# An Introduction to Neural Networks

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October 10, 2018

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# Intro

- Who am I?
- What will I be talking about?

# What is a Neural Network?

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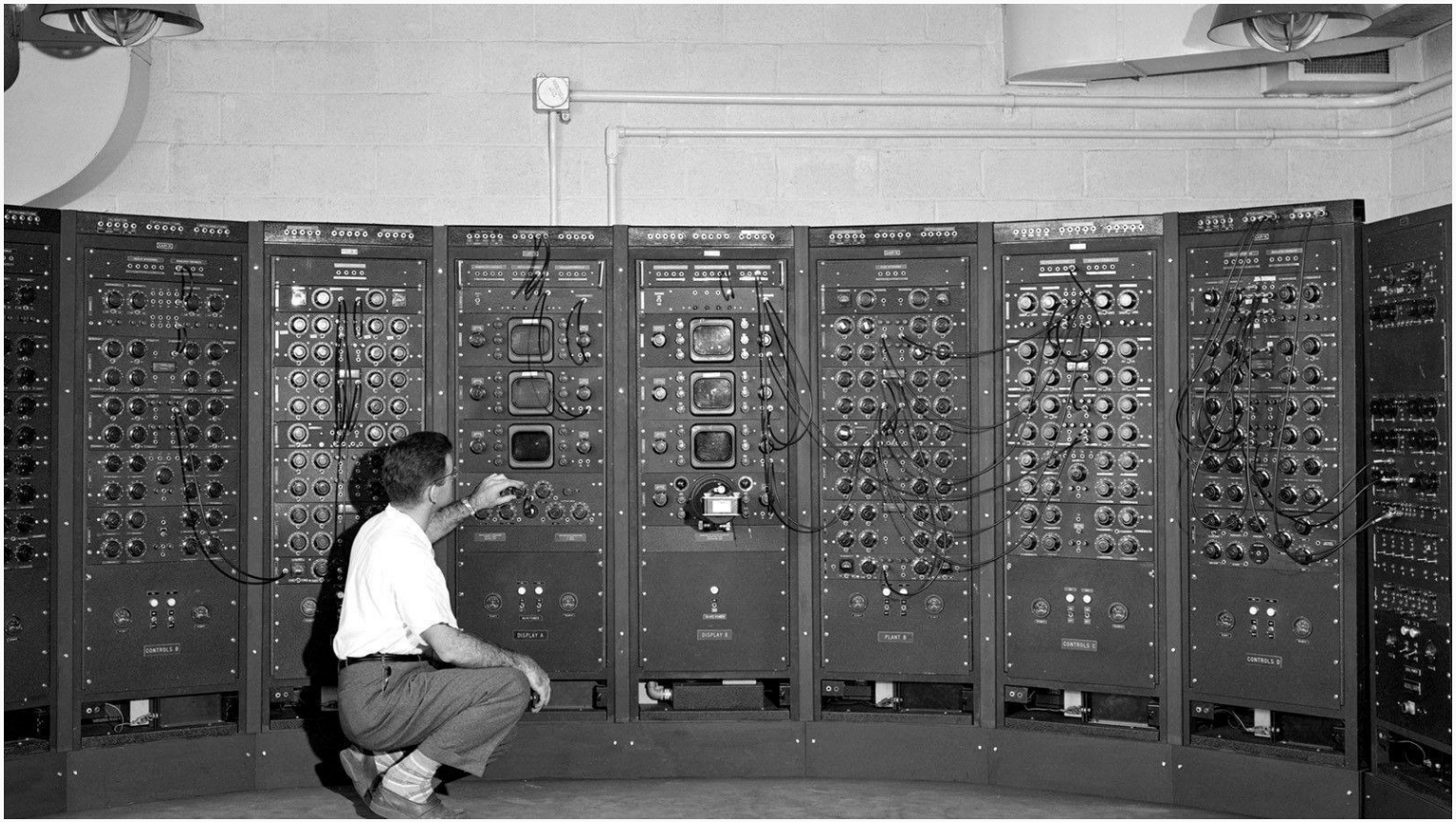

