

Machine Learning

Machine learning, at its core, is essentially the concept of implementing computer systems with the ability to automatically learn and improve, from prior experience, without having necessarily been programmed or coded to do so. Machine Learning (ML) is both a subfield and explicit component of Artificial intelligence. ML, along with natural language processing (NLP), robotics, speech and vision learning are core components of what makes up today's AI technology. ML's initial learning process consists of observation of data in the form of examples, direct experience and instruction to better develop decision making as well as to analyse patterns in the data. This is all done without explicit instructions to enable the program to find relationships in the data. Put simply, ML software works by linking an input with an output, in most cases the input are data sets provided in the algorithms and the output is the desired action of the ML. Modern algorithms that teach ML systems incorporate an approach based on semantic analysis, which mimics the human ability to understand the meaning of text.

There are two main categories that exist when it comes to ML algorithms; Supervised and Unsupervised learning.

Supervised learning is when the system is fed validation data to test accuracy and the "learning" takes place during this stage. Within supervised learning, one of the main methods used is classification.

Classification is when the system is given a set of data and is provided with "categories", the machine then groups the data into the given categories.

Unlike supervised learning, unsupervised learning provides no training data or an output requirement, the purpose is to allow the system to discover naturally occurring patterns in the data.

One of the main methods of unsupervised learning is anomaly detection where outlier information is detected and interpreted. This is most commonly used in fraud prevention to track suspicious behaviour or financial patterns.

We may not realise it but Machine learning is already deeply integrated into some of the products and services we heavily rely on and use daily. Some major examples of machine learning are:

- Google uses machine learning to create personalized advertising options.
- Spotify uses machine learning for playlist recommendations.
- Uber and Lyft use machine learning for travel time estimations.
- Amazon uses machine learning to predict and analyze the purchasing behavior of its customers.
- Text analysis for mapping out content and finding trending topics.
- Analytics for finding and investing in quality real estate.
- Call verification in the fraud recovery process.
- Price tracking for air travel to find the best deals

(<https://learn.g2.com/machine-learning>)

Machine learning has had a major impact on the digital landscape, and will continue to do so in the coming future. With technology progressing at such a rapid rate, it's important to be aware of how this advanced form of data analysis aids us each and every day. Along with the list of common uses of ML listed above, here are some more implementations in a little more detail:

Email Spam Detection: it wouldn't be wrong to assume most of all use email services daily, and most of us are used to receiving spam and advertising material consistently. Services such as Gmail, Hotmail and Yahoo have different algorithms for filtering out this material and separating it from the more important information we want to stay on top of. This is done through machine learning. The algorithm sees patterns in the kind of content we regularly get and can make predictions and decisions when things like spam are sent to us, and differentiate it from our regular inbox.

Face recognition: Facial recognition has seen a massive spike in popularity on some of the technology we rely on daily. Services such as Facebook can make suggestions to you, asking whether you would like to tag a friend in your new profile picture just based on the facial scanning of the other person in the photo. Similarly Facebook can alert you if you are in someone else's photo and can suggest to them to tag you. Another huge use of this is iPhones face unlock, when you set up your new iPhone, the first thing people do is train the device to recognise their face for security reasons.

Speech recognition: Just like facial recognition, speech recognition is just as popular nowadays on most of our smart devices. Products like Google assistant, Amazon echo and Apples Siri are all forms of machine learning speech recognition. It is trained to recognise patterns in your voice and interpret what you are asking it to do, and perform accordingly.

Whilst machine learning is quite powerful on its own, it's important to understand advancements in the technology and how a more powerful and complex iteration of ML is used today and this is where deep learning comes in. Deep learning is somewhat of an extension of machine learning, It operates in a similar fashion in that it acquires data and trains itself with no assistance. With deep learning, however, the way it processes this data is through the use of artificial neural networks and this is what separates it from machine learning. The goal of deep learning is to artificially mimic the way a human brain's neural network stores and recalls information. It makes use of many layers of nodes (neurons) and is capable of learning on its own and making adjustments to itself and its algorithms. Unlike machine learning, deep learning requires much more data in order to learn. This could be in the form of millions of images and lines of text or thousands of hours of video footage. In some cases, like for driverless cars, it's a culmination of many types of data.

Some of the major companies that are prominently leading the way in deep learning and AI are DeepMind and OpenAI (co-founded by Elon Musk). These companies are on the cutting edge of what deep learning and AI is capable of and have conquered some impressive milestones along the way. In 2016, DeepMinds AlphaGo program beat world champion Go player Lee Sedol and this really started to indicate what machine learning was capable of. Another one of Elon musk's founded companies, Neuralink, is dedicated to developing and producing chips that are implanted in the skull of those suffering from motor neuron problems, stroke victims, quadriplegics and paraplegics. The chip is then used to reconnect the damaged neural links in the brain, and restore limb and nerve function. This may sound like something out of a sci-fi movie, but deep learning and artificial neural networking lie at the heart of the experimental research.

I personally am very excited to see what the future holds and I totally embrace the new age of machine learning that we will no doubt enter very soon. Services such as self driving vehicles will immensely help the transportation industry, as well as providing those who may not be able to drive themselves with the freedom to travel on their own. Technology such as eldercare and enhanced health care will take some of the strain of our already endlessly working health workers. Home security will become smarter and safer, allowing those adopting the technology a greater sense of peace knowing their family and valuables are safe due to AI like systems protecting their property. I believe all of these areas and much more will allow us to advance as a society and achieve greater and better things. These advancements are the stepping stones that humanity needs to take to enable us to progress in ways thought impossible 50 years ago.

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