MACHINE LEARNING AND DEEP LEARNING REAL-TIME APPLICATIONS

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Abstract

Machine learning is a current hot topic in the modern computer world and is a branch of artificial intelligence. Many researchers have contributed their work in this field to enhancing the accuracy and intelligence of machine learning approaches. Learning is a process to create a new concept, which is used in machines too. In addition, another deep learning notion begins to play a significant role. A branch of machine learning called deep learning (DL) uses neural networks and is utilized for many real-time applications owing to its automatic learning strategy. This chapter presents an overview of machine and deep learning approaches and their real-time applications.

Keywords: *Machine learning, deep learning, real time applications, and artificial intelligence.*

1. Introduction:

Figure 1 shows the relation among machine learning (ML) and deep learning (DL) with respect to the artificial intelligence (AI) model. The artificial intelligence sub-class is machine learning. The algorithm depends upon self-learning and in this case, the system identifies the required patterns from the input applied and alters the output relies on the learning process. Overall the system has smarter time without the involvement of humans (Shinde et al. (2018)). Many layers among the neural network input and output are referred to as deep. Technology is always trying to mimic human intellect, and grabs the attentions of many researchers. Since the 1950s, the majority of computer scientists have worked on machine learning.

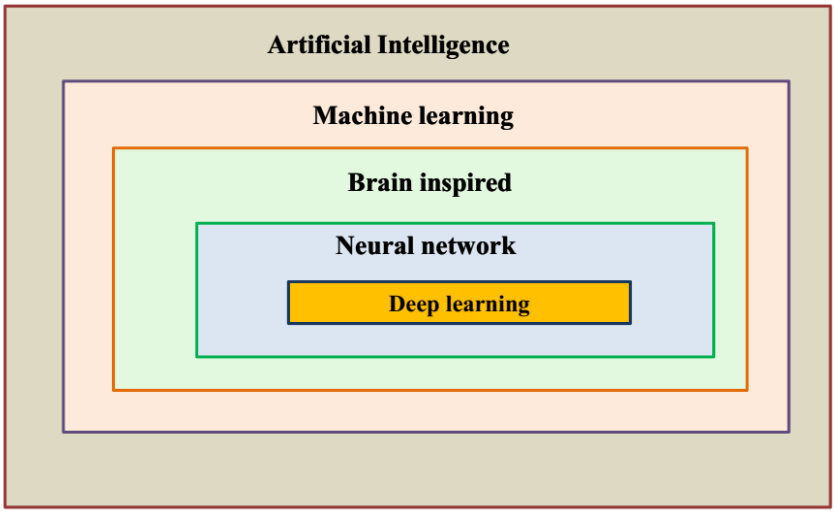

Figure 1: Relation among machine learning and deep learning with respect to AI model.

The pandemic effect with a lot of attention gained in this track, continues deep learning attempts and hence, increased expectations for the machines. Based on a contact-free world, higher attention are related to different applications namely face recognition, classification and detection. Since each person's face is different; it gives humans an amazing sense of authenticity. Machine learning has been used extensively in many fields. The research communities are continually conducting studies in relation to new developing areas.

2. Machine Learning Approaches:

In 1959, Arthur Samuel carried out the machine evolution. In 1948, Turing and Champernowne create paper and pencil with a computer program based on the foremost chess game. Draughts algorithm was created by Christopher Strachey (1952). The pattern classification with pattern classification book was published by Nilsson in 1960s. The pattern classification was explained by Duda and Hart in 1970. The researchers Hinton, Nielsen, Rumelhart, and Williams suggested neural networks in 1985 and 1986. The training of practical backpropagation (BP) with multilayer perceptron (MLP) is a major idea. Deep learning terms the neural network as coming towards today's time.

2.1 Categorization of ML:

Reinforcement learning with unsupervised and supervised learning is the categorization of ML algorithms.

- The action-oriented decision-learning model is reinforcement learning. At the desired or output condition, the precious outcome and takes action depending upon the decision. The learner's decision affects the future and present situation (Nassif et al. (2021)).

- A machine learning algorithm is unsupervised learning and few characteristics of input data are learned.
- External help is required via the utilization of supervised learning. Both testing and training datasets are the separation of the input dataset. From the training database, classify or predict the output variable. During the training database, the ML model attempted to study a few shapes.

2.2 Applications of ML:

Machine learning versatile domain is computer vision that trains the machines to recognize, analyze and process visual data. The Naïve Bayes, SVM, KNN and etc are the different key methods in computer vision. The field of sub-domains is recognition, object processing and object detection. New-era technologies like iris scans and facial recognition. The crowded places from the visitors like various other important events, airports and congress centers are recognized. For fast implementations, Tonic called a deep reinforcement learning library was introduced. The detection and recognition used different applications like Waymo and FacePRO.

Applications that recognize handwriting make work easier for businesses with plenty of handwritten paperwork. For instance, colleges, testing locations, police, etc. It is a quick procedure for scanning and digitizing paper documents. The technique of converting spoken words into writing is called recognition of speech. Medical Care, the military, automobile systems, or the use of speech interfaces and assistants that speak in daily life might all profit from it as it works to increase usability (Ngai et al. (2011)).

In the field of medical care, a study has led to the development of unique software that properly detects any variation in humans. It can simultaneously identify many factors and process them for immediate use in medical records. Additionally, statistical evaluation of medical records is demonstrating its value as a standard. Using artificial intelligence, recommendations based on past data may be made. Several uses, including forecasting stock prices, doing research, running advertising initiatives that are and many more. Predictions are often made using random forest techniques and artificial neural networks. Text classification, categorization, medical evaluation, and other sub domains are among them.

