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A Study of Artificial Intelligence (Ai) in Deep Learning

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Introduction:-

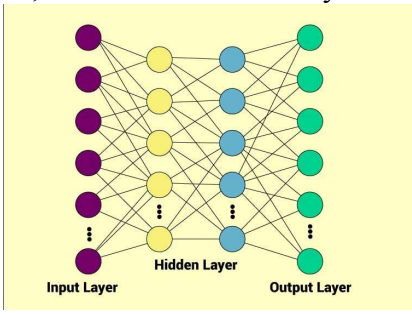
Deep learning is an artificial intelligence (AI) function that imitates the workings of the human brain in processing data and creating patterns for use in decision making. Deep learning is a subset of machine learning in artificial intelligence that has networks capable of learning unsupervised from data that is unstructured or unlabeled. Also known as deep neural learning or deep neural network

KEY TAKEAWAYS

- Deep learning is an AI function that mimics the workings of the human brain in processing data for use in detecting objects, recognizing speech, translating languages, and making decisions.
- Deep learning AI is able to learn without human supervision, drawing from data that is both unstructured and unlabeled.
- Deep learning, a form of machine learning, can be used to help detect fraud or money laundering, among other functions.

The Need for Deep learning its Working

Deep learning is a specific subfield of machine learning: a new take on learning representations from data that puts an emphasis on learning successive layers of increasingly meaningful representations. The deep in deep learning isn't a reference to any kind of deeper understanding achieved by the approach; rather, it stands for this idea of successive layers of representations. How many layers contribute to a model of the data is called the depth of the model. Other appropriate names for the field could have been layered representations learning and hierarchical representations learning. Modern deep learning often involves tens or even hundreds of successive layers of representations and they're all learned automatically from exposure to training data. Meanwhile, other approaches to machine learning tend to focus on learning only one or two layers of representations of the data; hence, they're sometimes called shallow learning. In deep learning, these layered representations are (almost always) learned via models called neural networks, structured in literal layers stacked on top of each other.



The term neural network is a reference to neurobiology, but although some of the central concepts in deep learning were developed in part by drawing inspiration from our understanding of the brain, deep-learning models are not models of the brain.

There's no evidence that the brain implements anything like the learning mechanisms used in modern deep-learning models. You may come across pop-science articles proclaiming that deep learning works like the brain or was modeled after the brain, but that isn't the case. It

would be confusing and counterproductive for newcomers to the field to think of deep learning as being in any way related to neurobiology; you don't need that shroud of "just like our minds" mystique and mystery, and you may as well forget anything you may have read about hypothetical links between deep learning and biology. A network several layers deep (see figure 1.5) transforms an image of a digit in order to recognize what digit it is.

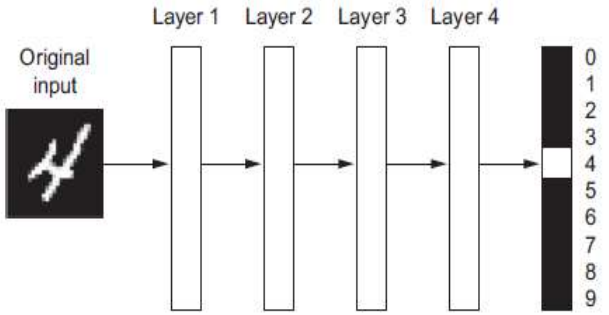


Figure 1.5 A deep neural network for digit classification

As you can see in figure 1.6, the network transforms the digit image into representations that are increasingly different from the original image and increasingly informative about the final result. You can think of a deep network as a multistage information-distillation operation, where information goes through successive filters and comes out increasingly purified (that is, useful with regard to some task).

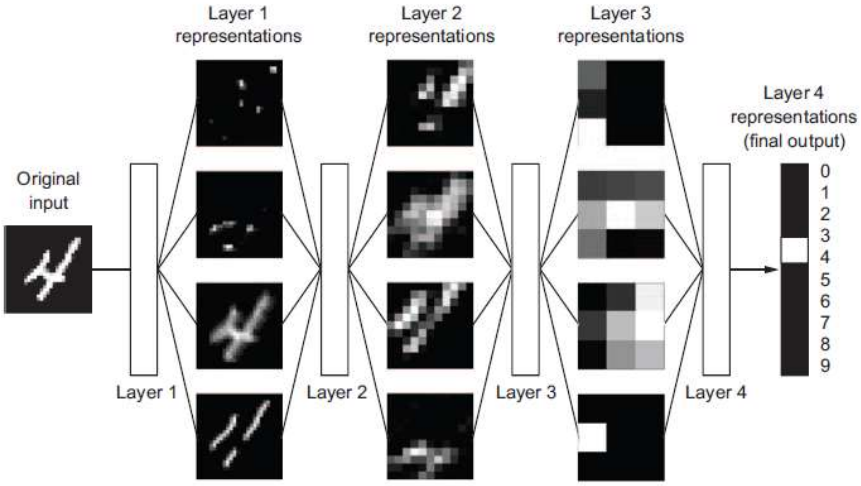


Figure 1.6 Deep representations learned by a digit-classification model

So that's what deep learning is, technically: a multistage way to learn data representations. It's a simple idea but, as it turns out, very simple mechanisms, sufficiently scaled, can end up looking like magic.

