

Concepts

Machine Learning
Subfield

Based on Neural
Network

 **Deep** 
Learning

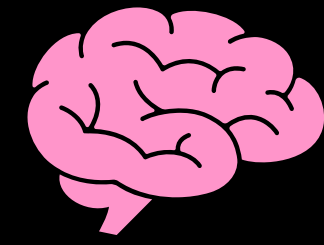
What for?

Automatic Speech
Recognition
(NLP)

Automatic object
Recognition
(Healthcare,...)

Time Series
Forecasting
(Finance)

and many more!!!

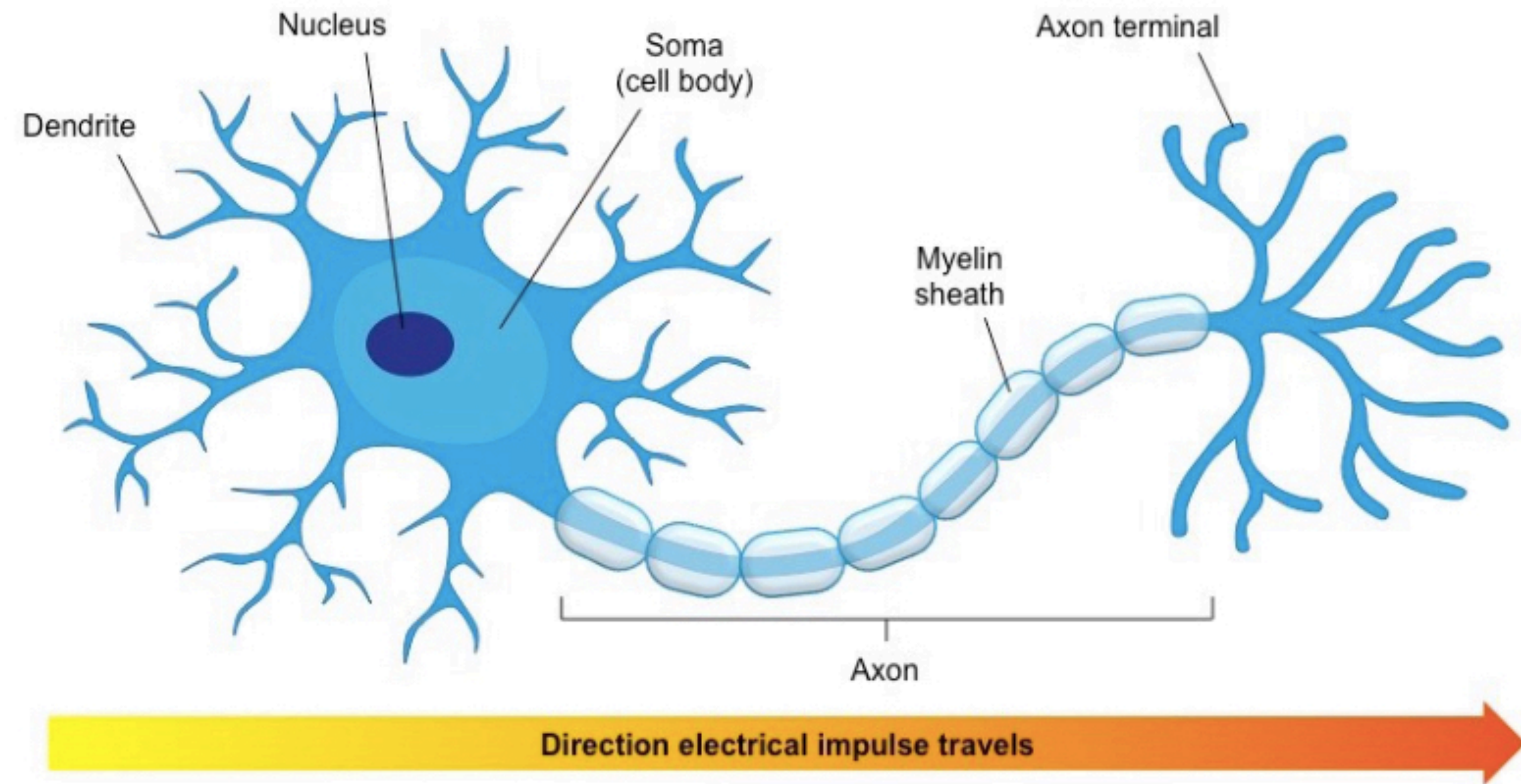


Deep Learning



Why “Neural” Network?

