
Real World Applications of Data Science

In partnership with:
Proscia Inc, Betamore, Spark B-more

Lecture 6: Neural Networks + Computing Infrastructures

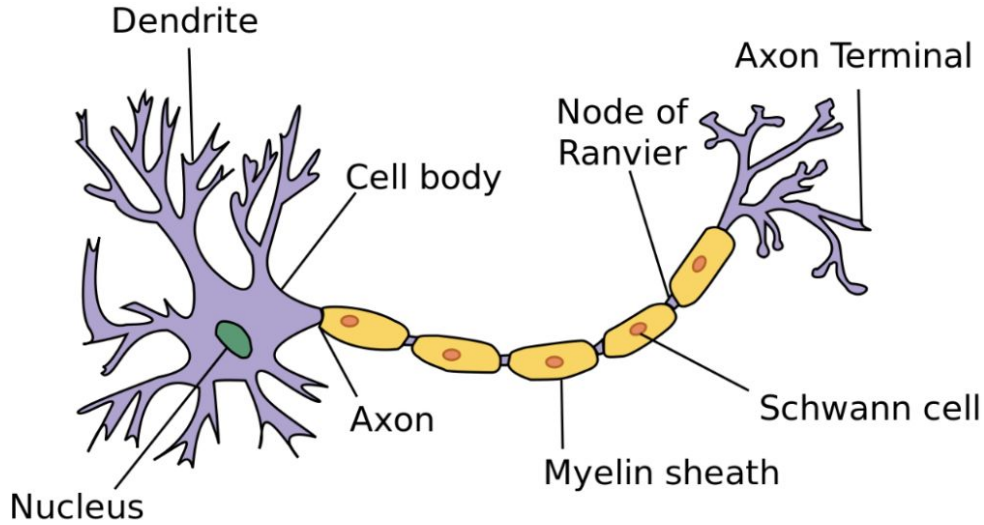
Artificial Neural Networks

A computational system
comprised of layers and each layer
is built of interconnected perceptrons