Top Algorithms in Deep Learning

Deep learning has evolved hand-in-hand with the digital era, which has brought about an explosion of data in all forms and from every region of the world. This data, known simply as big data, is drawn from sources like social media, internet search engines, e-commerce platforms, and online cinemas, among others. This enormous amount of data is readily accessible and can be shared through fintech applications like cloud computing.

However, the data, which normally is unstructured, is so vast that it could take decades for humans to comprehend it and extract relevant information. Companies realize the incredible potential that can result from unraveling this wealth of information and are increasingly adapting to AI systems for automated support.

Advantages of Deep Learning

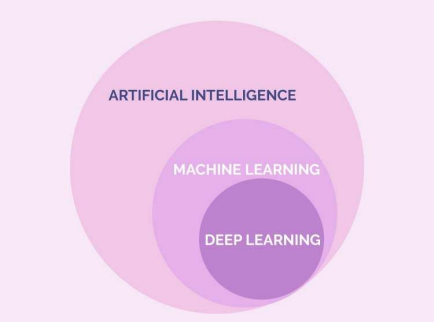
- Ability to generate new features from the limited available training data sets.
- Can work on unsupervised learning techniques helps in generating actionable and reliable task outcomes.
- It reduces the time required for feature engineering, one of the tasks that requires major time in practicing machine learning.
- With continuous training, its architecture has become adaptive to change and is able to work on diverse problems.

Disadvantages of Deep Learning

- With the increasing popularity, deep learning also has a handful of threats that needs to be addressed:
- The complete training process relies on the continuous flow of the data, which decreases the scope for improvement in the training process.
- The cost of computational training significantly increases with an increase in the number of datasets.
- Lack of transparency in fault revision. No intermediate steps to provide the arguments for a certain fault. In order to resolve the issue, a complete algorithm gets revised.
- Need for expensive resources, high-speed processing units and powerful GPU's for training the data sets.

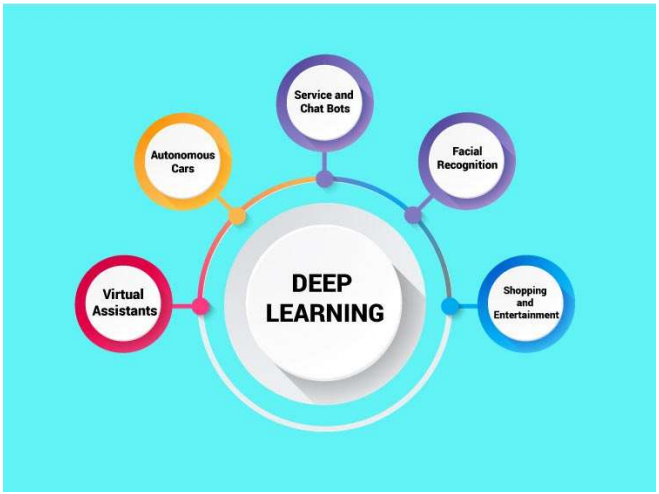
Deep Learning vs. Machine Learning

One of the most common AI techniques used for processing big data is machine learning, a self-adaptive algorithm that gets increasingly better analysis and patterns with experience or with newly added data. Deep learning, a subset of machine learning, utilizes a hierarchical level of artificial neural networks to carry out the process of machine learning. The artificial neural networks are built like the human brain, with neuron nodes connected together like a web. While traditional programs build analysis with data in a linear way, the hierarchical function of deep learning systems enables machines to process data with a nonlinear approach.



A Deep Learning Example

Using the fraud detection system mentioned above with machine learning, one can create a deep learning example. If the machine learning system created a model with parameters built around the number of dollars a user sends or receives, the deep-learning method can start building on the results offered by machine learning.Each layer of its neural network builds on its previous layer with added data like a retailer, sender, user, social media event, credit score, IP address, and a host of other features that may take years to connect together if processed by a human being. Deep learning algorithms are trained to not just create patterns from all transactions, but also know when a pattern is signaling the need for a fraudulent investigation. The final layer relays a signal to an analyst who may freeze the user's account until all pending investigations are finalized.



Conclusion :-

 Deep learning is the one category of machine learning that emphasizes training the computer about the basic instincts of human beings.

 Learning means finding a combination of model parameters that minimizes a loss function for a given set of training data samples and their corresponding targets.

 The entire learning process is made possible by the fact that neural networks are chains of differentiable tensor operations, and thus it's possible to apply the chain rule of derivation to find the gradient function mapping the current parameters and current batch of data to a gradient value.

 Two key concepts you'll see frequently in future chapters are loss and optimizers. These are the two things you need to define before you begin feeding data into a network.

 The loss is the quantity you'll attempt to minimize during training, so it should represent a measure of success for the task you're trying to solve.

 The optimizer specifies the exact way in which the gradient of the loss will be used to update parameters: for instance, it could be the RMSProp optimizer, SGD with momentum, and so on.

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