

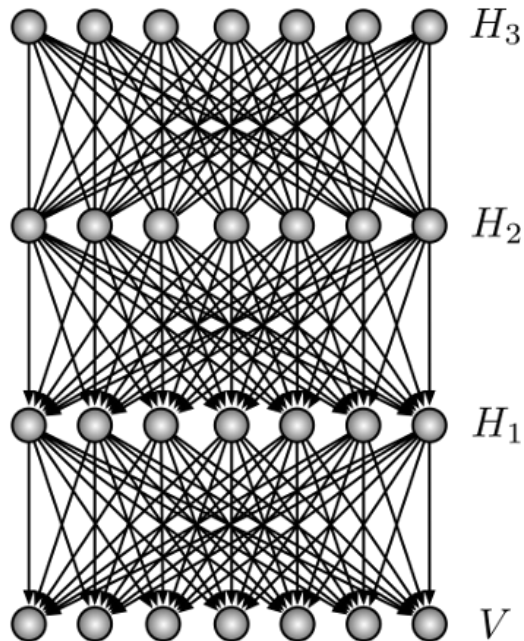
Where We're At

Progress of AI and Related Technologies

How Big is the Field of AI?

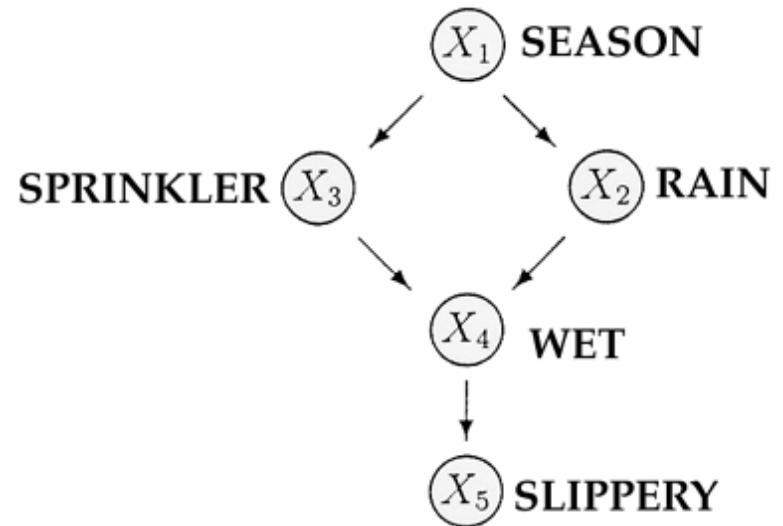
- +50% publications/5 years
- 106 journals, 7,125 organizations
- Approx \$56M funding from NSF in 2011, but
- Most funding is from private companies and hard to tally
- Large influx of corporate funding recently

Deep Learning



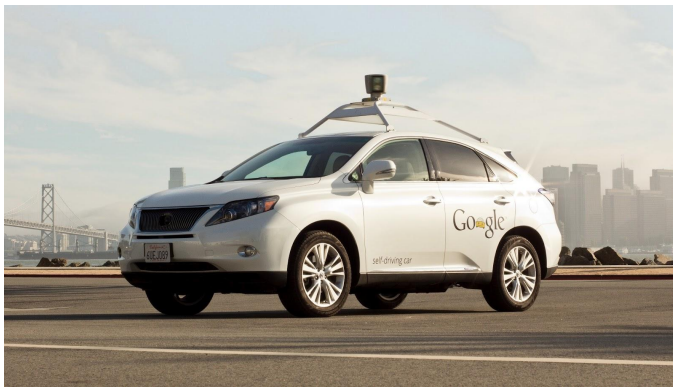
Geoffrey E. Hinton, Simon Osindero, Yee-Whye Teh: *A fast algorithm for deep belief nets* (2006)

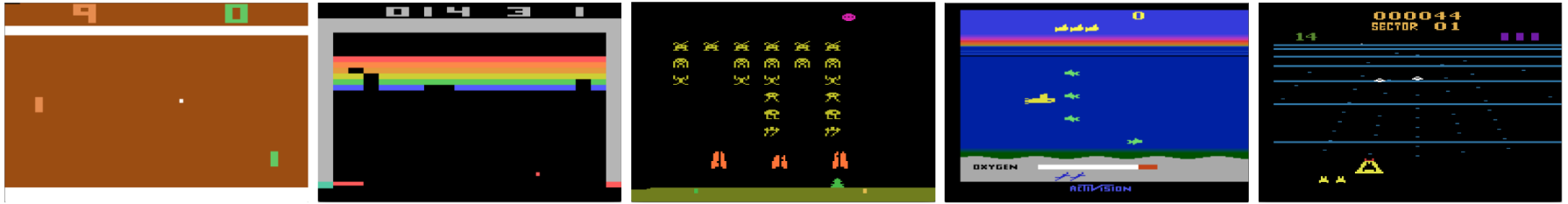
Causal Networks



Pearl, Judea. *Causality: Models, Reasoning and Inference* (2000)

Recent Progress





DeepMind

- Combined deep learning (convolutional neural net) with reinforcement learning to play 7 Atari games
- Sold to Google for >\$400M in Jan 2014
Demis Hassabis required an “AI ethics board” as a condition of sale
- Demis says: 50% chance of AGI within 15yrs

Google

- Commercially deployed: language translation, speech recognition, OCR, image classification
- Massive software and hardware infrastructure for large-scale computation
- Large datasets: Web, Books, Scholar, ReCaptcha, YouTube
- Prominent researchers: Ray Kurzweil, Peter Norvig, Andrew Ng, Geoffrey Hinton, Jeff Dean
- In 2013, bought: DeepMind, DNNResearch, 8 Robotics companies

Other Groups Working on AI

IBM Watson Research Center

Beat the world champion at Jeopardy (2011)

Located in Cambridge

Facebook

New lab headed by Yann LeCun (famous for: backpropagation algorithm, convolutional neural nets), announced Dec 2013

Human Brain Project

€1.1B in EU funding, aimed at simulating complete human brain on supercomputers

Other Groups Working on AI

Blue Brain Project

Began 2005, simulated rat cortical column

OpenCog

Open source library of AI algorithms, founded and chaired by Ben Goertzel

Vicarious

Got \$24M VC funding in 2012. Solved ReCAPTCHA in 2013.