Bio-Neuron





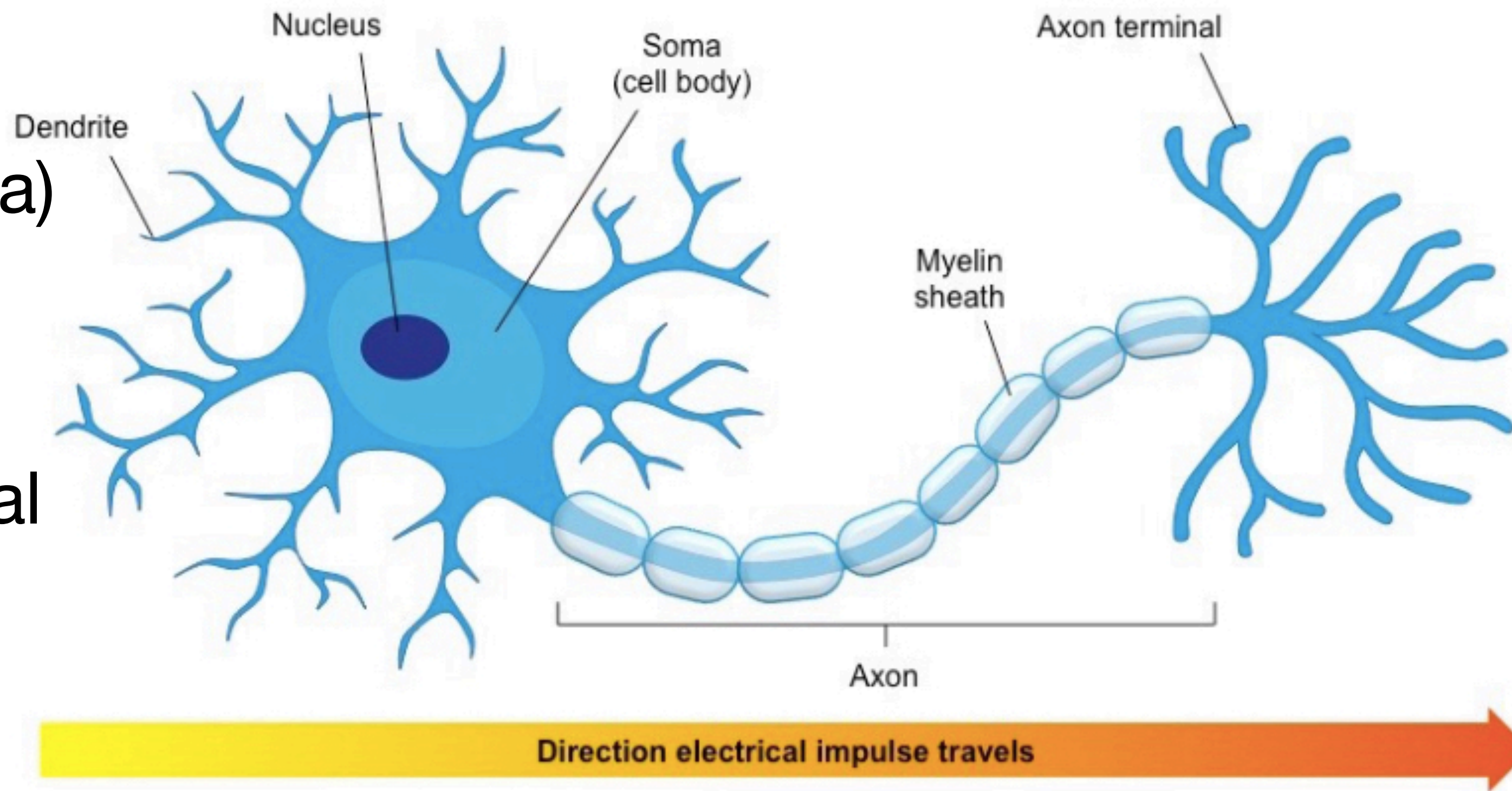
Deep Learning



Why “Neural” Network?

