

WHAT IS DEEP LEARNING?

The Most Advanced Form of Artificial Intelligence



Deep learning (DL) is a learning method for machines, inspired by the structure of the human brain and how we learn. It's the technology that makes autonomous vehicles a reality and your smartphone voice assistant gets better at assisting you with time. DL is how we create machines with human-like intelligence. Deep learning allows artificial intelligence systems to imitate the manner in which humans acquire certain kinds of knowledge. DL algorithms try to draw conclusions – similar to how humans do it – by continually analyzing data. To achieve this, DL uses artificial neural networks (ANNs).

Deep learning is a sub-field of machine learning that mimics the functioning of the human brain in processing data. DL enables machines to learn without human supervision and grants them the ability to recognize speech, translate languages, detect objects, and even make data-driven decisions. DL is a type of machine learning (ML) that is an imitation of the neurons of the human brain and tries to mimic their functions. DL systems aren't restricted by a finite capacity to learn like traditional ML algorithms. Instead, DL systems can learn and improve their performance with access to larger volumes of data.

Processing enormous volumes of unstructured data is virtually impossible for humans. With the help of deep learning, an AI system can learn and improve without any human supervision. DL also enables machines to learn from data that is unlabeled or unstructured, or both. However, the learning process can be unsupervised, semi-supervised, or supervised.

Branches of artificial intelligence such as computer vision and natural language processing are possible due to deep learning. The term "deep" is used to specify the number of hidden layers the neural networks have. While traditional neural networks contain two to three hidden layers, deep networks can have 150 layers.

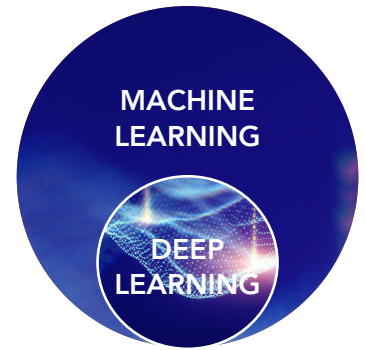
MACHINE LEARNING VS. DEEP LEARNING

The spam filtering algorithm in your email account is an example of a machine learning algorithm. ML algorithms can analyze data, identify patterns, and make predictions. They learn and adapt as newer datasets are introduced. ML Makes computers more human as it enables the ability to learn and progress.

Deep Learning (DL) is a subset of machine learning, which in turn is a subset of artificial intelligence. Many use DL and ML interchangeably as they function similarly, but DL is a more advanced version of ML/AI.

ML and DL have different capabilities. ML algorithms can learn and improve gradually, but they need some form of human guidance. For instance, if the algorithm makes an incorrect prediction, then human intervention is essential to make adjustments. DL algorithms, however, can determine whether their predictions are accurate or not without human help by relying on the help of artificial neural networks.

Another way to differentiate between ML and DL is by how they learn. If you have to teach a machine to categorize images of dogs and cats, you'll have to provide structured data – in this instance, the labeled images of dogs and cats – for the ML algorithm to learn the specific features that differentiate the images of both animals. The algorithm gets better with each labeled image exposed to it. With a DL model, you don't have to provide structured data or labeled images. The artificial neural networks help algorithms understand distinct features of each animal.



	MACHINE LEARNING	DEEP LEARNING
HUMAN SUPERVISION	Required	Not Required
LABELLED DATA	Required	Not Required
TRAINING TIME	Seconds or a few hours	Hours or a few weeks
NUMBER OF DATA POINTS REQUIRED	Thousands	Millions
COMPUTATIONAL RESOURCES	Fewer resources needed	Massive resources needed
GPU	Not required	Required

DEEP LEARNING APPLICATIONS

There are many DL applications far and wide in our daily life including Uber, AirBnB, online dating apps and more. This provides some that affect healthcare.

