

Let's Talk Digital Series #11

How Do Machines Learn?

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Differences between traditional programming techniques and machine learning.

Traditionally, if we wanted a computer to do something, a person, normally referred to as a Programmer would develop something called a Program. A Program is essentially a step by step series of instructions which you want the computer to execute. The computer would then take these set of instructions and execute each of these instructions in the sequence you told it to. Thus, leading to the famous adage that “computers do what you tell it to do, not what you want it to do.”

In most used cases, this is exactly what is required; you need the computer to calculate the tax on a set of invoices, or to print a report in a predefined format. You want to be able to explicitly define how tax is calculated or how wide the margins on your printed report should be. But what if you had a large collection of pictures of animals and you wanted the computer to identify what animals they were? You could, in theory, use the same approach as the report example, but you would have to define what a cat or dog looks like.

What if computers could learn the way humans do, i.e. through exposure to stimulus? So, if I wanted to teach a child what a dog was, I would show her a dog and tell her this is a dog. She would probably get it wrong the first few times, probably by saying “dog” when she sees any animal that has 4 legs. Through feedback and more examples, she will be able to make better and better distinctions.

Eventually, she will also be able to notice traits that define the different dog breeds; the elongated body of the Daschund, or the long floppy ears of the Beagle.

In short, humans learn by exposure to stimulus (i.e. seeing pictures of animals) and feedback (i.e. being told which one is a dog and which isn't). This is essentially how machine learning works.

Artificial Neural Networks

The science behind machine learning is the Artificial Neural Network (ANN). Neural networks are (loosely) modelled after the neurons in the human brain (Figure 1).

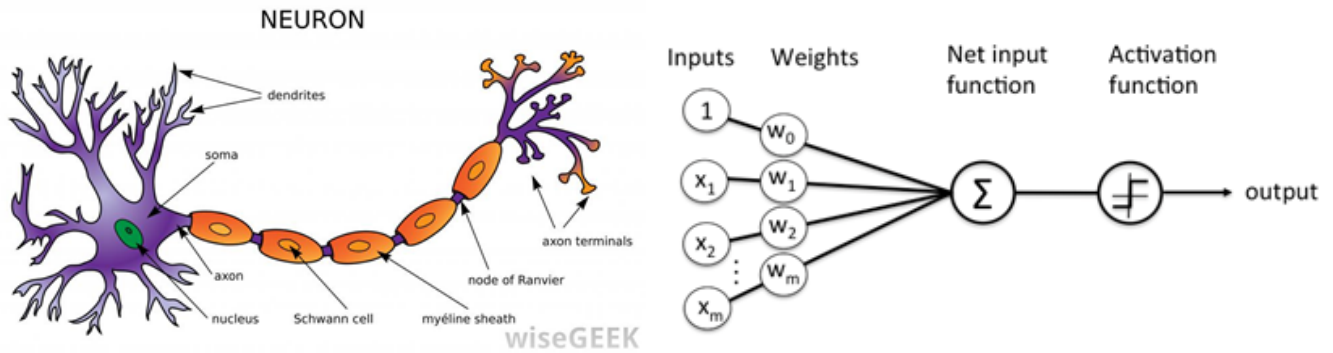


Figure 1: A brain Neuron vs an Artificial Neuron

<https://pathmind.com/wiki/neural-network>

https://en.wikipedia.org/wiki/Artificial_neural_network

The Artificial Neurons are that combined into a dense collection of layers to form the neural network (Figure 2).