- * pick signals (dendrites)
- * Combine and transform signal (soma)
- * strong enough signal transmitted to the axon
- * signal sent out through axon terminal

Bio-Neuron





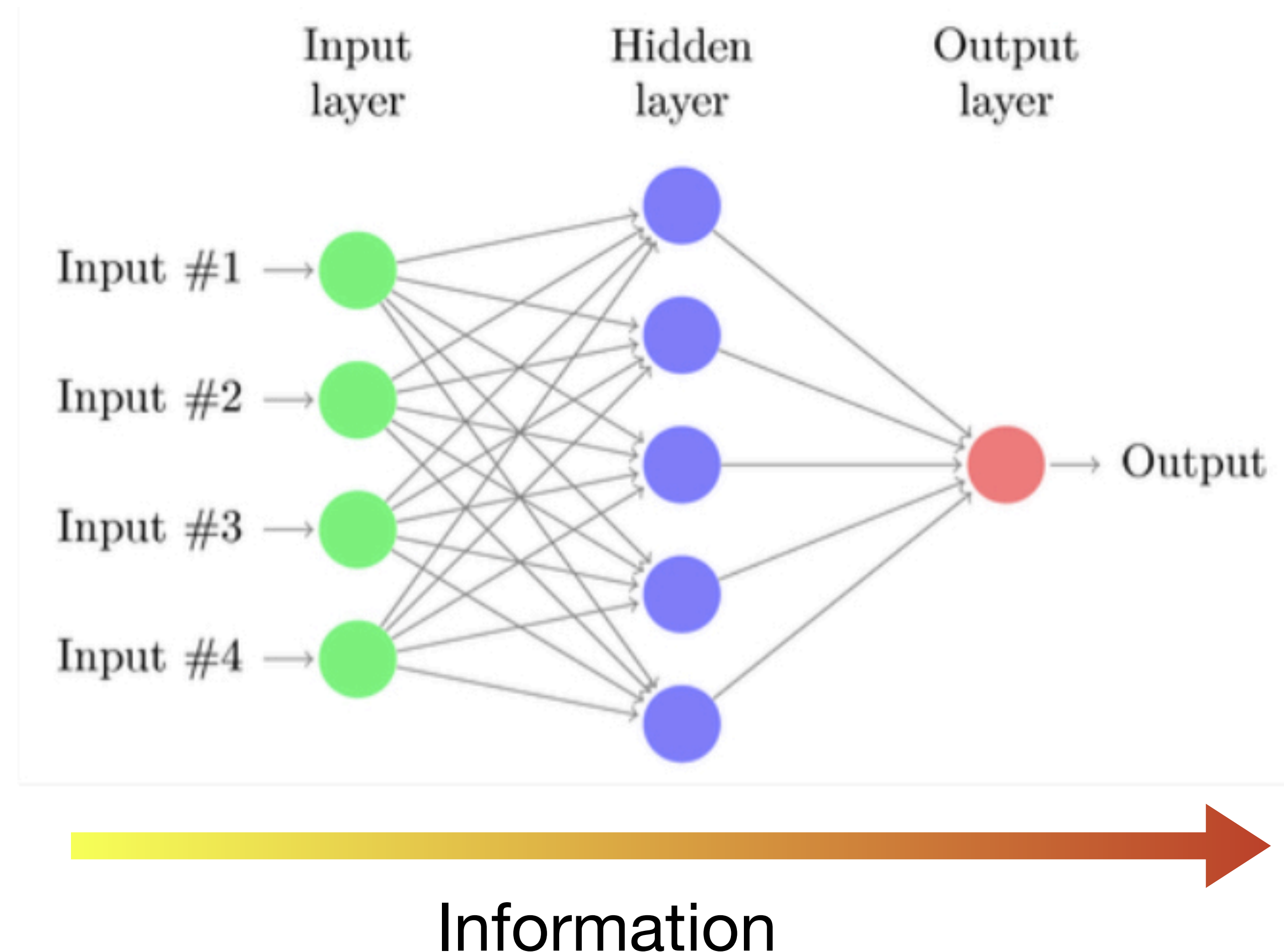
Deep Learning