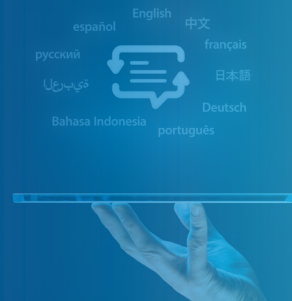
SELF-DRIVING CARS

Autonomous vehicles use DL to process millions of datasets to learn how to navigate the road safely. With DL models, driverless cars can handle unprecedented scenarios without causing harm to the riders or pedestrians. Along with helping machines solve hypothetical scenarios, DL helps analyze and process raw data collected from cameras, GPS, and numerous sensors to allow autonomous vehicles to identify and distinguish between lanes and road dividers, barricades, signs, pedestrians, slowing or halted cars, and more. Imagine how this can transform medical transport and ambulatory services.

VOICE – NATURAL LANGUAGE PROCESSING (NLP)

Smart assistants like Siri and Google Assistant and language translation apps like Google Translate are real-world examples of how DL makes it possible for machines to converse with humans and even understand the contextual nuances of a language. NLP is a field of artificial intelligence that gives machines the ability to understand, interpret, and derive meaning from human languages. Google Assistant, which depends almost entirely on DL, has the highest accuracy. For healthcare, we expect patients and health plan members in the near future to largely communicate with digital devices using voice.

VISUAL TRANSLATION



Have you ever used the Google Translate app? Not only does the app “translate” the words, but it overlays the image with the translation. The app does this with the help of deep neural networks and is one of the many ways Google squeezes deep learning into a smartphone. For healthcare, visuals can help better explain conditions, options, treatments and costs and are part of how the industry can boost healthcare literacy and better decision making.

RECOMMENDATION ENGINES

DL algorithms are used as recommendation systems to suggest content streaming companies like Netflix and products e-commerce platforms like Amazon. Similarly, DL can match patients with providers to ensure the right care for the right condition, help patients find high quality providers in any market and can even identify providers that meet personal preferences e.g. language, gender, zip code.

DOCUMENT SUMMARIZATION: DL extracts crucial information from a large text passage and creates a concise synopsis. Along with saving time for humans, document summarization also helps computer programs process large amounts of data quickly. Imagine this processing power applied to medical claims for a large employee population.

IMAGE RECOGNITION: Before DL, image recognition heavily required a lot of processes performed by humans and that took a lot of time. DL eliminates the need for manual or traditional image processing and significantly quickens the process. Google Photos is an example of using DL to classify and group images. DL does an outstanding job of recognizing human faces, animals, places, and things with high accuracy and almost zero error. For healthcare, DL can improve the accuracy of reading visual medical data as well as extract insights from visual data such as x-rays and photos to enhance diagnoses and treatment options.

MEMBER ENGAGEMENT



With DL, healthcare organizations can find new means to enhance customer experience and satisfaction and even identify costly, replaceable processes. DL can help providers and companies plan ahead by predicting disease states and seasonal demands. A DL system can effortlessly find the correlation between factors that cause seasonal illness and predict future illness by analyzing past data. DL models can also help companies build strategies for compliance and health engagement.

DEEP LEARNING: THE MORE, THE BETTER



DL gets better if you provide more data and more computational resources. DL algorithms are highly accurate and require less to no human assistance. It is the key to unlocking the greatest benefits of artificial intelligence in healthcare to deliver benefits to patients, providers, health plan members and companies with self-insured health plans.

ABOUT MARPAI

Marpai is an AI-powered alternative to third party administrators (TPAs) serving employers in the \$22 billion self-insured health plan sector. Marpai drives down health plan costs by driving up member health and claims processing efficiencies. With proprietary deep learning models, Marpai predicts and prevents costly health events, elevates quality care and makes proactive health easy.

Operating nationwide and serving over 60 self-funded companies and over 40,000 members, Marpai works with world class provider networks including Aetna and Cigna and partners with brokers and consultants across the U.S.

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What will be.