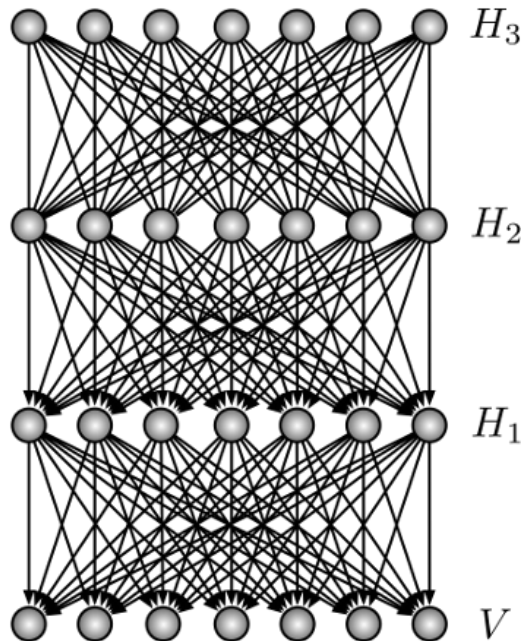# Where We're At

Progress of AI and Related Technologies

How Big is the Field of AI?

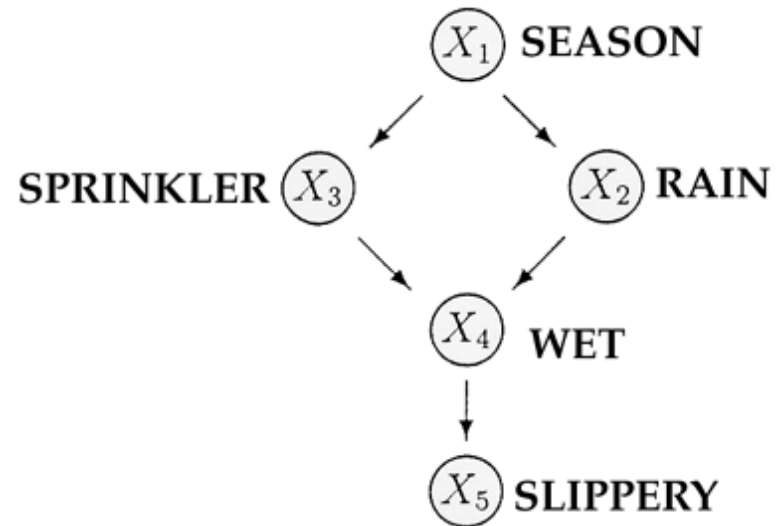- +50% publications/5 years
- 106 journals, 7,125 organizations
- Approx $56M funding from NSF in 2011, but
- Most funding is from private companies and hard to tally
- Large influx of corporate funding recently
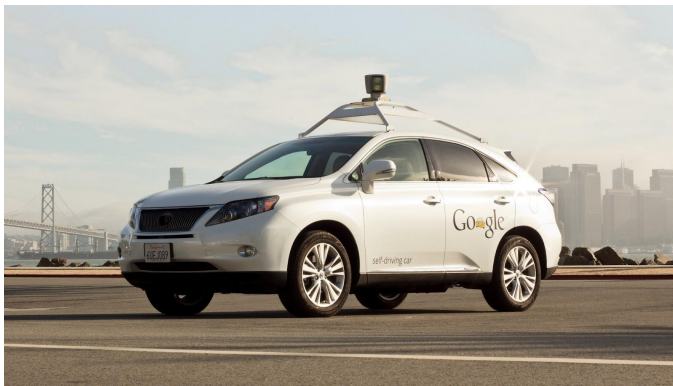
Deep Learning

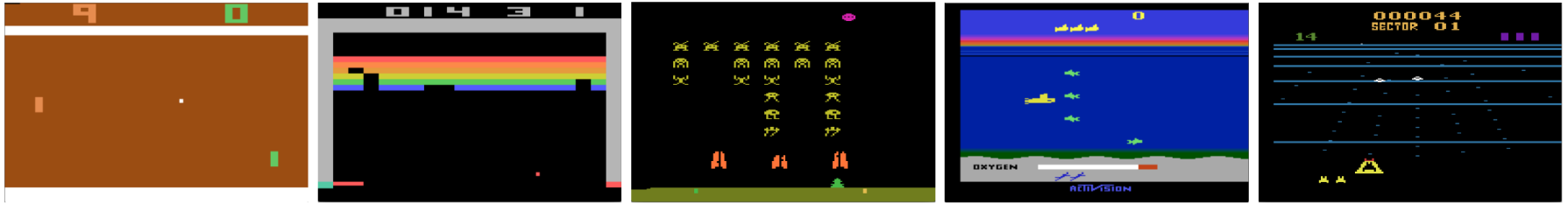Geoffrey E. Hinton, Simon Osindero, Yee-Whye Teh: *A fast algorithm for deep belief nets* (2006)