Analogies

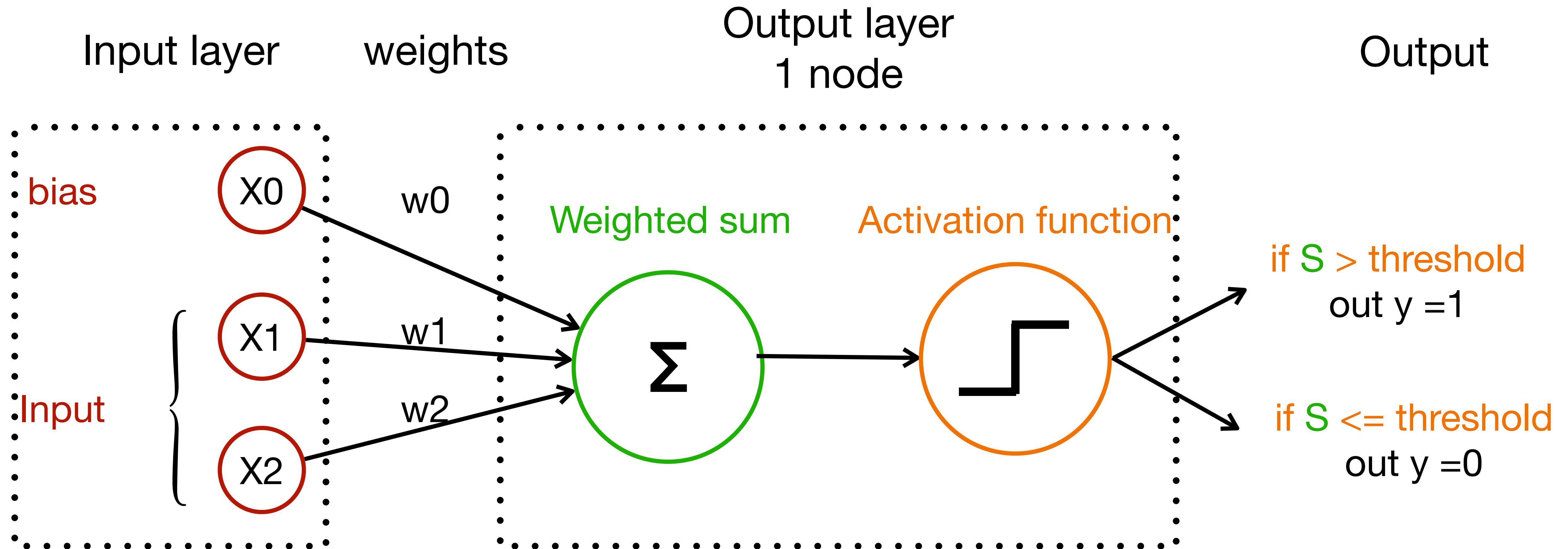
- * “pick” input (input layer nodes)
- * combine and transform the inputs (each nodes of hidden layers)
- * “strong” enough combinations transmitted to the next layer

