

MACHINE LEARNING & DEEP LEARNING APPLICATIONS

Abstract

The intelligent construction robots similar to the human brain are known as artificial intelligence (AI). In computer engineering, artificial intelligence (AI) is the learning of Expert Systems, these are machines that are aware of their environment and take action to improve their chances of success. Artificial Intelligence is a term used to describe a system that is capable of performing tasks that people associate with further human brains, such as problem solving and learning. Machines must be capable of learning. Therefore machine learning (ML) is a subset of Artificial Intelligent (AI). As a result, the expectations of the machines increase. This strategy is demonstrated through deep learning. It includes the subfield of machine learning.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL).

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I. INTRODCUTION

1. Machine learning: Machine learning is a subset of artificial intelligence which employs methods (like deep learning) which allow machines to something learns from experience and it becomes better at completing tasks. The foundation of the learning process are as followings:

Put the information in an algorithm. (During this step, for example, you can provide more data to the model by performing feature extraction).

- To train the model, using by the data
- Deploying and testing the model
- Use a deployed model to automatically perform a prediction task.

2. Deep learning: Artificial neural networks are the core of the "deep learning" subfield of machine learning. The learning process is complicated because artificial neural networks include various inputs, outputs, and hidden layers. The components in each layer transform the incoming data into knowledge that the lower layer can utilise to carry out a particular predicted task. The machine can learn by processing its own data thanks to this framework.

3. Artificial intelligence: A method called artificial intelligence (AI) enables computers to emulate human intelligence. It has machine learning.

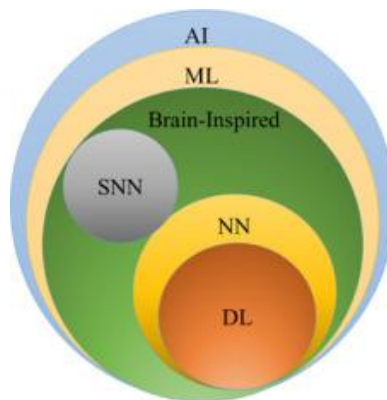


Figure 1: Structure of different technologies [5]

You can create computer programs and systems that use deep learning and machine learning approaches to perform activities that are often attributable to human intelligence. These include language translation, speech recognition, and picture and image recognition.

II. TECHNIQUES OF MACHINE LEARNING VS. DEEP LEARNING

Let us now compare Machine Learning and Deep Learning once you have an idea of both the methods. In machine learning, it is necessary to instruct an algorithm to produce correct predictions by consuming additional data (for example, by performing feature

extraction). Algorithms can learn how to make precise predictions by ingesting their own data because ANN are built for deep learning [2].

Table 1: Techniques of Machine Learning Vs. Deep Learning

Base	Machine learning	Deep learning
Number of data points	Can make predictions using a small amount of data.	There is a need to generate predictions using a lot of training data.
Hardware dependencies	Can work on low-end computers. It does not require a lot of processing power.	Depends on sophisticated equipment. It already performs many matrix multiplication operations. These operations can be effectively optimized using the GPU.
Different Process with respect of features	Demands that users accurately identify and build features.	Develops new features automatically, learning higher-level features from data.
Learning approach	Divides learning into more manageable stages. The results of each step are then combined to form an output.	One moves through the learning process by working through the problem from start to finish.
Execution time	Training requires a short amount of time, ranging from just a few seconds to a few hours.	Due to many layers of deep learning systems, training usually takes a long time.
Output	Typically, the result is a number, such as a score or classification.	Output can come in a variety of media, such as text, music or sound.

III. APPROACHES IN MACHINE LEARNING

There are three classification types used in ML algorithms:

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

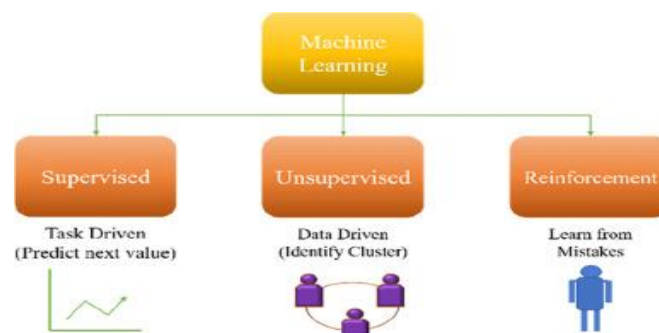


Figure 2: Approaches of Machine Learning [4]

- 1. Supervised learning:** It employs an algorithm that solicits external assistance. The training and test datasets are created using the provided input database. The training database is used to predict or categorize the output variables. During database training, algorithms attempt to learn certain shapes, and then they apply these new patterns to the test database to produce results in inference [4].
- 2. Unsupervised learning:** The Machine learning (ML) approach called unsupervised learning selects certain properties of the incoming data. After provisioning of a new database, it uses previously discovered traits to identify the data class. It is mostly preferred for both clustering and feature reduction.
- 3. Reinforcement learning:** Reinforcement learning is the process of learning action-based decision concepts. In this learning, judgments are followed by actions to raise the value of the results in the intended outcome or positive scenario. The learner, however, has no prior knowledge of the information. After being exposed to the scenario, it learns to select the best course of action. The learner's choice, or action taken, has an impact on the situation now and in the future. Only two conditions—delayed outcome and trial-and-error finding—are used in reinforcement learning [5].

