AI In A Day (Quantum Neuromorphics - draft)

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The inclusive AI...

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Artificial intelligence in a Day

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Artificial Intelligence

A day to learn … a lifetime to master

Abhishek Choudhary

Version 0.1 (Draft)

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Artificial Intelligence in a Day

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Overview

1 Introduction to AI

2 Working concepts - Model, Dataset, Framework

3 System concepts - Accelerator, Neuromorphics, GPGPU, FPGA

4 Relevance of AI & Cognitive technologies to enterprise solutions

5.

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AI = Artificial Intelligence

What do you think is AI?

So when did it begin?

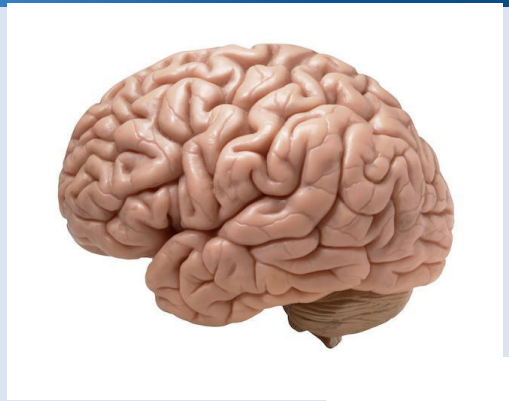
WWII and the Church Turing Thesis

The 1956 Dartmouth conference

The first wave – symbolic learning

The second wave – connectionist learning

The third wave – “Today!” – powered by advent of “Big Data”



The Turing Test

Image recognition

NLP

IOT / Analytics

Knowledge based systems, problem solving and other "higher functions of AI"

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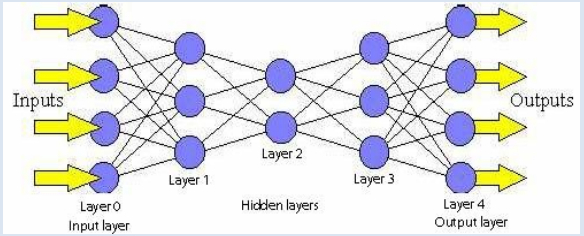
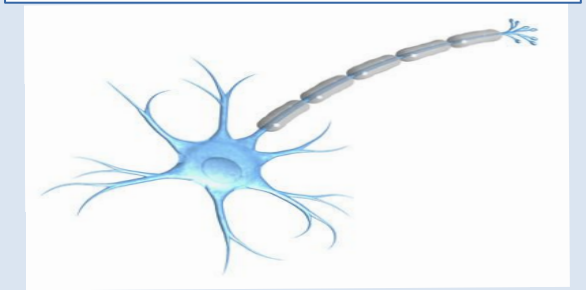
Cognitive Computing uses MLDL... What is it?

ML : Machine Learning

- Machine learning is the study and construction of algorithms that learn from and make predictions on data
- Make data-driven predictions or decisions as outputs, rather than follow static instructions.



$$w_{ij}(t+1) = w_{ij}(t) + \eta \frac{\partial C}{\partial w_{ij}}$$



DL: Deep Learning

- ANN (Artificial Neural Network) topologies intended for *unsupervised learning*
- Typical multi-layered feed-forward and back-propagation networks
- Deep learning makes the assumption that the layers of factors correspond to levels of abstraction
- Varying numbers of layers and layer sizes can be used to provide different amounts of abstraction
- Universal approximation theorem interpretation / Ergodic processes (probabilistic) interpretation

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Working concepts in AI

Framework

The software framework or library that enables past creation of AI models

Model

An AI model (most commonly Deep Neural Network)

Dataset

The data to train the AI Model

ImageNet Challenge

IMAGENET

- 1,000 object classes (categories).
- Images:
  - 1.2 M train
  - 100k test.

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Torch

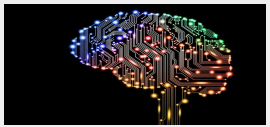
Torch is a scientific computing framework with wide support for machine learning algorithms that puts GPUs first. It is easy to use and efficient, thanks to an easy and fast scripting language, LuaJIT, and an underlying C/CUDA implementation.

Caffe

Caffe is a deep learning framework. It is developed by the Berkeley Vision and Learning Center (BVLC) and by community contributors.