Artificial Neural Network





Perceptron



$$S = X_0w_0 + X_1w_1 + X_2w_2$$

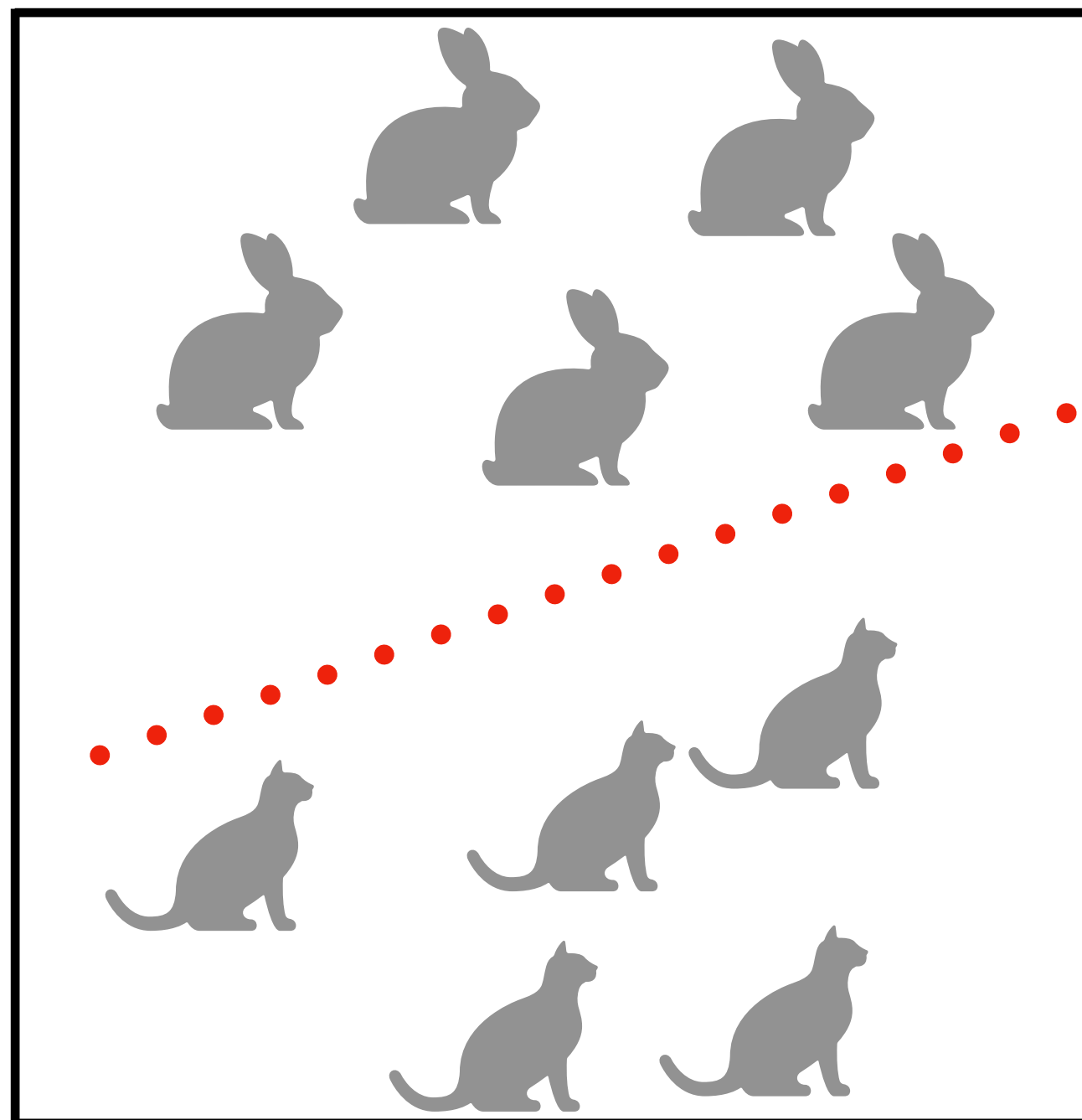


Perceptron



Some Uses

Linear Binary Classifier



Decision
Boundary

$$X_0w_0 + X_1w_1 + X_2w_2 = c$$