IV. APPLICATIONS OF MACHINE LEARNING

Computer vision, forecasting, text analytics, natural language processing and information extraction are just a few of the many application domains of machine learning.

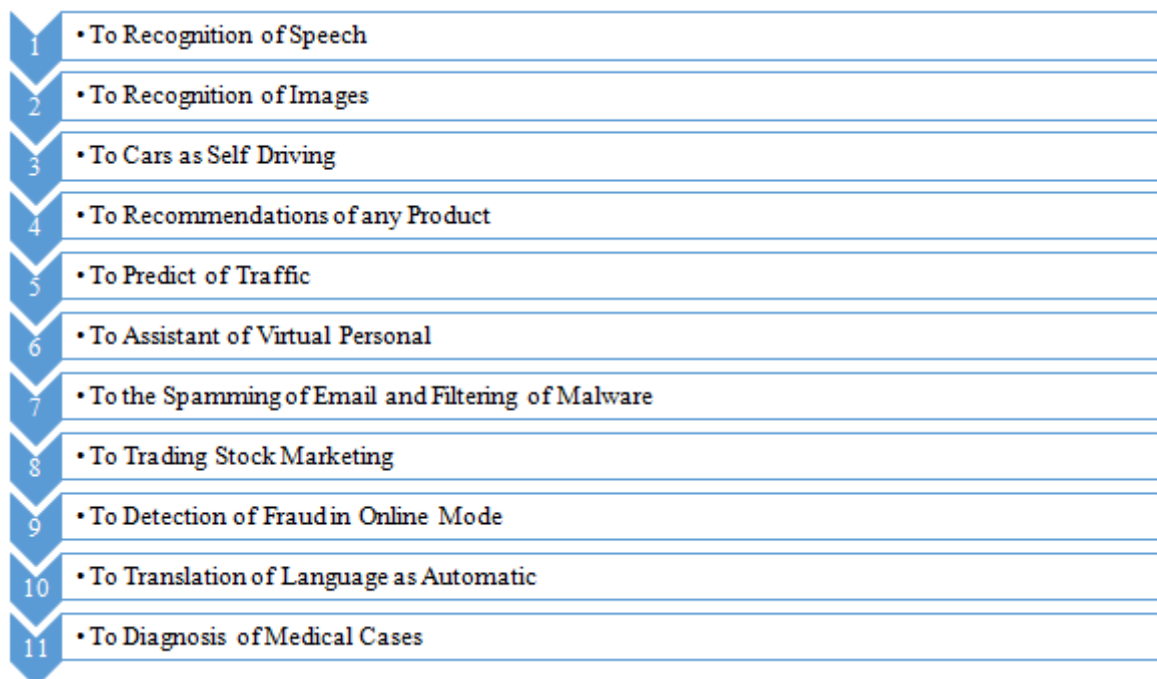


Figure 3: Various applications of machine learning

- 1. To recognition of speech:** When using Google, we have the option of "Search by Voice", which comes under Speech Recognition and is a well known machine learning application. Speech recognition, often referred to as "text-to-speech" or "computer speech recognition", is the process of converting spoken commands into text. Speech recognition

applications currently use machine learning algorithms extensively. Speech recognition technology is used by Alexa, Google Assistant, Siri, Cortana and Microsoft Cortana to execute voice commands.

2. **To recognition of image:** The most popular usage of machine learning is picture recognition. It is used to identify things like digital photographs, people, places and items. Automated friend tagging suggestions are a common use for face and image recognition. We have the option of automatic friend tagging recommendations on Facebook. When we upload a photo of one of our Facebook friends, the automatic tagging recommendation with names is provided by the facial recognition and recognition technology used in machine learning. It is based on Facebook's "Deep Facial" technology, which uses facial recognition and human recognition in photos.
3. **To cars as self driving:** Self-driving automobiles are one of the most interesting uses of machine learning. Self-driving cars rely heavily on machine learning. The best-known automaker, Tesla, is developing a self-driving vehicle. To train the model of the car to recognize people and objects while driving, unsupervised learning was used.
4. **To recommendations of any product:** Amazon, Netflix and other e-commerce and entertainment businesses often use machine learning to recommend products to users. Due to machine learning, whenever we look for a product on Amazon, we end up seeing ads for the same product when using the same browser to browse the internet. Google uses a variety of machine learning algorithms to assess user interests and make product recommendations based on those interests. The way we get recommendations for entertainment series, movies, etc while using Netflix, this is accomplished with the help of machine learning.
5. **To predict of traffic:** Google Maps is helpful when we wish to travel to a new location because it shows us the best route and forecasts the traffic. To predict traffic conditions, such as whether it will be clear, slow, or congested, it employs two techniques:
 - The Google Maps app and sensors on the car identify the vehicle's real-time location.
 - On the same days in the past, it took an average amount of time.