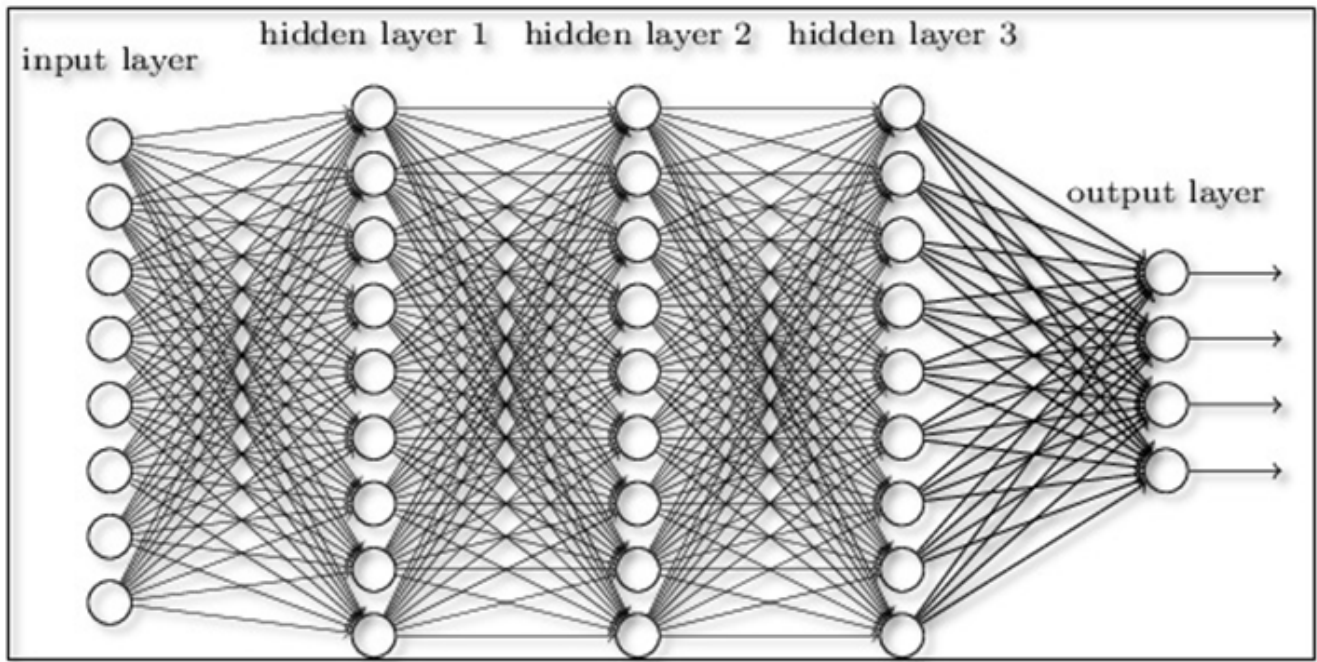


Figure 2: Artificial Neural Network

<https://www.houseofbots.com/news-detail/1442-1-what-is-deep-learning-and-neural-network>

With enough data sets (inputs), the neural networks “learn” by adjusting the weights until the desired outputs are achieved. This is known as the training phase. The trained neural network can then be used to recognize other data sets.

Some Applications of Machine Learning in the Finance Industry

Following are some areas where Machine Learning has been used in the Finance Industry (<https://algorithmxlab.com/blog/applications-machine-learning-finance/>):

Portfolio Management – Robo-Advisors	Online applications used to provide automated financial information.
Algorithmic Trading	Computers execute programmes with a predetermined set of instructions (an algorithm) for placing a trade on behalf of a trader.
Fraud Detection	Scan through vast data sets, detect unusual activities (anomalies), and flag them.
Loan/Insurance Underwriting	Based on historical consumer information, algorithms can look for patterns to decide if the application qualifies for a loan or insurance.
Document Analysis	ML used to scan and analyze legal and other documents to meet compliance requirements and combat fraud.
Money-Laundering Prevention	AI software used to collect internal, publicly-existing and transactional data to attempt to spot money laundering signs.

Conclusion

Neural Networks have essentially moved out of the labs and into practical use over the past decade or so and has shown great promise in areas which are difficult to address with traditional programming techniques.



This article is part of the Digital Banking Learning Series, 'Let's Talk Digital', an initiative by the ABS Center for Digital Banking. It is written by industry practitioners and are aimed at educating the general public on the intricacies of digital applications in banking and other related industries, including the latest insights and trends of Digital Banking.

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