The banking and financial industries, where there is a significant likelihood of fraud detection in the event that money transfers go digital, are among the advantageous application fields for machine learning. The detection and avoidance of fraud are done using credit ratings, unusual conduct detection, and patterns in customer transactions. ML techniques for regression and classification, together with neural networks, are mostly utilized in fraud detection. The development of automatic encoders using Keras and Tensor flow for the identification of credit card frauds results in significant cost savings for cost recovery and coverage for banking organizations.

3. Deep learning

Deep learning (DL) is an artificial intelligence network with three or more layers of neural networks. It is otherwise known as a subcategory of machine learning and imitates the characteristics of the human brain. Besides, a single layer of a neural network can provide better predictions; however, appending more hidden layers provides optimized and refined results. The accurate results are yielded with the combination of data inputs, bias and weights of the neural networks. The main important features of DL are automated learning and determination of their structure in hierarchical forms for different levels and are distinct from machine learning approaches. The first layers of DL effectuate input data processing or learning simple features and forward to the next layers for performing intricate feature learning. For this reason, DL is explicitly used for the performance of large-scale and intricate data.

3.1 History of Deep Learning

In the year 1943 McCulloch and Pits utilized joined neurons for the framing of the Turning machine (Liu et al. (1991)). Rosenblatt illustrated the intersection of perceptrons during the year 1958. The back-propagation algorithm of DL is demonstrated by Geoffrey Hinton et al. (1985). Visual pattern recognition utilized a new hierarchical neural network called Neocognitron during the year 1988. With the incorporation of a convolutional neural network, the backpropagation was used for document analysis in the year 1998 by Yan LeCun. Meanwhile, the issues occur during the training process were solved in the Hinton Laboratory (2006). Many fields utilize DL from 2012 to now.

3.2 Need for Deep Learning

The DL is also named as universal learning approach and today it is used in many applications (Han et al. (2019)). It is sued in many situations where there is no interruption of human beings such as language understanding and biometrics, navigation on mars, speech and vision recognition, and etc. some of the features resulting in the usage of DL are explained below,

- ***Universal Learning Method:*** Since the usage of DL in many applications it is also known as universal learning.
- ***Automatic Learning Features:*** The DL does not utilize peculiar features for learning instead it process automatically and determines the optimal features for any work and thus makes it robust.
- ***Transfer Learning:*** The term transfer learning means that the same DL approach can be utilized for various datasets in different applications. This is mostly applicable in the case where there is insufficient dataset.
- ***Scalability:*** The scalability of the DL is higher in terms of computational performance. The DL network ResNet was designed on the scale of supercomputing.

3.3 Applications

Deep learning is used in the field of big data that uses MAVIS (Microsoft voice recognition). The search of audio and video files in this learning aid uses human voices and talks. In order to establish comprehension of pictures and make indexing, image tagging, and annotation simple, Google also used the DL approach for searching images in the big data environment. (Ardabili et al. (2019)).

- With augmented reality (AR), Google and the improbable firm recreate the actual world. For instance, a better navigation system employs augmented reality to superimpose the trajectory over a live image of the road, while Singapore airport ground employees use augmented reality glasses to see additional details about cargo containers and speed up loading times.
- Identifying and managing developmental delays in children will be the largest challenge for the future of the country and for parents. A computer system that can recognize language and speech impairments even before kindergarten has been developed by MIT researchers. A child's ability to live a complete life is hindered by autism, developmental abnormalities, and speech impairments. Physical, emotional, and mental health can result from early analysis and treatment in amazing ways.
- The zooming notion in films was made possible with DL incorporated with the super-resolution pixel recursive process. In 2017, Google Brain researchers built a deep learning network using incredibly low-resolution facial images, and then used it to predict a person's face.
- Language complexity is challenging to comprehend; regardless of if it is in terms of syntax, tonal subtleties, semantics, or phrases, which are among the hardest things for a person to learn. Natural language processing (NLP) is attempting to reach the highest degree of accomplishment with the use of deep learning. SVM, logistic regression, and other time-consuming methods are no longer effective when compared to CNN, RNN, and reinforcement learning.

4. Discussion

A broad range of applications, including computer vision, natural language processing, semantic analysis, machine learning prediction fields, and deep learning techniques. The most recently released deep learning application is ECRM (electronic customer relationship management). Deep learning is mostly used for feature engineering, data dependencies, and GPU (Graphics Processing Unit) technology. Data dependencies refer to software that utilizes a lot of data. The capacity of DL to extract broad characteristics from provided data, known as feature engineering, sets it apart from ML. As a result, deep learning is starting to take on new applications in a variety of fields.

5. Summary

In a nutshell, this chapter presented the applications of machine learning and deep learning approaches in the real world. A collection of algorithms utilised in this field to estimate and observe the data, followed by learning, and finally with the best possible results. Deep learning uses layers of artificial neural networks as its foundation. Deep learning and machine learning are studied in depth, along with their applications. Machine learning applications are common these days, either explicitly or implicitly. Product recommendations and video recommendations while using social media and online shopping platforms are examples of applications of machine learning and deep learning approaches. This chapter discussed the features of both approaches and summarized that the DL approach has a better future and can be used for a wide range of applications in the modern world.

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