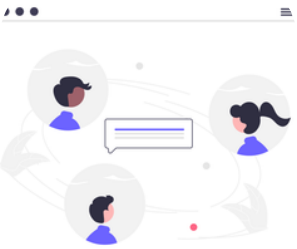
Algorithms
Transcription

In 2002, Google's revenues were less than half a billion USD. Ten years later, its revenues had jumped 125 fold, and the company was generating half a billion USD every three days. At the heart of this staggering growth was the PageRank algorithm, a novel and original way to rank the popularity and relevance of web pages. Google has never gauged which page is better from a human perspective; its algorithms simply respond to what Google has deemed to be most important in determining what it shows first.

In mathematics and computer science, an algorithm is a self-contained step-by-step set of operations to be performed. Algorithms perform calculation, data processing, and/or automated reasoning tasks. It's basically a recipe with step by step instructions to get to the desired outcome. For an Exponential Organization, algorithms are a way to make sense of the abundance of data, gathered from various internal and external sources. It transforms this data into business value. This can then be used to improve internal strategy and operations or to deliver additional value to its customers.



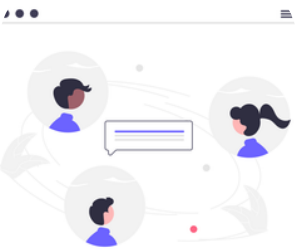
You might not be aware of it, but algorithms have been around us for some time now.As you turn on Zoom, Netflix or any other video/audio provider, ever wonder how quickly the audio and video is transmitted? Probably not. But if you were to go back a few years, you'd notice the abysmal difference in quality. These providers use audio and video compression algorithms to ensure that, whatever your connection speed is, you get the best experience possible.

Every time you type in an address on Waze or Google Maps and get directions, they use a route-finding algorithm. When you start typing on Google search and autofill kicks in – it's an algorithm at work, just as when you write a message and it gets autocorrected. When you go on Amazon and get recommendations – it is thanks to the Amazon recommendation engine, powered by algorithms. All these algorithms boil down to the same thing – a set of automated steps to accomplish a task. Across all sciences, efficient algorithms are needed to analyze enormous data sets or to select intelligently from a vast number of possible outcomes.

There are two principles to a successful algorithm. Firstly, that it solves a problem and secondly that it does so efficiently. And how do we know they are efficient? Computer scientists use a technique called asymptotic analysis, which basically compares algorithms, independent of language programmed in, or use case, confirming if some algorithms are more efficient than others.

Let’s now look more closely on a particular set of algorithms which are at the frontier of this new world - Machine Learning. Machine learning is a type of artificial intelligence that uses layers of algorithms to "learn" from the data it is processing. While artificial intelligence is more of a catch-all term for simulating human intelligence, machine learning deals with how a machine acquires information, understands the rules for how it should be used, and continues improving itself over time. Successful machine learning applications are applied in areas that involve processing large amounts of data which today can be said about a growing number of fields. Music streaming services use machine learning to decide which new songs or artists to recommend and use algorithms to associate the listener’s preferences with others that have similar musical taste.

It’s a subjective analysis that delivers the “best” results based on the quality of available data. We say that a system is capable of “machine learning” when it performs a function with the data given to it and gets progressively better over time. If we take the example of customer service, we can see machine learning being used to support customer service agents.



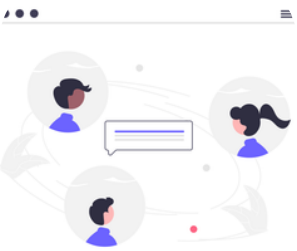
It shouldn’t be much of a surprise when you factor in that 81% of customers would rather help themselves than speak with an agent. leading to a significant preference towards self-service. Thus, we see the use of machine learning in chatbots, virtual assistants, predictive analysis and even in content creation.

There are different kinds of machine learning such as supervised learning, unsupervised learning and reinforcement learning. Both supervised learning and unsupervised learning relies on existing sets of data from which the ‘machine can learn’ and create the correct algorithm to process and extract value out of this data. The difference between the 2 is that for supervised learning, we tag the initial set of data and closely monitor whether the algorithm is picking up the correct traits - those that we want it to focus on. With unsupervised learning, both the creation of the algorithm as well as the finding of the patterns themselves is left up to the AI system.

Reinforcement learning is closest to how we as humans learn. Think of a small baby, learning to walk through trial and error. This type of learning is suitable for situations where we want AI to learn certain skills that are difficult, or even impossible for us to accurately describe and understand. Key to reinforcement learning is setting up the broad objective and then using a set of rewards to ‘motivate’ the AI towards learning the right skills and behaviours.

A great example of machine learning is also Google's AlphaGo, a computer programme that Google created using its own neural network that learned to play the abstract and highly complex board game Go. AlphaGo uses a custom developed type of machine learning called deep learning. Through this process, it learned how to play at a level never seen before, by combining large data sets from past Go games with its own 'intuition'-based algorithm. This allowed it to complement the analytics approach of other machine learning systems with novel creativity and originality as seen in one of the games played with Lee SeeDol in a world famous duel.

But even more impressive is AlphaGo's successor called AlphaGo Zero, which was given no data whatsoever and instead learned how to play Go by playing against itself millions of times across a space of roughly 1 month. AlphaGo Zero has then been able to beat AlphaGo by a result of 100 to 0. Following that, the scope was expanded to include Chess, Shogi and even tackle protein folding predictions.



To implement algorithms, exponential organizations need to follow the following steps:

1. List all key sources of digital information available
2. Analyse in which business areas you can gain most value by automating processes or by extracting value out of data
3. Choose the right kind of algorithm for each priority area
4. Build and test your algorithms
5. Launch and improve over time

Algorithms are usually closely linked with the Interfaces attribute as most well designed interfaces have a set of sophisticated algorithms running behind the scenes.

The impending explosion of data, resulting from the billions and trillions of sensors that will soon be deployed, makes algorithms a critical future component of every business. Given that they are faster, effective and more scalable than human beings, algorithms are not only critical for organizations committed to driving exponential growth, but also represent unprecedented business opportunities going forward.