Introduction to Deep Learning Algorithms - Notes

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May 21, 2015

1 Depth

Depth: the longest path from the input to the output. flow graph: the graph that contains all the necessary computations.

2 Motivation for deep architecture

The motivation is that:

1) Insufficient depth can hurt. As in d-depth, the complexity could be $O(n)$, but in the $(d-1)$-depth, the complexity could be $O(2^n)$. When reducing the depth of the architecture, the complexity should be in exponent.

2) human brain has a deep architecture. Human concept processing has hierarchy, from simple to complex, and has many neurons that process the computing. And the only %1 neurons is active simultaneously when processing.

3) Cognitive process seem deep. Human organize the knowledge hierarchically.

3 Breakthrough in deep learning

Before 2006, the deep learning doesn't have a good performance, training a deep supervised feedforward neural network tends to yield worse results, after that, Hilton and others have published some papers about DBNs, that introduce the pre-training and fine-tuning of the unsupervised learning will yield a good performance.

See the reference for more papers about these breakthroughs.

4 Reference

1)Yoshua Bengio, Learning Deep Architectures for AI, Foundations and Trends in Machine Learning, 2(1), 2009

2)A fast learning algorithm for deep belief nets

3)Greedy Layer-Wise Training of Deep Networks
4)Efficient Learning of Sparse Representations with an Energy-Based Model