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RECURRENT NEURAL NETWORK AS A SUPERVISED ALGORITHM OF DEEP LEARNING

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Abstract

Deep Learning is a system powered by huge amounts of data. With the generation of massive amounts of data, the data analyzing keeps getting complex. Deep learning solves the problem of Traditional machine learning algorithms that fail to perform well when the amount of data is enormous.

Keywords: Artificial Intellignece(AI), Machine Learning(ML), Computer Vision.

Introduction

Deep Learning belongs to the family of Artificial Intelligence methods. It is inspired by the structure and ability of the cell neuron. It takes an input, analyses it and gives an output hence the name, Artificial Neural Networks. Deep Learning is based on ANN.

Artificial Intelligence is the development of intelligent systems, usually computers that are enabled to make independent decisions. These systems can make human like decisions without explicitly being informed. Any AI system is built upon the idea of learning, reasoning and self-correction. Where Learning is acquiring information(data), reasoning is using this information in making decisions and self-correction is confirming the correctness and remembering the choice and its credibility.

Machine Learning algorithms are suitable for problems with moderate high amount of data. It takes up to few hours to train the algorithm. Deep Learning algorithms are more suitable for problems with enormous amounts of data so it takes much longer to train the algorithm. But at test time, Deep learning algorithms take less time to work.

These machine learning algorithms are further sorted into Supervised and Unsupervised. Supervised learning is when learning a function and training an algorithm that maps an input to an output based on example input-output pairs. Unsupervised learning is a (self-organized) learning that finds previously undiscovered patterns in data set without labels.

Deep learning is applying deep neural networks with multiple layers and a lot more data than traditional ML algorithms and hence, it needs bigger models and more computation. It is also helpful as performance of traditional machine learning algorithms cannot be enhanced after a point even if the amount of data is increased but the performance of deep learning algorithms is directly proportional to amount and variety of data. As shown in fig 3. Artificial Neural Networks are systems that learn to take actions based on examples, without an explicitly specific program.

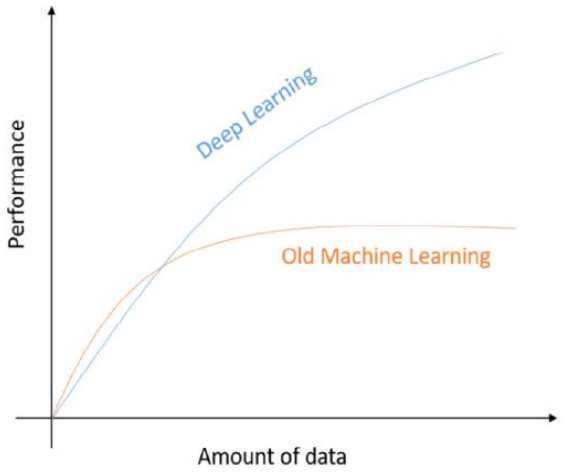

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Fig 2: Performance comparison based on amount of data for AI and ML Algorithms

Deep Learning Algorithms

Deep neural networks are not easy to train with back propagation due to the problem of vanishing gradient which impacts the time taken for training and reduces accuracy. Artificial Neural Networks calculate cost function based on the net difference between the Neural Network's predicted output and actual output in the training data. Based on the cost, weights and biases are altered after each process. Till the cost is as little as possible. Gradient is the rate at which cost will change based on weights and biases.

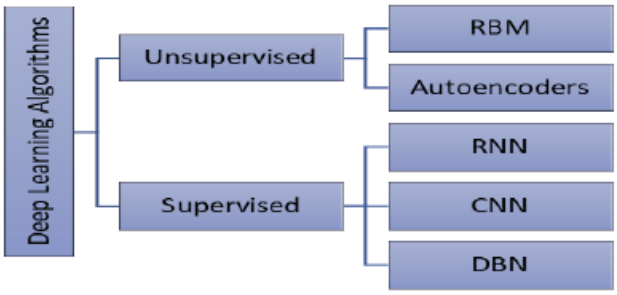

Fig 3: Classification of deep learning algorithms

This is the reason for late bloom of Deep nets. The problem of vanishing gradient can be avoided by using Deep Learning techniques. That is why Deep learning algorithms perform best with problems with huge data set.

Recurrent Neural Network

RNN is used when the output needs to be sequential like in image captioning and language translation. In a regular MLP each layer has its own weights and biases and hence cannot be combined. To combine these layers, use of same weights and biases is made (Recurrent layer). This ensures that the neuron remembers the existing state and based on this state the next output is generated.

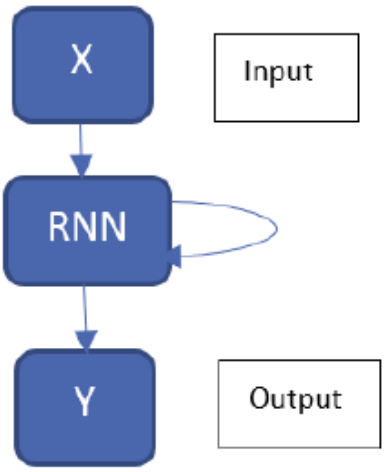

Fig 7: RNN architecture

Conclusion

Deep Learning is a part of artificial intelligence that is based on artificial neural networks. Deep Learning algorithms more suitable for problems with huge datasets, other problems with smaller datasets may be solved simply by using Machine Learning. We compare the different models used in different problems such as object detection, object recognition, captioning and so on.

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