Logical AND

x1	x2	output
0	0	0
0	1	0
1	0	0
1	1	1

Logical OR

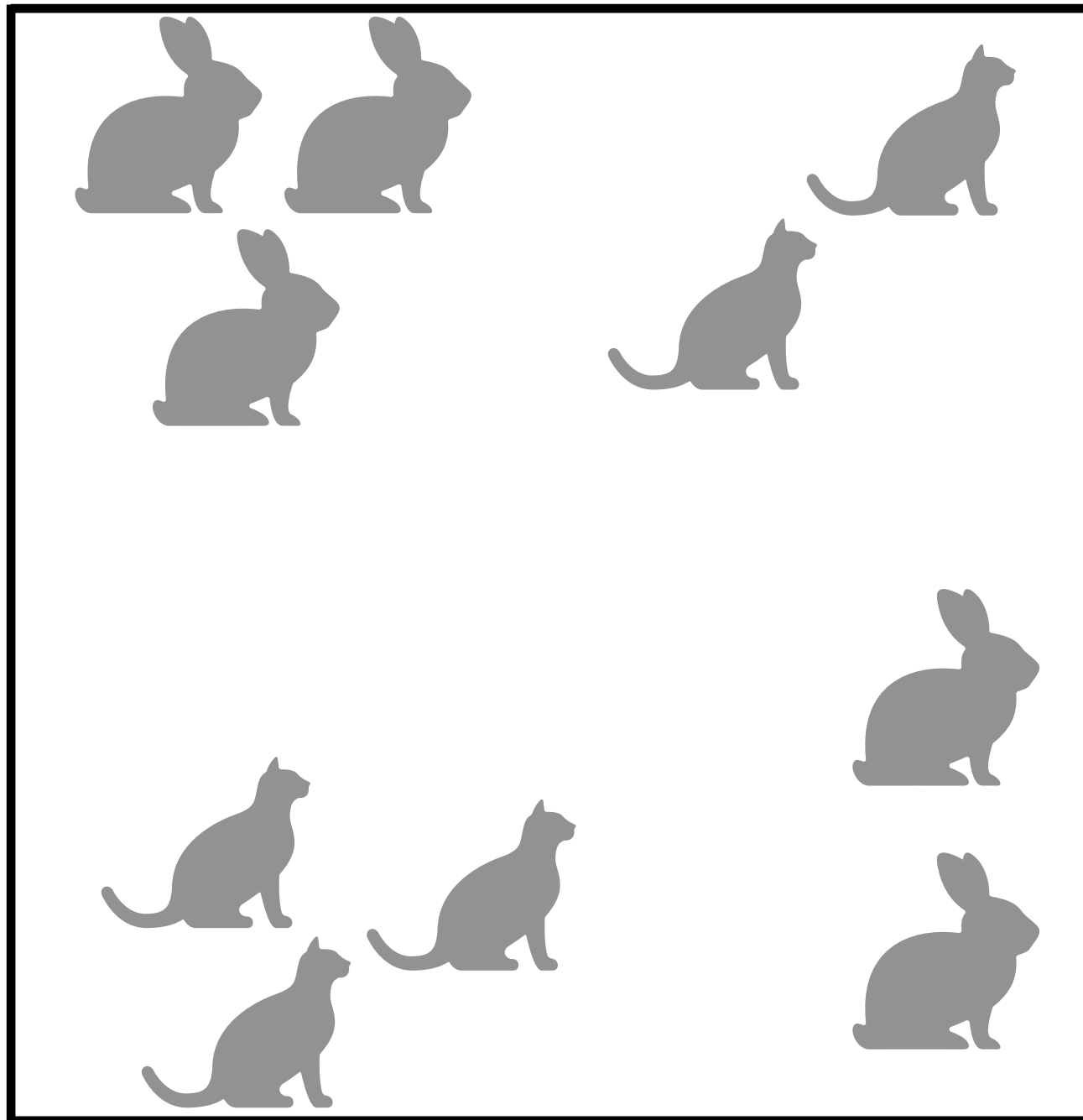
x1	x2	output
0	0	0
0	1	1
1	0	1
1	1	1



Perceptron

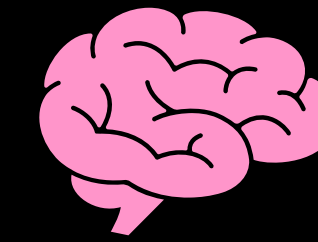


Can it build...?

