Summary on

Deep learning

Authors: Yann LeCun, Yoshua Bengio & Geoffrey Hinton
Publication: Nature
Year: 2015

Abstract:

"Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. Deep learning discovers intricate structure in large data sets by using the backpropagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the representation in the previous layer. Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio, whereas recurrent nets have shone light on sequential data such as text and speech."

Introduction

- It can be referred as a tutorial paper, that deliberately explains the various terms and basic procedures followed in the Machine Learning applications.
- It initially gave an overview of the machine learning and it's internal processes and later explained the advancements of the subject.
- Very good and application oriented examples are taken to explain the procedures followed.
- All the previous works done in the field and their drawbacks are given nicely in the paper.

Content

- The origins of the topic are stated initially and explained the advancements in chronological order in the article.
- From the top layered terms like supervised learning, convolutional neural networks to integrated term like ReLU, N-grams are also defined clearly. The figures are very brief and sufficient.
- In supervised learning the learning is done by assigning the names to the images or classes through training. For example, if images are considered to be the data handled, then they are trained and produced as the output in the vector form.
- The paper pictures the content in such a beautiful way. They convey the importance of machine learning in a very portrayed manner.
- The neural networks procedures of inputting the data and getting output through hidden networks are also stated.
- More than that they even explained the back propagation of the networks to measure the errors.
- Then they progressed to unsupervised Learning . From the fact that CIFAR introduced it, to the day to day applications of it in NLP applications, everything is well guided through the paper.
- It is said to contrast to the supervised learning, in the unsupervised learning, the training is done without labelling the data.
- The weights are given to the features to be processed in the learning. These weights effects the network to process and result in the appropriate output.

- The optimizers were also discussed, such as the stochastic gradient descent(SGD), which optimizes the solutions. These optimizers helps in adjusting the weights during the training.
- Not much later, a great view of CNN are given, by stating the drawbacks of the initial stage neural networks. These Convolutional neural networks are used to process the data in the shape of numerous arrays.
- For example, the image with three different arrays representing the RGB colors can be used in processing through CNN. The use of convolutional neural networks had advanced the computer vision with different applications of object detection, segmentation, face recognition etc.,
- That is followed by the applications of deep convolutional networks in image processing and their results are also given in a pictured manner. Their applications in different industries, their statistics and their advancements are explained.
- Then the use of recurrent neural networks are stated and their procedures of the training and testing are demonstrated. The process in the networks, the terminology like Long short term architectures are detailed in the paper.
- The subject of N-grams are also explained and their origins and drawbacks. The process of how neural networks overtook the term is well explained by giving the example in between them by referencing the frequency and weighted terms.
- The procedure of backpropogation algorithm is also mentioned, which assists in training the multi layer architectures. It is analogous to the chain rule in derivatives.
- He also stated that unsupervised learning is going to be used very much in the coming days and also stated the importance of RNNs for the applications of Natural language understandings.

Discussion and Thoughts

- The paper does contains a very good description of Machine Learning which even helps the beginner, which satisfies the motivation of a tutorial paper. The authors started with a good introduction of the Machine Learning and their applications.
- A good description and examples are provided for the topic. The process of labeling are also well defined.
- They started with the introduction of machine learning and their procedure by distributed systems. Then explained the drawbacks until the supervised learning.
- The future scopes in the field are also well addressed at the last by logical explanation towards the future.
- The authors declared that artificial intelligence is going to be ruled by the representation learning through complex reasoning and also explained the need of new paradigms and algorithms, which are not sufficient for present Natural Language Trainings.

Conclusion

- On the whole, the paper can be stated as the beginner’s guide for Machine Learning and Deep Learning.
- The freshness of the paper has not gone as the same trends are being continued and all the topics are well covered by their uniqueness, which are advanced due to the drawbacks of previous version.

- Even the procedures are well explained from point to point.
- The figures are well pictured, despite that they have been very far from the content, which make the reader to move forth and back to make use of them.
- Rather than that, the paper satisfies very basic reason of a tutorial explaining from the introduction of the topic to the future scopes of the Machine Learning.