

What is Machine Learning vs Deep Learning vs Reinforcement Learning vs Supervised Learning?

This is a simplified explanation of Machine Learning intended for non-computer science people. It definitely glosses over the massive complexity involved in this field but should give you a basic understanding of the core concepts in just a few short sentences.

What is Machine Learning?

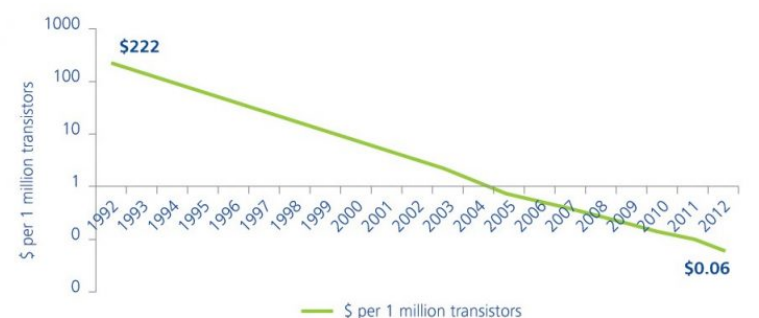
Machine Learning is a set of rules that a computer develops on its own to correctly solve problems. The basic idea is that a Machine Learning computer will find patterns in data (data could be numbers, pictures, shapes, ...) and then predict the outcome of something it has never seen before. Machine Learning is a critical component to any Artificial Intelligence (AI) development.

Until recently Machine Learning was not possible because we lacked the very large data sets computers require to find patterns in, the storage capacity to keep all of that data and the computing power to find those patterns in a reasonable amount of time. All three of these factors have now changed:



1. With the advent of parallel processors, usually GPU's (Graphics Processing Unit's [often from nVidia](#)) the computing power issue has been advanced to the point where Machine Learning is now possible. It will only get better with faster and more powerful processors.
2. Storing huge amounts of data is still expensive but as you can see in the graphic to the right, computer storage costs decrease at a nearly constant and predictable rate. In 2017, a terabyte disk can now be purchased for less than \$50.
3. So called 'Big Data' has now collected enough data samples for Machine Learning to work with. In the past, computer systems did not collect very much data and what they did collect was often not stored for any length of time. This meant

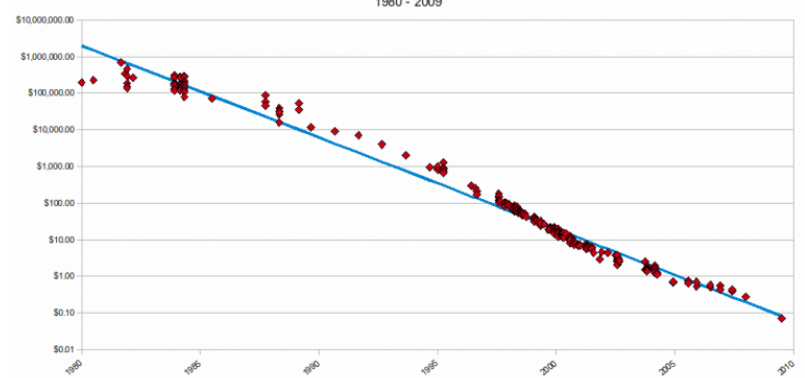
Computing cost-performance (1992–2012)



Source: Leading technology research vendor

Graphic: Deloitte University Press | DUPress.com

Hard Drive Cost per Gigabyte
1980 - 2009



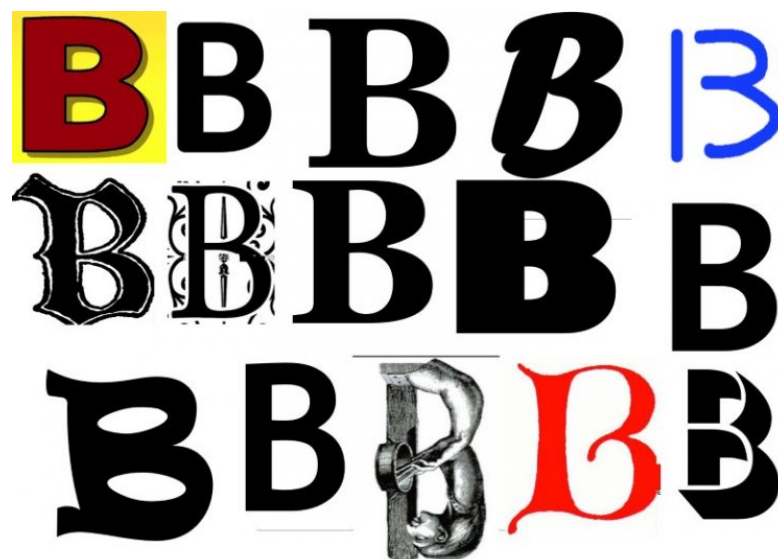
Source: <http://www.mkomo.com/cost-per-gigabyte>

we lacked the large (huge!) data sets required for Machine Learning to be successful. Today we have billions of sensors and systems collecting data onto vast storage arrays. Think about all the data your smart phone collects, all of the security camera's data and all of the posts on social media. Those three items alone account for billions of captured data points each day.

There are [MANY 'types' of Machine Learning](#) but in 2017 the most prevalent 'types' of machine learning are Supervised Learning, Deep Learning and Reinforcement Learning. Below are simple explanations of each of the three types of Machine learning along with short, fun videos to firm up your understanding.

What is Supervised Learning?

Supervised Learning is a type of machine learning that feeds a computer system many (thousands, millions or even billions) of examples of a given item and having the computer calculate the similarities between those items so that it can recognize other examples of that item which it has not seen yet. For example, if you fed the computer the following set of graphics (and thousands more!) and told it they were all examples of the capital letter B:



it should be able to calculate distances between various parts of each of those letters to develop ratios that let it identify the following letter B graphic even though it has never 'seen' before like this one:



What is Reinforcement Learning?

Reinforcement Learning is a type of machine learning that tells a computer if it has made the correct decision or the wrong decision. With enough iterations a reinforcement learning system will eventually be able to predict the correct outcomes and therefore make the 'right decision'.

What is Deep Learning?

Deep Learning is a type of machine learning that requires computer systems to iteratively perform calculations to determine patterns by itself. This means after a Deep Learning computer has determined that a picture it is evaluating is in the shape of a rectangle; it will then cycle through again to find that the picture contains an oval shape; it will then cycle through again to find that the picture has measurements between key points on the oval shape that match typical placement of a nose, eyes and ears; it will then cycle through again to find that the eyes have fur like substance on them; it will then cycle through again to find that the nose is pink; and so on, eventually deciding that this picture has enough similarities to things it already knows to state that the it is looking at a framed cat picture.

Canada's Montreal and Toronto areas are the global centers for Deep Learning in 2017. Google opened an AI Center in Montreal in 2016, a year that saw more than \$200M in AI investments flood into Montreal alone. [Microsoft bought Montreal based Deep Learning startup Maluuba](#) and at the same time announced a \$6M grant to the University of Montreal's Deep Learning facilities and another [\\$1M to McGill University](#) (again in Montreal) in January 2017. That move is what prompted me to investigate Machine Learning and write this article.

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