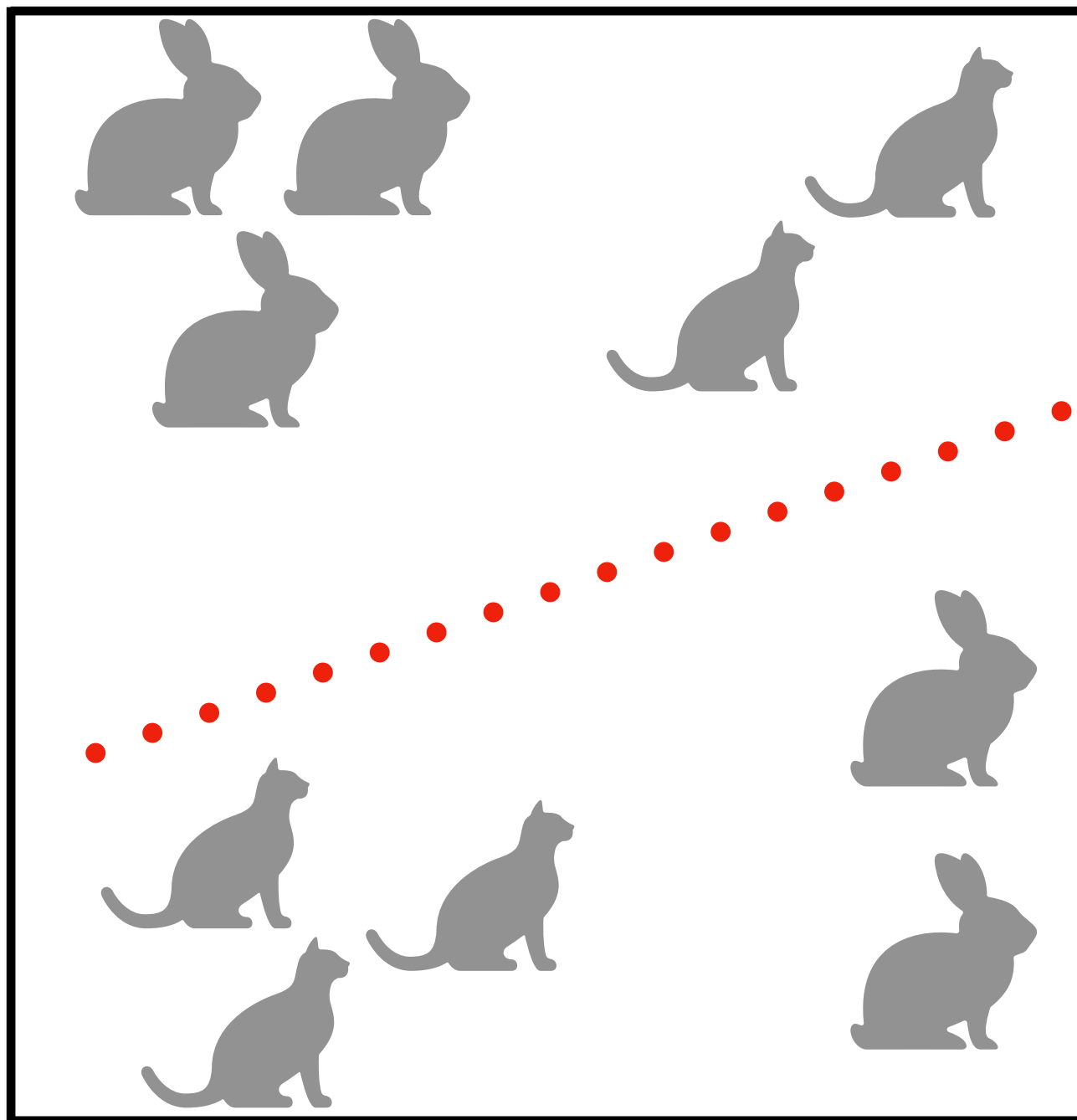




Perceptron



Can it build...?