# What is this Function?

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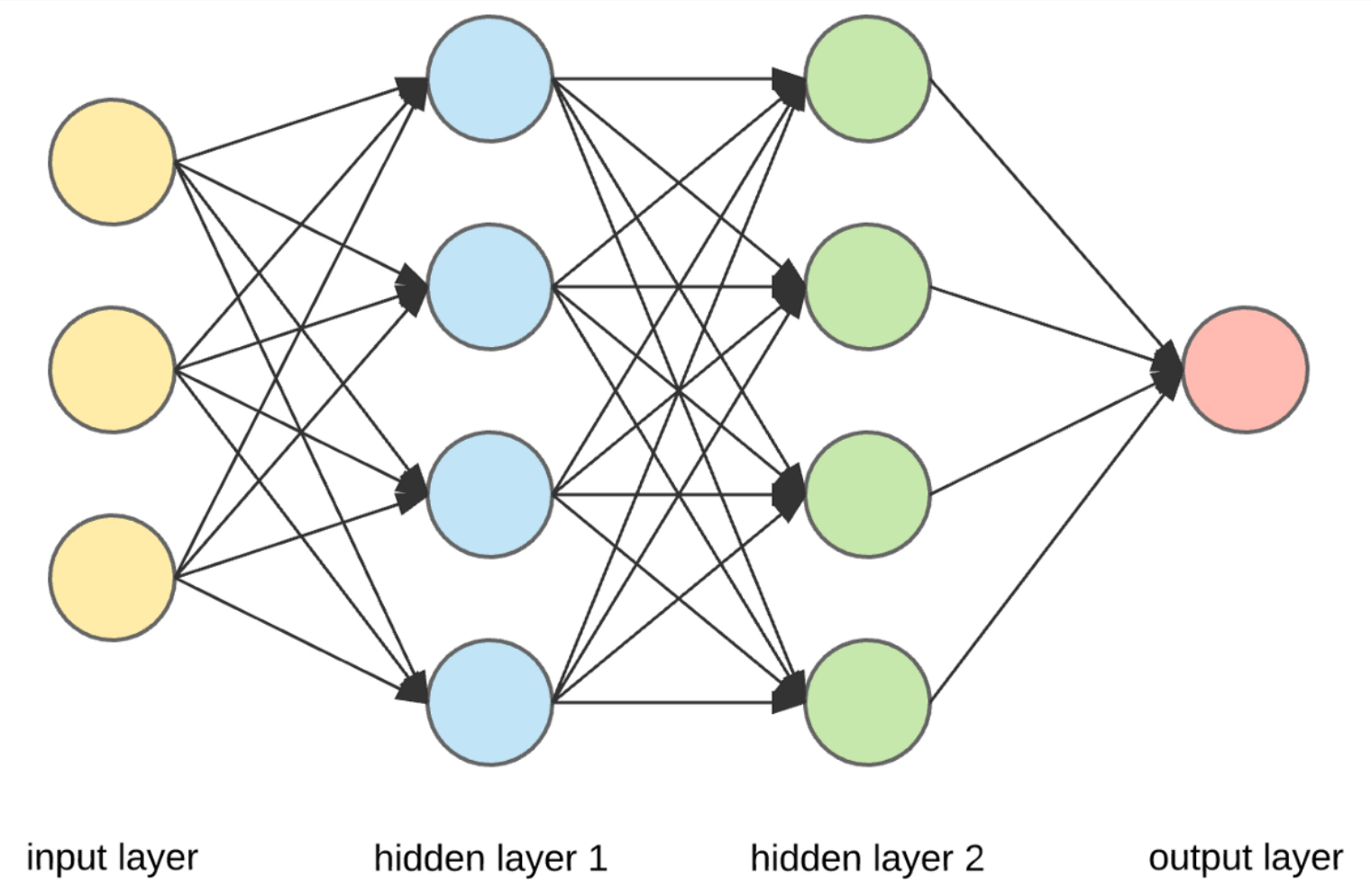