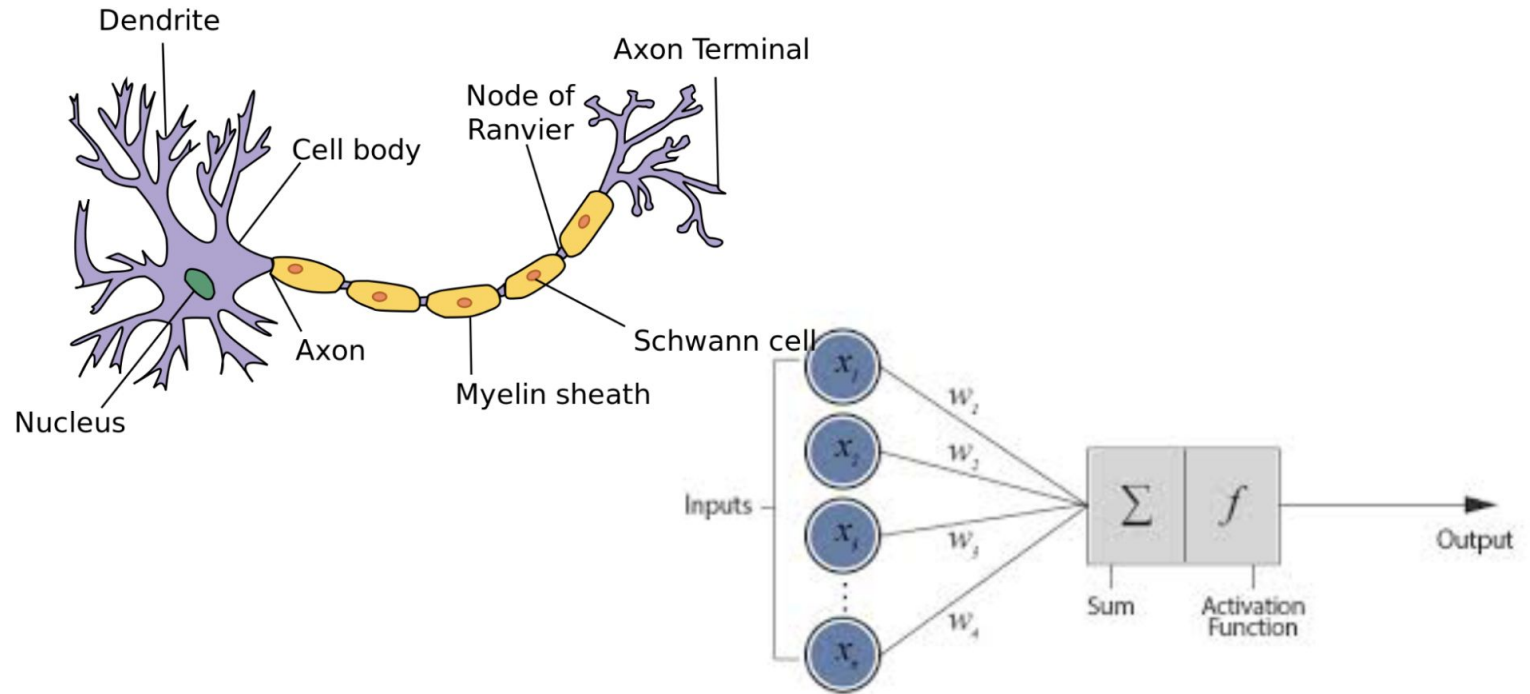
ANN

Built to model the animal nervous system

ANN



ANN



ANN structure

Single Perceptron

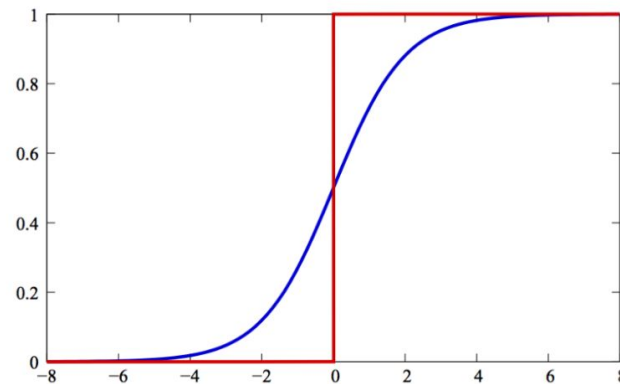
Takes in input and uses an activation function in order to output

ANN structure

Single Perceptron

$$f_{log}(z) = \frac{1}{1 + e^{-z}}$$

f_{log} is called **logistic function**



NOTE:

A single perception can be like a logistic regression in and of itself!

Takes in input and uses an activation function in order to output

ANN structure

Single Perceptron

But what is z ? A weighted sum on the inputs!

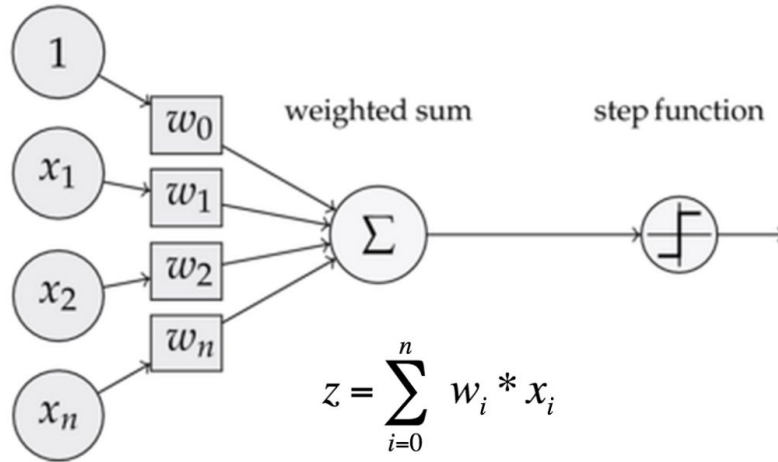
$$z = \sum_{i=0}^n w_i * x_i$$

Where w is the weight on input x

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Single Perceptron

inputs weights



$$f_{log}(z) = \frac{1}{1 + e^{-z}}$$

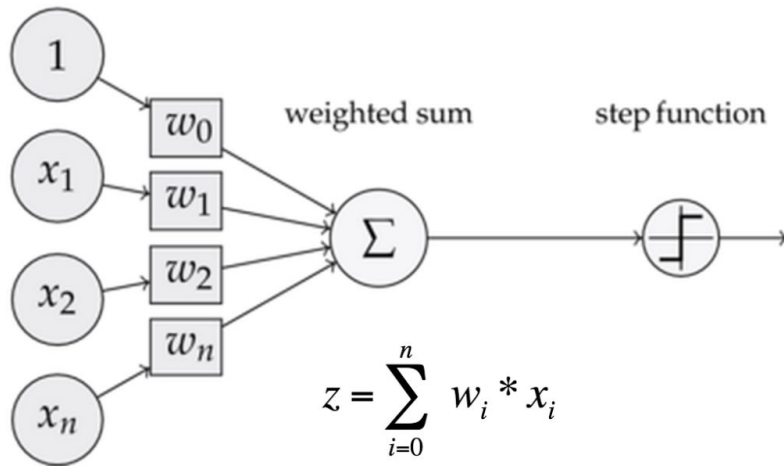
f_{log} is called **logistic function**

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Single Perceptron

If $f(z)$ is above a threshold, generally called theta, then the neuron “fires”