Microsoft Research

MIT CSAIL

Harvard AIRG

Stanford Artificial Intelligence Laboratory

Dalle Molle Institute for Artificial Intelligence Research

CMU

Rensselaer Artificial Intelligence and Reasoning Lab

WPI AIRG

OSU Laboratory for Artificial Intelligence Research

Berkeley Center for Intelligent Systems

Berkeley Robotics and Intelligent Machines Laboratory

Berkeley Vision and Learning Center

JPL Artificial Intelligence Group

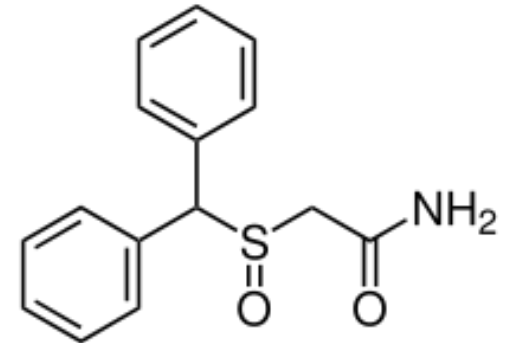
Bosch Research and Technology Center

Austrian Research Institute for Artificial Intelligence

Deutsches Forschungszentrum für Künstliche Intelligenz

SRI International AI Research Center

Cognitive Enhancement



- Would greatly speed up AI research
- Possible phase-change soon:
 - Google Glass: better lifelogging
 - Soylent: eliminate noise from diet
- Quantified Self: ~160 groups, ~30k members
- Research occurs in secret



Quantified Self
self knowledge through numbers

Distributed Computation

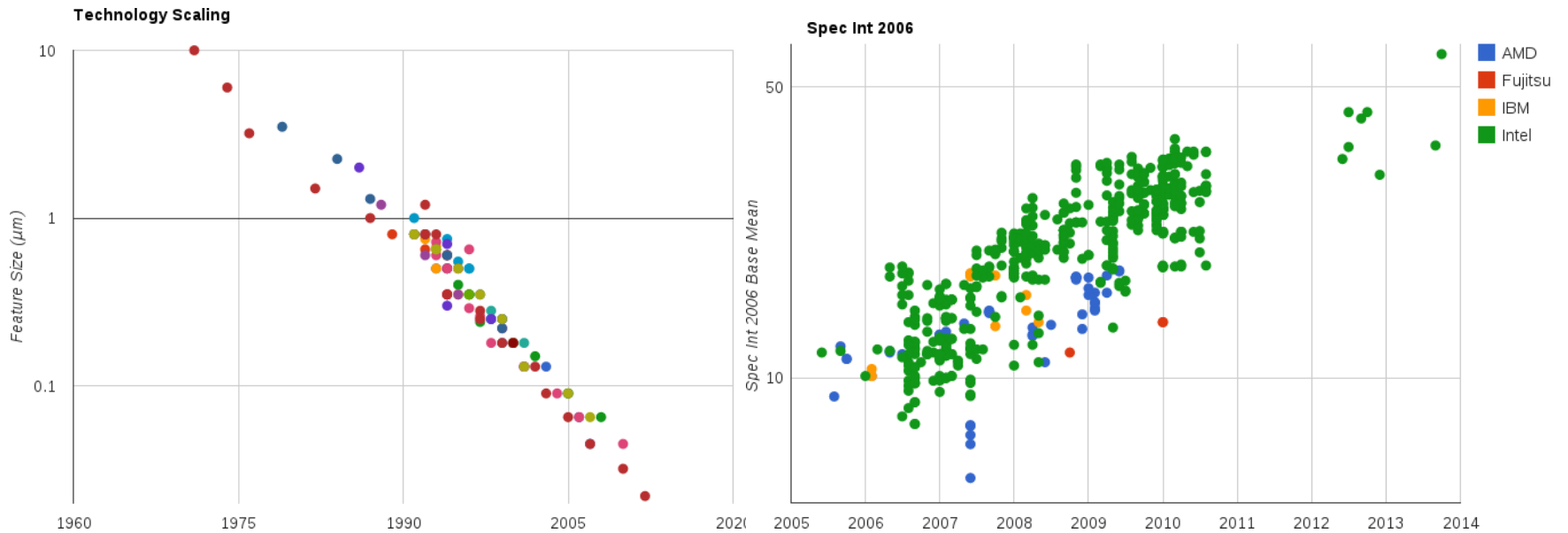
- MapReduce (2004)
- Amazon EC2 (2006)
- GPGPU (2006)
- Google Spanner (2012)

“The database renaissance has begun.”

- Eliot Horowitz (MongoDB), October 2013

Transistor Size

Single-Thread Performance



From Berkeley CPUDB. Each dot is an x86 processor.

How Much Does it Take?



Brain

10^{14} synapses

Tianhi-2 Supercomputer

10^6 processors of 10^8 transistors each

10^{14} transistors

Overall Status

- Wildly uncertain timeline for AGI
- Significant recent progress
- Resources are pouring in

FAI / safety research is not progressing at the same rate.