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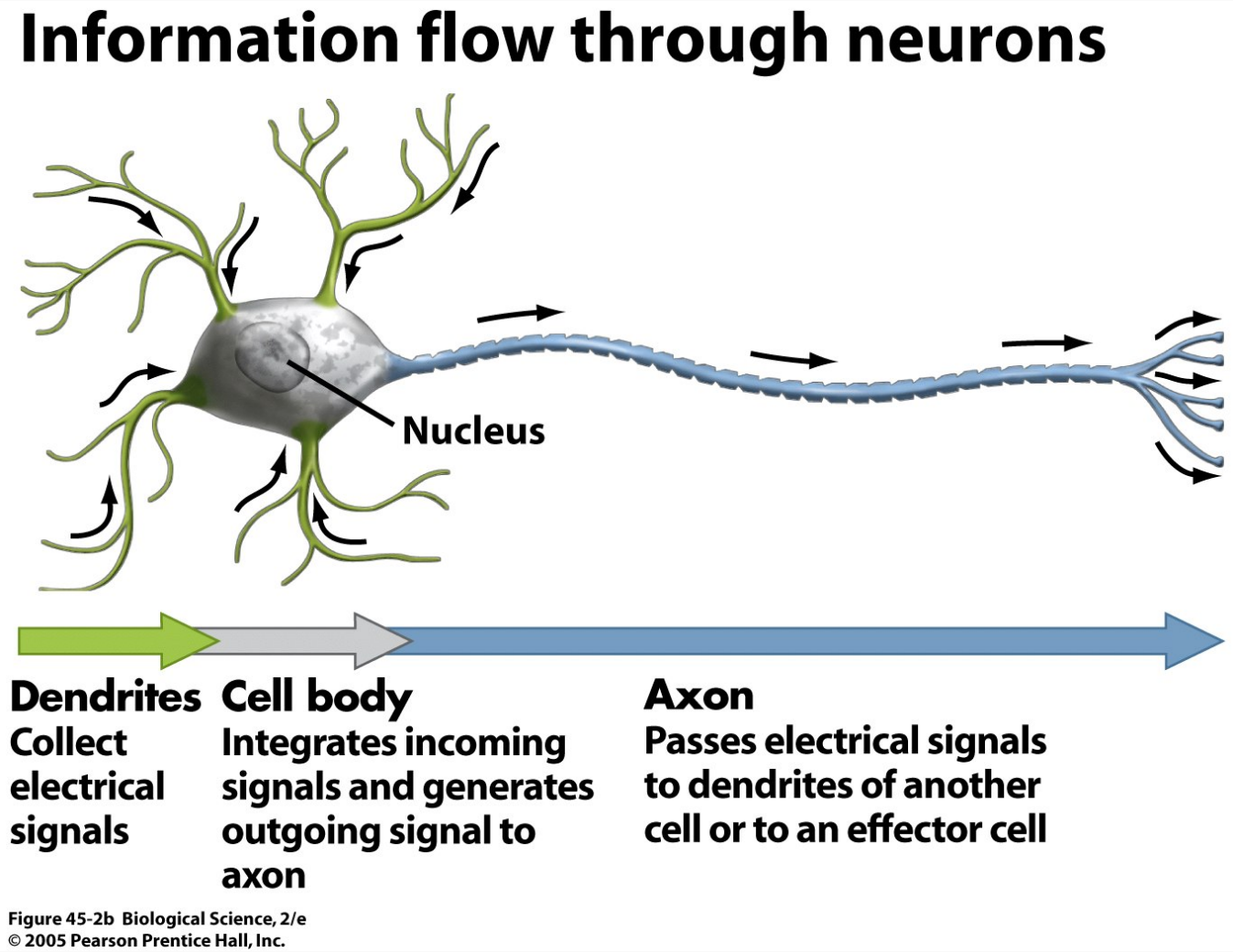

