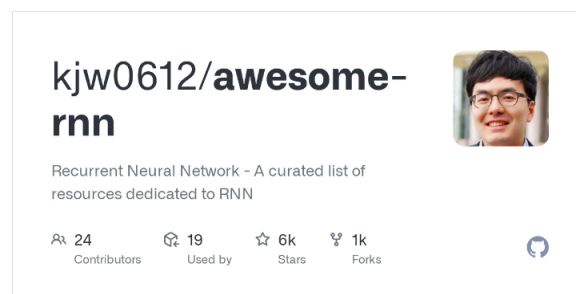**Sanity:**

The Paradox of Deep Learning" discusses the reasons why deep learning performs effectively despite several inherent challenges.
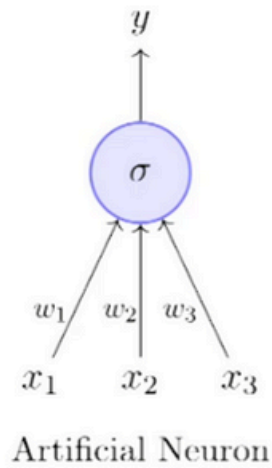
Reasons for Effectiveness:

1. **High Capacity**: Deep learning models have a high capacity for learning, which makes them susceptible to overfitting.
2. **Numerical Instability**: Issues like vanishing and exploding gradients can occur during training, affecting model performance.
3. **Sharp Minima**: The presence of sharp minima in the loss landscape can lead to overfitting.
4. **Non-Robustness**: Deep learning models may lack robustness, making them sensitive to small changes in input data.

Current Understanding:

- There are no clear answers to why deep learning works so well despite these issues.
- There is a growing emphasis on **explainability** and **theoretical justifications** in the field.
- The hope is that this focus will lead to more coherent and rational approaches in deep learning research.

kjw0612/**awesome-rnn**

Recurrent Neural Network - A curated list of resources dedicated to RNN

| 24 Contributors | 19 Used by | 6k Stars | 1k Forks |

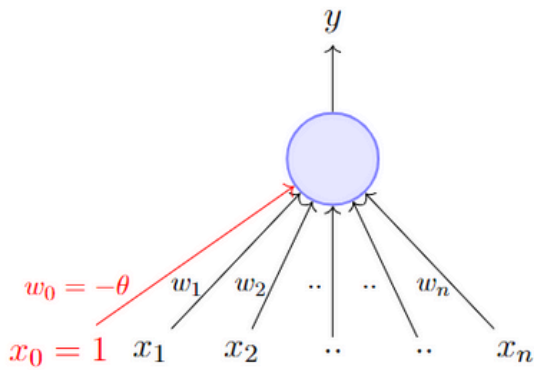# Motivation from Biological Neurons

Artificial Neuron

- The most fundamental unit of a deep neural network is called an *artificial neuron*
- Why is it called a neuron ? Where does the inspiration come from ?
- The inspiration comes from biology (more specifically, from the *brain*)
- *biological neurons = neural cells = neural processing units*
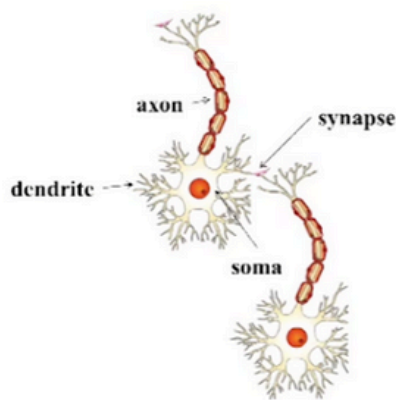
Biological Neurons*

- **dendrite:** receives signals from other neurons
- **synapse:** point of connection to other neurons
- **soma:** processes the information
- **axon:** transmits the output of this neuron

$$y = 1 \quad if \sum_{i=1}^{n} w_i * x_i \geq \theta$$

$$= 0 \quad if \sum_{i=1}^{n} w_i * x_i < \theta$$

Rewriting the above,

$$y = 1 \quad if \sum_{i=1}^{n} w_i * x_i - \theta \geq 0$$

$$= 0 \quad if \sum_{i=1}^{n} w_i * x_i - \theta < 0$$

A more accepted convention,

$$y = 1 \quad if \sum_{i=0}^{n} w_i * x_i \geq 0$$

$$= 0 \quad if \sum_{i=0}^{n} w_i * x_i < 0$$

where, $\quad x_0 = 1 \quad and \quad w_0 = -\theta$