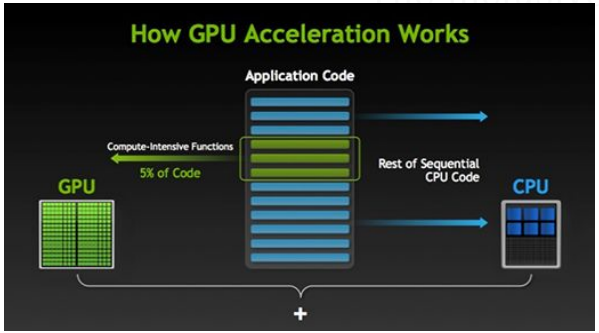
Theano

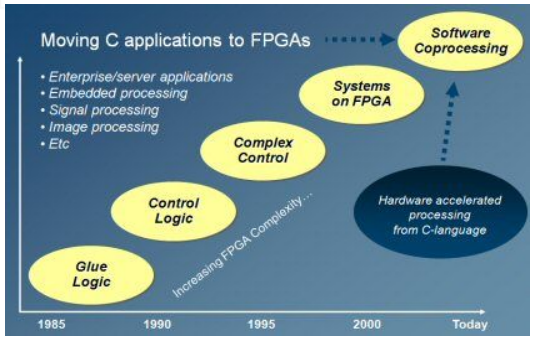
Theano is a Python library that allows you to define, optimize, and evaluate mathematical expressions involving multi-dimensional arrays efficiently.

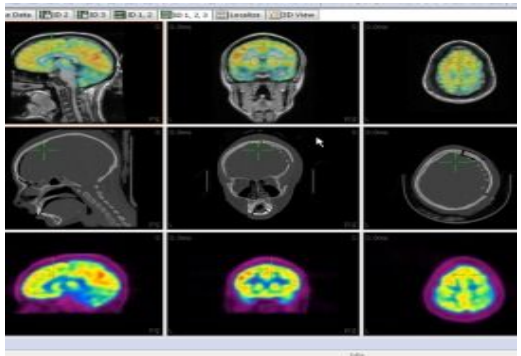


Other libs

- DL4J
- TensorFlow
- Bazel
- Alexnet
- Spark MLLib







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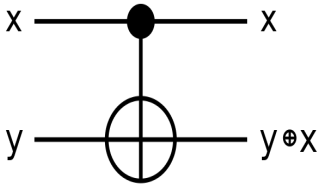
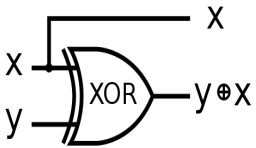
Quantum Neuromorphics





input		output	
x	y	x	y+x
|0⟩	|0⟩	|0⟩	|0⟩
|0⟩	|1⟩	|0⟩	|1⟩
|1⟩	|0⟩	|1⟩	|1⟩
|1⟩	|1⟩	|1⟩	|0⟩

input		output	
x	y	x	y+x
0	0	0	0
0	1	0	1
1	0	1	1
1	1	1	0

QisKit Tutorial on GitHub

Fig credit:
https://upload.wikimedia.org/wikipedia/en/thumb/5/58/Cnot-compared-to-xor.svg/1280px-Cnot-compared-to-xor.svg.png

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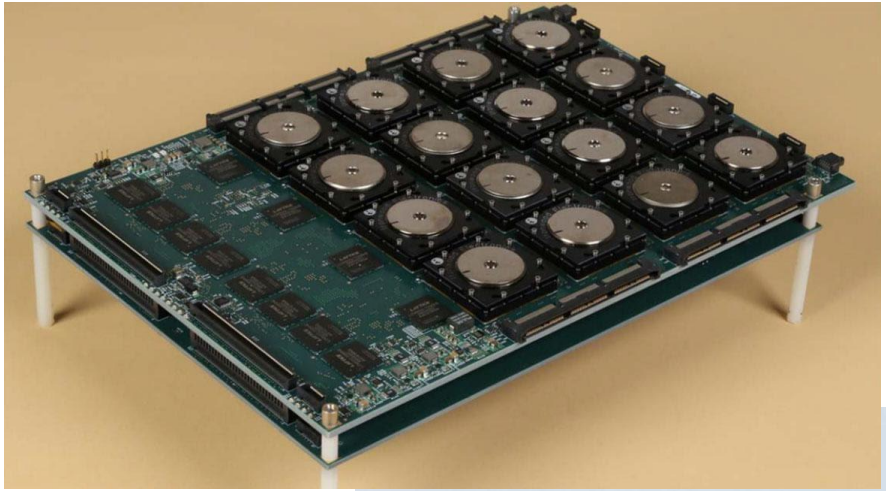
Systems Concepts in AI



Accelerator

Hardware the runs AI faster

GPGPU

FPGA

Neuromorphics

Hardware that implements neural networks

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What next? (Open house)

SIG – link

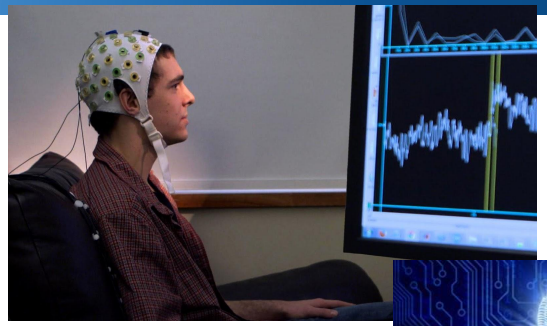
AI – a day to learn… a lifetime to master

Brain Computer Interface

Computational creativity

Tech singularity – myths and facts

Cognitive era skills



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