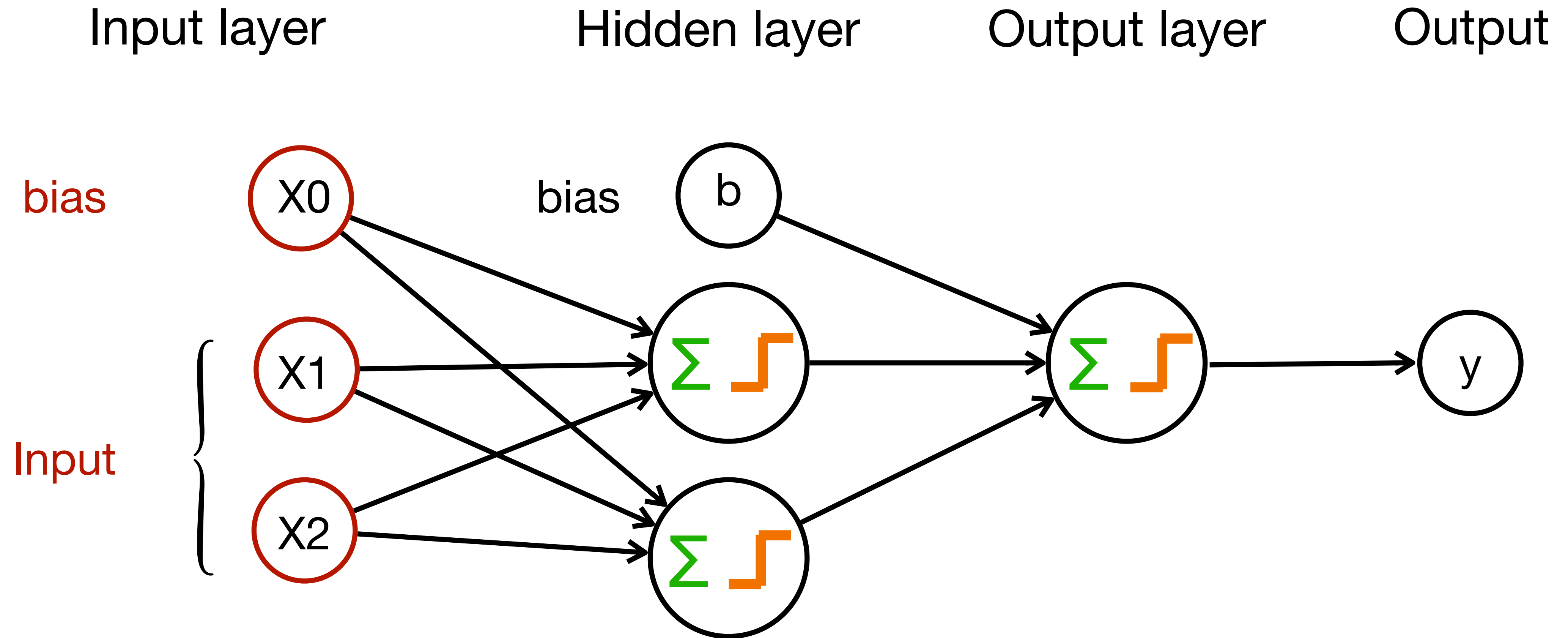
Nope

XOR Nonlinear function



Logical XOR		
x1	x2	output
0	0	0
0	1	1
1	0	1
1	1	0

Multi-Layer Perceptron

FEED-FORWARD NEURAL NETWORK



FEED-FORWARD
NEURAL
NETWORK

 **Deep** 
Learning
ARCHITECTURES

RECURRENT
NEURAL
NETWORK

CONVOLUTIONAL
NEURAL
NETWORK