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	Berkeley Center for Intelligent Systems
Harvard AIRG	Berkeley Robotics and Intelligent Machines Laboratory
Stanford Artificial Intelligence Laboratory	Berkeley Vision and Learning Center
Dalle Molle Institute for Artificial Intelligence Research	JPL Artificial Intelligence Group
CMU	Bosch Research and Technology Center
Rensselaer Artificial Intelligence and Reasoning Lab	Austrian Research Institute for Artificial Intelligence
WPI AIRG	Deutsches Forschungszentrum für Künstliche Intelligenz
OSU Laboratory for Artificial Intelligence Research	SRI International AI Research Center

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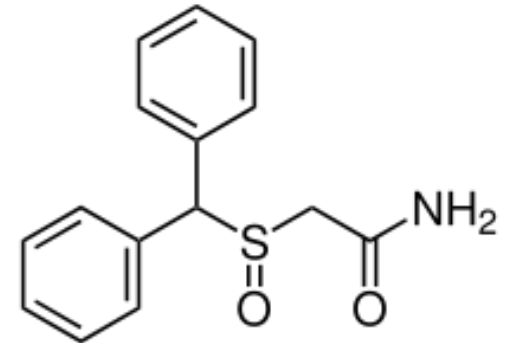
- Would greatly speed up AI research
- Possible phase-change soon:
  - Google Glass: better lifelogging
  - Soylent: eliminate noise from diet
- Quantified Self: ~160 groups, ~30k members
- Research occurs in secret
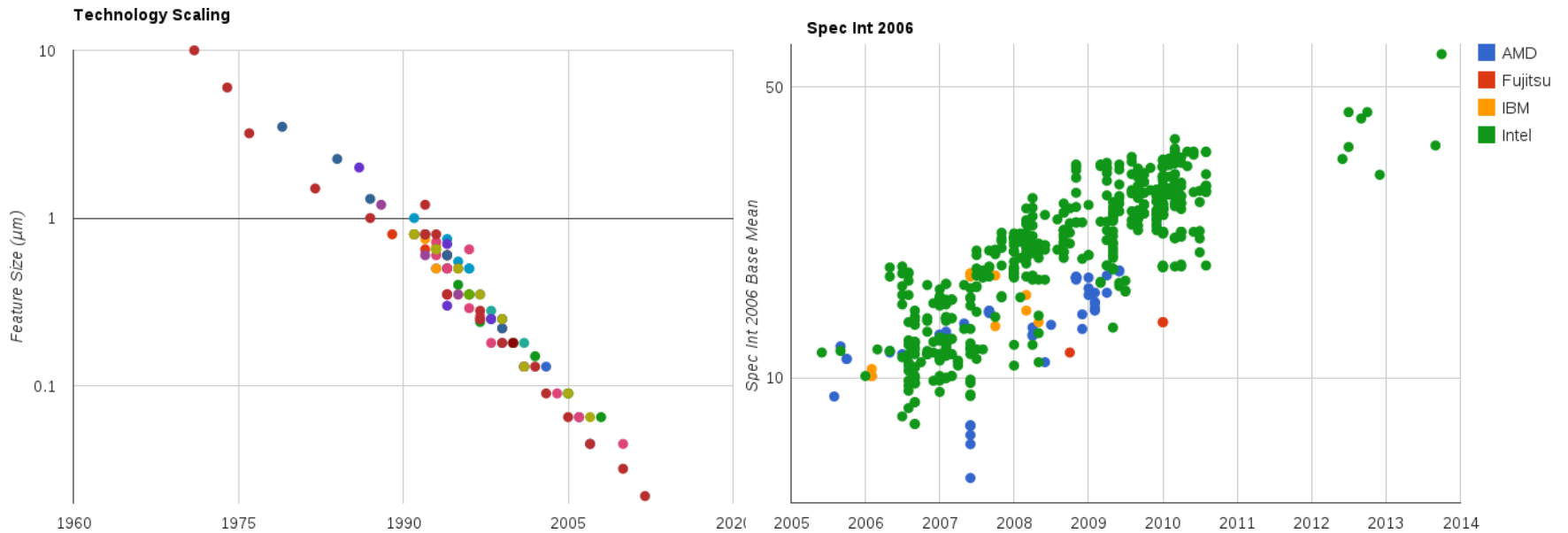
Distributed Computation

- 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.