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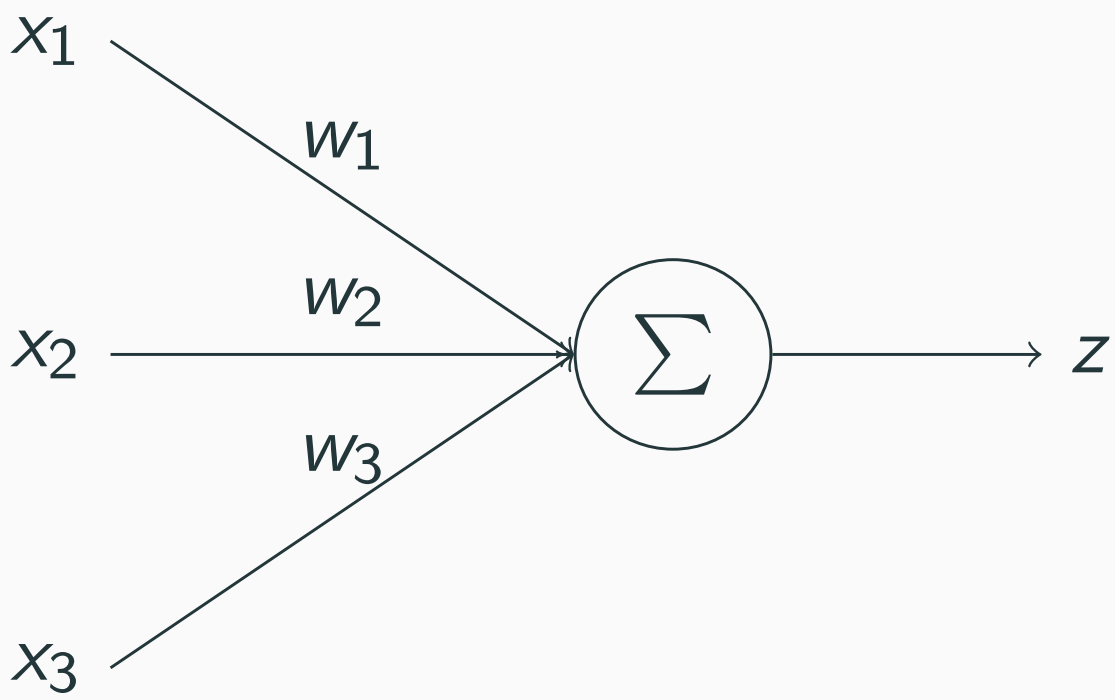


$$z = x_1 \cdot w_1 + x_2 \cdot w_2 + x_3 \cdot w_3$$

# Activation Functions

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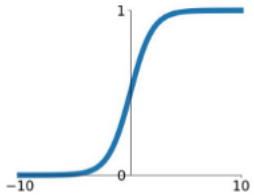
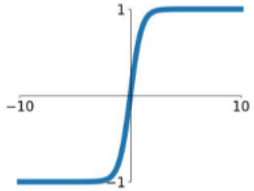
**Sigmoid**

