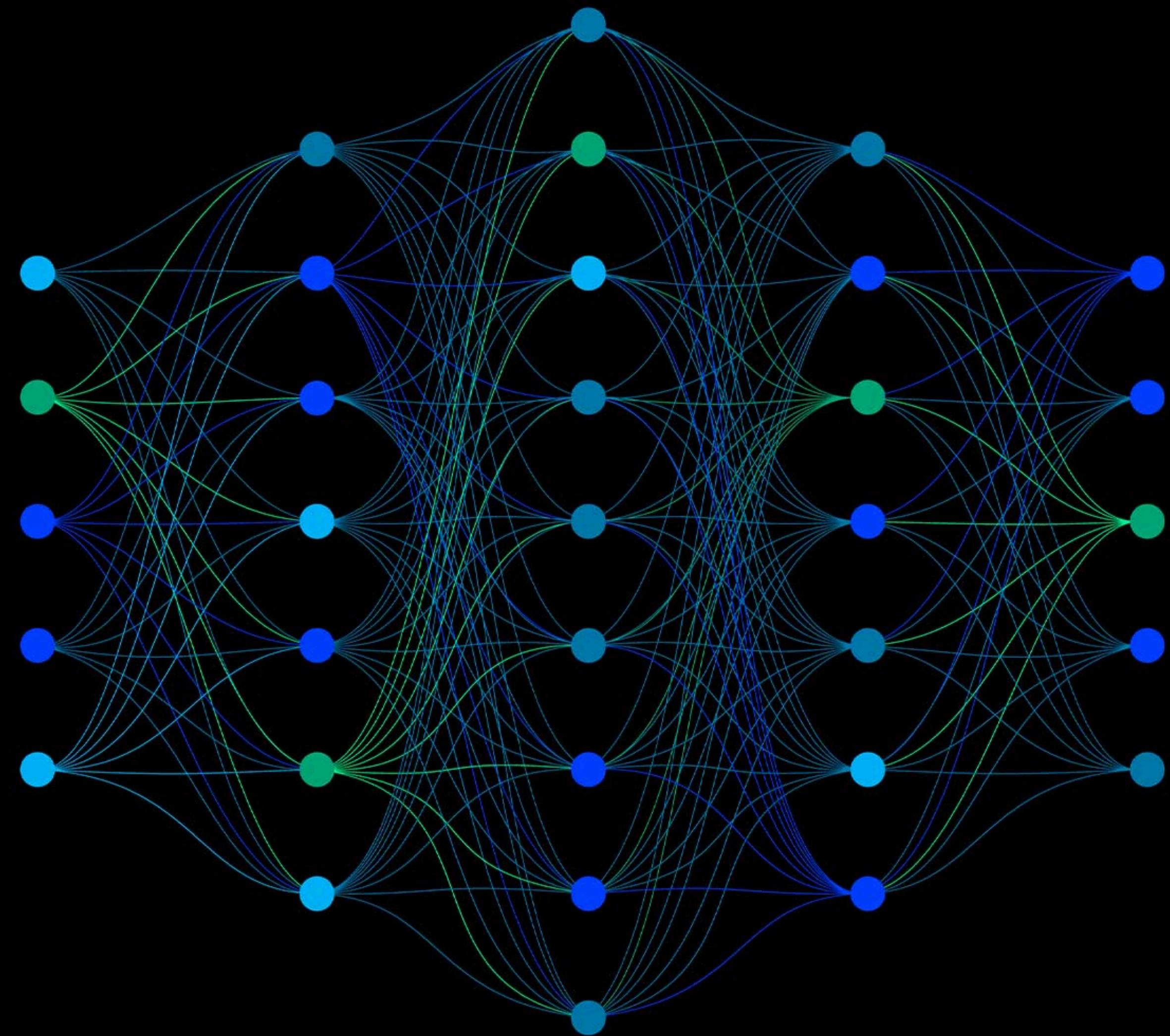
a^{L-2}

$$\frac{\partial C}{\partial w^{L-1}} = \left[\frac{\partial C}{\partial a^L} \cdot \frac{\partial a^L}{\partial z^L} \right] \cdot \boxed{\frac{\partial z^L}{\partial a^{L-1}}} \cdot \left[\frac{\partial a^{L-1}}{\partial z^{L-1}} \right] \cdot \boxed{\frac{\partial z^{L-1}}{\partial w^{L-1}}}$$
$$\frac{\partial C}{\partial b^{L-1}} = \left[\frac{\partial C}{\partial a^L} \cdot \frac{\partial a^L}{\partial z^L} \right] \cdot \boxed{\frac{\partial z^L}{\partial a^{L-1}}} \cdot \left[\frac{\partial a^{L-1}}{\partial z^{L-1}} \right] \cdot \boxed{\frac{\partial z^{L-1}}{\partial b^{L-1}}}$$

1

APLICAMOS LA CHAIN RULE A ESTA COMPOSICION

$$C(a^L(W^L a^{L-1}(W^{L-1} a^{L-2} + b^{L-1}) + b^L))$$



Thankyou