inputs weights



$$f_{log}(z) = \frac{1}{1 + e^{-z}}$$

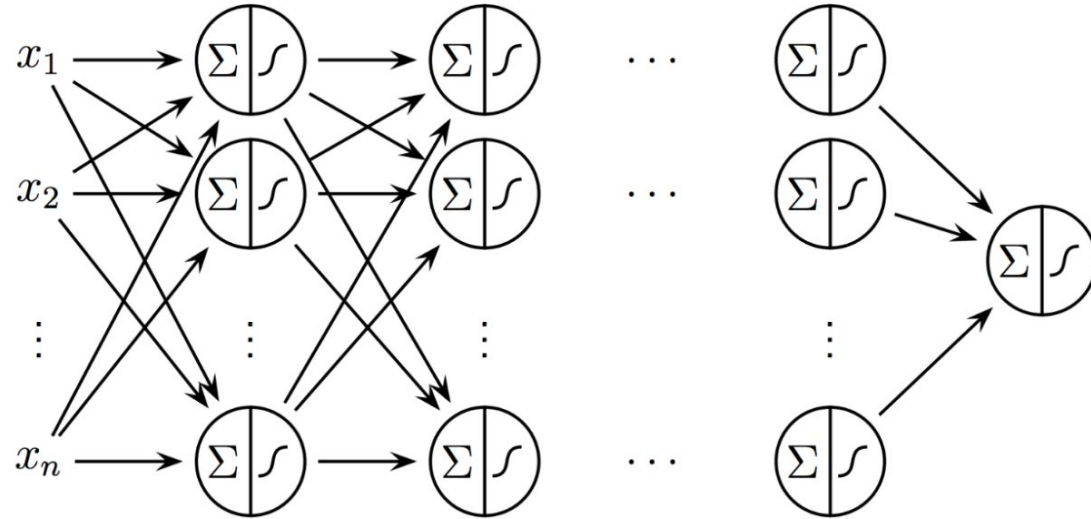
f_{log} is called **logistic function**

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Artificial Neural Networks are
also known as multi layer perceptrons

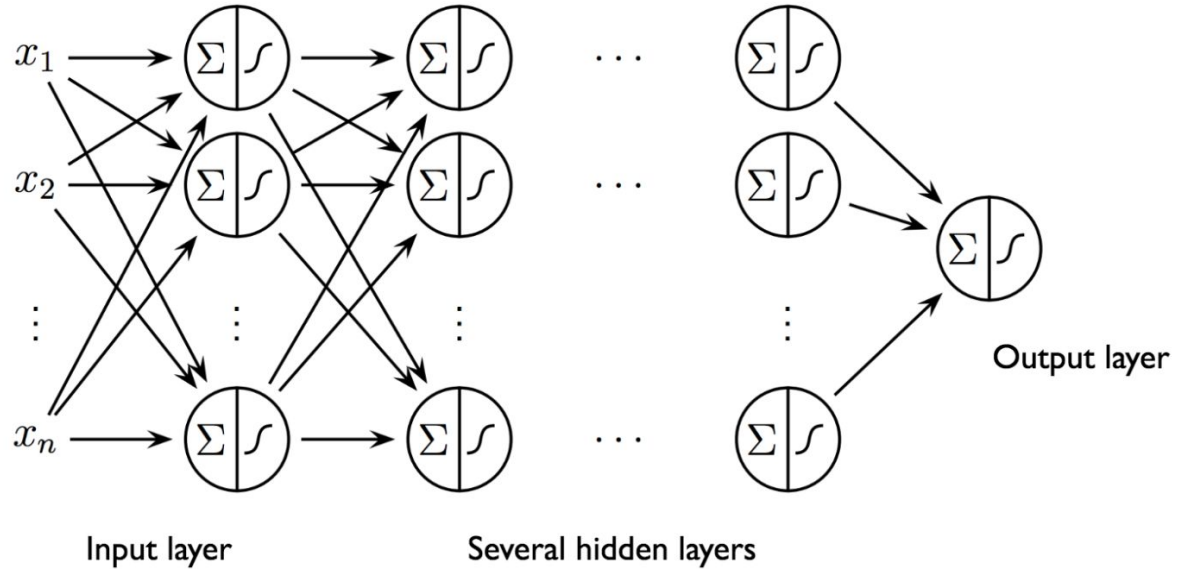
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A **multi layer perceptrons (MLP)** is a finite acyclic graph. The nodes are neurons with logistic activation.



ANN

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But how does it learn?!

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Back-Propagation

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As we train the model we update the sigmoid function weights in order to get the best predictions possible

If an observation goes through the model and is outputted as False when it should have been True, The logistic functions in the single perceptrons are changed slightly

ANN

Pros

- Online model (updates as you go)
 - Doesn't need to be fit all of the time
- Very fast predictions
- Can approximate almost any type of function
- Can be used in a supervised and unsupervised manner
- Super cool

Cons

- Requires many training samples to be considered good
 - Hard to describe what is happening
 - Requires a lot of hardware / computation power
 - Slow to train
 - Sklearn only has unsupervised version
 - Other versions are difficult to use
-

ANN

The most advanced ANN's use thousand's of neurons which is a lot right?

Sure but my dog has billions.....



Computing Infrastructures

AWS v. Azure



AWS v. Azure

- Leading cloud infrastructures
 - Hadoop support
 - AWS: Elastic Map Reduce
 - Azure: HDInsight
 - Computing
 - AWS: EC2
 - Azure: VMs
 - Storage
 - AWS: S3
 - Azure: Azure storage
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Any questions?
