Deep learning projects at Google

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What is Deep learning?

- Machine learning vs Artificial Intelligence
- Learning with large amount of layers
- Deep Neural Networks in the 80’s
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Introduction

Definition

Requirements

Our focus

What do you need?

- Large amounts of data
- Lots of processing power
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Introduction

Why Google?

- Access to huge amounts of data
- Purchased many Deep learning-companies
- Access to extremely powerful computers
- Useful in their own applications
- Complex system
- Consists of multiple parts
- Millions of variables
- Unsupervised learning
Data set

- 200 x 200 pixels color images
- 10 million random Youtube videos

Comparison: Example sheet 3 in ANN

- 1000 x 2 normalised numbers
Large scale infrastructure: DistBelief

Desired neural network  Partitioned into four parts  One computer/part

Training data
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System infrastructure

Large scale infrastructure: DistBelief

Parameter server: $P' = P + \Delta P$

Replicas:

Training data
Applications of Machine Learning

- Neural Network Visualization
- Real Time Visual Translation
- Youtube Thumbnail Generator
- Visualize what is going on inside the network
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Neural Networks Visualisation  Real Time Visual translation  Thumbnail Generator
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- Lower layers sensitive to basic features such as edges and their orientations.
- Higher-level layers, more sophisticated and complex features or emergence of whole objects
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Neural Networks Visualisation  Real Time Visual translation  Thumbnail Generator
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Neural Networks Visualisation  Real Time Visual translation  Thumbnail Generator

Applications
Google Translate
- Real time visual translation of 20 languages
- Machine learning to recognize letters
- Approximate dictionary look up of words
- Image replaced with translation
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- Not trained on perfect letter (overtraining)
- Computer generated letters with skewness, reflections etc.
- Slow mobile phones and bad connection.
- Bad thumbnails generate few clicks
- Tedious to pick a thumbnail manually
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Applications

Neural Networks Visualisation  Real Time Visual translation  Thumbnail Generator
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TensorFlow - a new platform

- Launched on November 9th
- Replaces DistBelief from 2011
- Improved and Generalized
- Up to twice as fast
- Open Source
So what has happened so far?

- Ideas of the 80’s
- Technology catches up
- Involves companies like Google
- Numerous applications used in everyday life
- Open Source platform
Are there any questions about the presentation?
Thank you for listening!

Links of interest:

- Google Deep Dream Generator
- Google research about neural networks
- TensorFlow
Questions from the review group:

1. What is the deal with Deep Learning; why is it gaining such momentum now; discuss if/how it could change society.
2. Neural networks are inspired by the human brain. Discuss the learning differences of a child's brain and a neural network. Does the human brain have a "cat-neuron" like the neural network shown in the presentation?
3. In the presentation examples of supervised learning are shown. Try to find examples for what the unsupervised learning can be used for, or reflect further upon those already given.
Questions from the review group:

4. Deep learning needs a lot of computing power, that makes it hard for most people to contribute to the field. Programs like "Tensor Flow" opens up the field. Can you come up with ways to make the field more accessible to the masses? And what problems can you see if only large companies has access to the technology?

5. In the last seminar the presenters talked about the complexity of language, and today we were shown an application for translating written messages. Can you think of any problems by having machines translating texts? Will the translations be impeccable to 100% in the future or will we always be dependent on human translators?