MACHINE LEARNING

Machine Learning (ML) is emerging as one of the hottest fields today. It has penetrated into numerous aspects of our everyday life—be it Siri or Alexa, Facebook/Instagram friend suggestions, Gmail spam filters, traffic congestion predictions, customer support chatbots, and much more. The Machine Learning market is ever-growing, predicted to scale up at a CAGR of 43.8% from 2019 to 2025, reaching up to an estimated evaluation of USD 96.7 billion by the end of 2025.

Deep Learning, a new area of Machine Learning research, is often clubbed together with it. But with advanced research happening in the areas of Deep Learning specifically, it is important for all AI enthusiasts to understand and keep up with the objective of moving Machine Learning closer to one of its original goals: Artificial Intelligence.

EVOLUTION OF MACHINE LEARNING

Because of new computing technologies, machine learning today is not like machine learning of the past. It was born from pattern recognition and the theory that computers can learn without being programmed to perform specific tasks; researchers interested in artificial intelligence wanted to see if computers could learn from data. The iterative aspect of machine learning is important because as models are exposed to new data, they are able to independently adapt. They learn from previous computations to produce reliable, repeatable decisions and results. It’s a science that’s not new – but one that has gained fresh momentum.

While many machine learning algorithms have been around for a long time, the ability to automatically apply complex mathematical calculations to [big data](https://www.sas.com/en_in/insights/big-data/what-is-big-data.html) – over and over, faster and faster – is a recent development. Here are a few widely publicized examples of machine learning applications you may be familiar with:

* The heavily hyped, self-driving Google car? The essence of machine learning.
* Online recommendation offers such as those from Amazon and Netflix? Machine learning applications for everyday life.
* Knowing what customers are saying about you on Twitter? Machine learning combined with linguistic rule creation.
* Fraud detection? One of the more obvious, important uses in our world today.

WHY IS MACHINE LEARNING IMPORTANT?

Resurging interest in machine learning is due to the same factors that have made [data mining](https://www.sas.com/en_in/insights/analytics/data-mining.html) and Bayesian analysis more popular than ever. Things like growing volumes and varieties of available data, computational processing that is cheaper and more powerful, and affordable data storage.

All of these things mean it's possible to quickly and automatically produce models that can analyze bigger, more complex data and deliver faster, more accurate results – even on a very large scale. And by building precise models, an organization has a better chance of identifying profitable opportunities – or avoiding unknown risks.

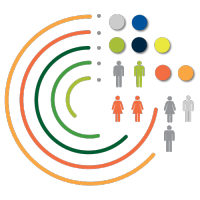
What are the differences between data mining, machine learning and deep learning?

Although all of these methods have the same goal – to extract insights, patterns and relationships that can be used to make decisions – they have different approaches and abilities.



[Data Mining](https://www.sas.com/en_in/insights/analytics/data-mining.html)

Data mining can be considered a superset of many different methods to extract insights from data. It might involve traditional statistical methods and machine learning. Data mining applies methods from many different areas to identify previously unknown patterns from data. This can include statistical algorithms, machine learning, text analytics, time series analysis and other areas of analytics. Data mining also includes the study and practice of data storage and data manipulation.



Machine Learning

The main difference with machine learning is that just like statistical models, the goal is to understand the structure of the data – fit theoretical distributions to the data that are well understood. So, with statistical models there is a theory behind the model that is mathematically proven, but this requires that data meets certain strong assumptions too. Machine learning has developed based on the ability to use computers to probe the data for structure, even if we do not have a theory of what that structure looks like. The test for a machine learning model is a validation error on new data, not a theoretical test that proves a null hypothesis. Because machine learning often uses an iterative approach to learn from data, the learning can be easily automated. Passes are run through the data until a robust pattern is found.



DEEP LEARNING

Deep learning combines advances in computing power and special types of neural networks to learn complicated patterns in large amounts of data. Deep learning techniques are currently state of the art for identifying objects in images and words in sounds. Researchers are now looking to apply these successes in pattern recognition to more complex tasks such as automatic language translation, medical diagnoses and numerous other important social and business problems.

WHATS THE DIFFERENCE BETWEEN ARTIFICIAL INTELIGENCE(AI), MACHINE LEARNING (ML), AND NATURAL LANGUAGE PROCESSING(NPL)?

It’s almost harder to understand all the acronyms that surround artificial intelligence (AI) than the underlying technology. Couple that with the different disciplines of AI as well as application domains and it’s easy for the average person to tune out and move on.

Below we attempt to explain the important parts of artificial intelligence and how they fit together. At Sonix we are specifically focused on automatic speech recognition so we explain the key technologies with that in mind.

First let’s start with some of the most commonly used acronyms and their definitions:

* **Artificial Intelligence (AI) -**the broad discipline of creating intelligent machines
* **Machine Learning (ML) -**refers to systems that can learn from experience
* **Deep Learning (DL) -**refers to systems that learn from experience on large data sets
* **Artificial Neural Networks (ANN) -**refers to models of human neural networks that are designed to help computers learn
* **Natural Language Processing (NLP) -**refers to systems that can understand language
* **Automated Speech Recognition (ASR) -**refers to the use of computer hardware and software-based techniques to identify and process human voice

Artificial intelligence (AI) is the overarching discipline that covers anything related to making machines smart. Whether it’s a robot, a refrigerator, a car, or a software application, if you are making them smart, then it’s AI. Machine Learning (ML) is commonly used alongside AI but they are not the same thing. ML is a subset of AI. ML refers to systems that can learn by themselves. Systems that get smarter and smarter over time without human intervention. Deep Learning (DL) is ML but applied to large data sets. Most AI work now involves ML because intelligent behavior requires considerable knowledge, and learning is the easiest way to get that knowledge. The image below captures the relationship between AI, ML, and DL.