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



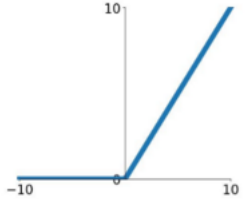

**tanh**

$$\tanh(x)$$



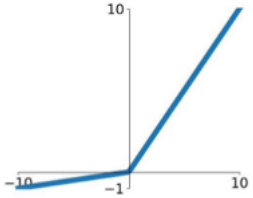

**ReLU**

$$\max(0, x)$$




**Leaky ReLU**

$$\max(0.1x, x)$$

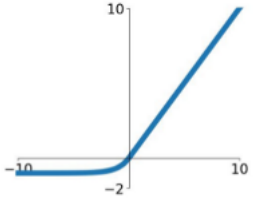



**Maxout**

$$\max(w_1^T x + b_1, w_2^T x + b_2)$$

**ELU**

$$\begin{cases} x & x \geq 0 \\ \alpha(e^x - 1) & x < 0 \end{cases}$$



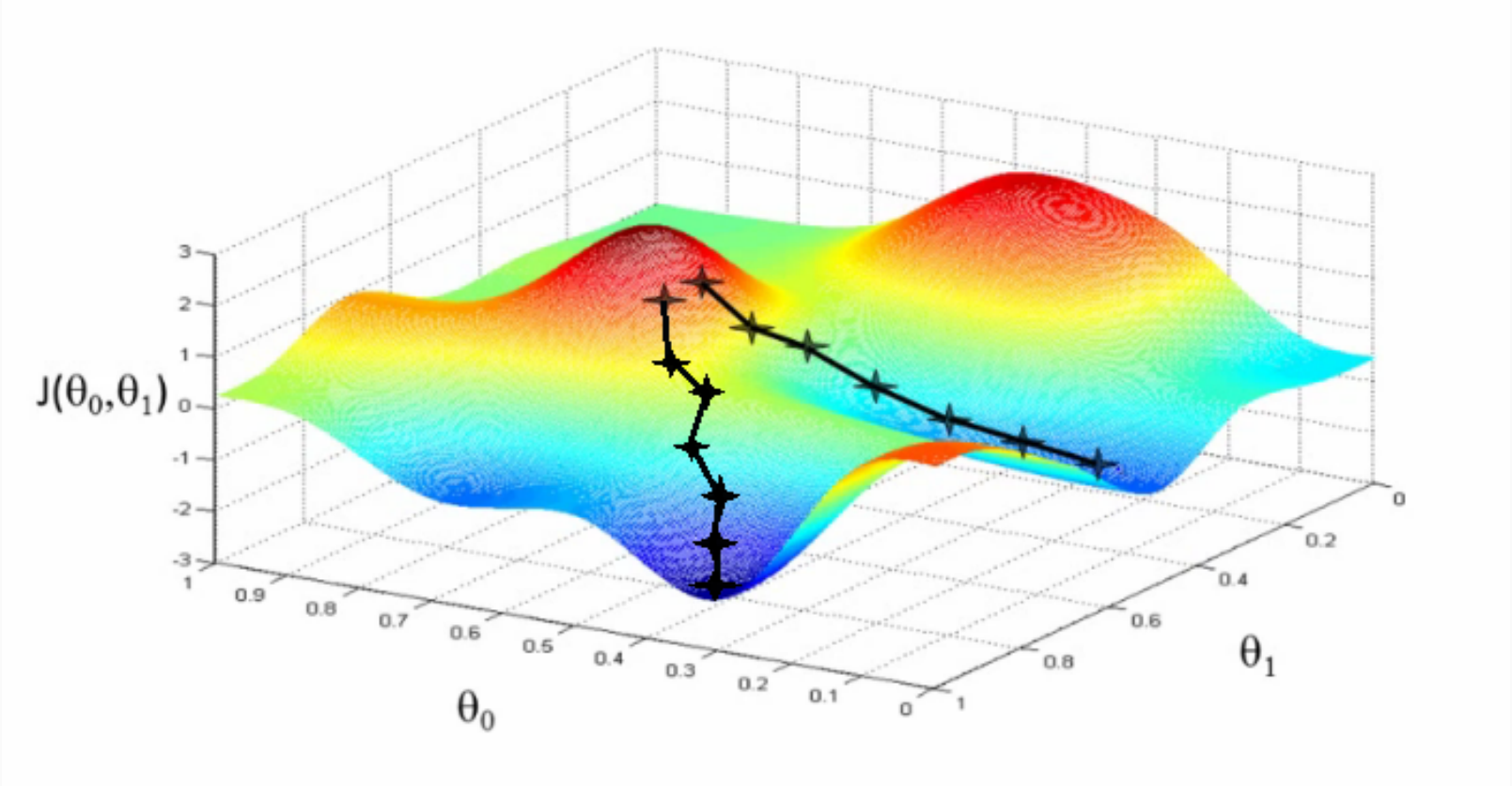
# Finding the best Weights

# Cost Function

$$C(W) = \frac{1}{2} \sum_{x_i \in X} (f(x_i) - y_i)^2$$

where $f$ is our neural network, $X$ is our training set, and $y_i$ is the target of $x_i$

# Gradient Descent



# The Full Process

# Full Process

- A Neural Network is just many small functions linked together.
- These small functions are just linear multiplication followed by an activation.
- We created a cost function to assess the performance of a set of weights.
- We came up with a method to iteratively improve our choice of weights.

# Let's see some code...

# Next Steps

- https://pythonmachinelearning.pro/free-ebook-deep-learning-with-python/
- https://eu.udacity.com/course/deep-learning–ud730
- http://www.deeplearningbook.org/

# Thank You...Any Questions?