

# Machine Learning - Deep Learning

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Deep Learning uses ANN. First we will look at a few deep learning applications that will give you an idea of its power.

## Applications

Deep Learning has shown a lot of success in several areas of machine learning applications.

**Self-driving Cars** – The autonomous self-driving cars use deep learning techniques. They generally adapt to the ever changing traffic situations and get better and better at driving over a period of time.

**Speech Recognition** – Another interesting application of Deep Learning is speech recognition. All of us use several mobile apps today that are capable of recognizing our speech. Apple's Siri, Amazon's Alexa, Microsoft's Cortana and Google's Assistant – all these use deep learning techniques.

**Mobile Apps** – We use several web-based and mobile apps for organizing our photos. Face detection, face ID, face tagging, identifying objects in an image – all these use deep learning.

## Untapped Opportunities of Deep Learning

After looking at the great success deep learning applications have achieved in many domains, people started exploring other domains where machine learning was not so far applied. There are several domains in which deep learning techniques are successfully applied and there are many other domains which can be exploited. Some of these are discussed here.

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Agriculture is one such industry where people can apply deep learning techniques to improve the crop yield.

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Consumer finance is another area where machine learning can greatly help in providing early detection on frauds and analyzing customer's ability to pay.

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Deep learning techniques are also applied to the field of medicine to create new drugs and provide a personalized prescription to a patient.

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The possibilities are endless and one has to keep watching as the new ideas and developments pop up frequently.

## **What is Required for Achieving More Using Deep Learning**

To use deep learning, supercomputing power is a mandatory requirement. You need both memory as well as the CPU to develop deep learning models. Fortunately, today we have an easy availability of HPC – High Performance Computing. Due to this, the development of the deep learning applications that we mentioned above became a reality today and in the future too we can see the applications in those untapped areas that we discussed earlier.

Now, we will look at some of the limitations of deep learning that we must consider before using it in our machine learning application.

## **Deep Learning Disadvantages**

Some of the important points that you need to consider before using deep learning are listed below –

- Black Box approach
- Duration of Development
- Amount of Data
- Computationally Expensive

We will now study each one of these limitations in detail.

### **Black Box approach**

An ANN is like a blackbox. You give it a certain input and it will provide you a specific output. The following diagram shows you one such application where you feed an animal image to a neural network and it tells you that the image is of a dog.

Why this is called a black-box approach is that you do not know why the network came up with a certain result. You do not know how the network concluded that it is a dog? Now consider a banking application where the bank wants to decide the creditworthiness of a client. The network will definitely provide you an answer to this question. However, will you be able to justify it to a client? Banks need to explain it to their customers why the loan is not sanctioned?

### **Duration of Development**

The process of training a neural network is depicted in the diagram below –

You first define the problem that you want to solve, create a specification for it, decide on the input features, design a network, deploy it and test the output. If the output is not as expected, take this as a feedback to restructure your network. This is an iterative process and may require several iterations until the time network is fully trained to produce desired outputs.

## **Amount of Data**

The deep learning networks usually require a huge amount of data for training, while the traditional machine learning algorithms can be used with a great success even with just a few thousands of data points. Fortunately, the data abundance is growing at 40% per year and CPU processing power is growing at 20% per year as seen in the diagram given below –

## **Computationally Expensive**

Training a neural network requires several times more computational power than the one required in running traditional algorithms. Successful training of deep Neural Networks may require several weeks of training time.

In contrast to this, traditional machine learning algorithms take only a few minutes/hours to train. Also, the amount of computational power needed for training deep neural network heavily depends on the size of your data and how deep and complex the network is?

After having an overview of what Machine Learning is, its capabilities, limitations, and applications, let us now dive into learning “Machine Learning”.

References

- [https://www.tutorialspoint.com/machine\\_learning/](https://www.tutorialspoint.com/machine_learning/)