Every user of Google Maps makes a contribution to its development. It receives data from the user and distributes it back to its database to improve performance.

6. **To assistant of virtual personal:** We have a number of virtual personal assistants, such as Siri, Cortana, Alexa, and Google Assistant. As their names imply, they assist us in doing voice searches for information. Our vocal instructions to these assistants, such as opening an email, playing music, setting up an appointment, and making a call, can help us in a number of ways. These helpers record our vocal commands, send them through cloud servers, decipher them using machine learning (ML) algorithms, and then take appropriate action.
7. **To spamming of email and filtering of malware:** Each new email we get is immediately categorised as either spam, common, or vital. We regularly receive important emails marked with the key sign in our inboxes and spam emails in our spam

boxes thanks to machine learning (ML) technology. Some of the spam filters that Gmail employs are listed below:

- Blacklists in general
- heading filter
- Permissions controls
- Filtering Content
- Filters with rules

Several machine learning techniques, like as multi-layer perceptions, decision trees, and the Nave Bayes classifier, are utilised for email spam filtering and virus diagnosis.

- 8. To trading stock marketing:** Machine learning is often used in trading in the stock market. Since there is always a chance that share prices may move up and down, machine learning's Long Term Memory Neural Networks are used to predict stock market patterns.
- 9. To detection of fraud in online mode:** Through the detection of fraudulent transactions, machine learning secures and protects online transactions. Fraudulent transactions can happen in a variety of ways when we conduct business online, including the creation of fictitious accounts and identification documents and the theft of money in between transactions. The feed forward neural network enables us to ascertain if a transaction is honest or dishonest as a result.

The output is changed for each legitimate transaction into a series of hash values, which are subsequently utilised as input for additional rounds. It is possible to identify each valid transaction and secure our online transactions since each one has a distinct pattern that changes when a fraudulent transaction takes place.

- 10. To translation of language as automatic:** These days, it doesn't matter if we visit a foreign country where the language is different from our own because machine learning also assists us in this by translating the text into our native tongues. Google's GNMT (Google Neural Machine Translation) provides this service and use neural machine learning to automatically translate content into our local tongue. The technology underlying automatic translation uses a sequence learning approach in conjunction with image recognition and text translation from one language to another.
- 11. To diagnosis of medical cases:** In medical science, machine learning is used to identify disorders. Because of this, medical technology is advancing quickly and is now able to create 3D models that can precisely detect the site of brain lesions. Finding brain tumours and other diseases related to the brain is now made simpler by this.

V. APPLICATIONS OF DEEP LEARNING

Deep learning is one subset of machine learning. It is a huge neural network consisting of many layers and settings. Most deep learning methods rely on neural network design. As a result it is also known as deep neural network. The following examples highlight some of the most cutting-edge deep learning application innovations:

- 1. Self-driving cars:** In self-driving cars, analyzing large amounts of data enables them to take in the scenery around them. They then decide whether to turn left, turn right or stop. As a result, it will decide what steps should be taken to further reduce the incidence of each year.
- 2. Voice controlled assistance:** Siri is the first thing that comes to mind when we discuss voice control assistance. Siri will find and offer whatever it wants to do for you, so you can ask it to do anything.
- 3. Automatic image caption generation:** The algorithm will work in such a way that it will generate a caption for each image you provide. If you type "blue eye", an image of the blue eye will appear, along with a caption below.
- 4. Automatic machine translation:** We can translate one language into another with the help of automatic machine translation and deep learning. Deep learning is mostly suitable for scaling applications due to data requirements, GPU hardware and feature engineering. Data-dependent deep learning techniques are those that work well with lots of data and are referred to as such. The term "GPU" stands for "Graphics Processing Unit" and describes an advanced processor [1].

VI. DISCUSSION

Natural language processing, computer vision, deep learning methods, machine learning prediction domains, and semantic analysis are just a few of the many uses. DL differs from ML in that it can feature engineer, or extract high-level characteristics from supplied data. Deep learning is becoming more applicable in a variety of fields as a result. Deep learning has a significant impact on many initiatives in consumer finance, precision agriculture, and medicine and is developing quickly, according to Andrew Ng's Quora article.

VII. CONCLUSION

In order to evaluate and interpret data, learn from it, and then make the best judgments possible based on those learnings, machine learning employs a set of algorithms. Deep learning and machine learning are studied in-depth, and their applications are looked at. Deep learning is built on layers of artificial neural networks. Everyone uses machine learning today, whether directly or indirectly. From getting product recommendation while shopping online to updating images on social networking sites. It also explains the history of deep learning and machine learning, along with their main features, shared traits, and differences. This indicates that deep learning has a new range of applications and has the potential to produce excellent results in the future. The ongoing nature of the research may result in the development of a new architecture.

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