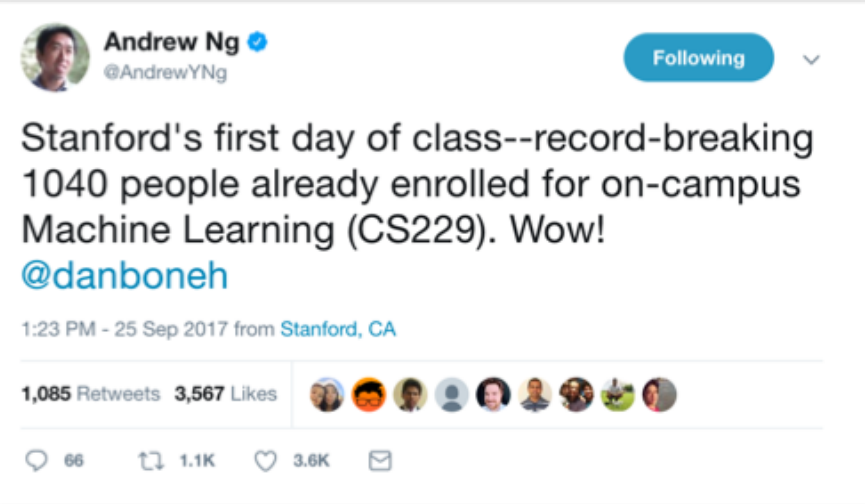


AI Frontiers

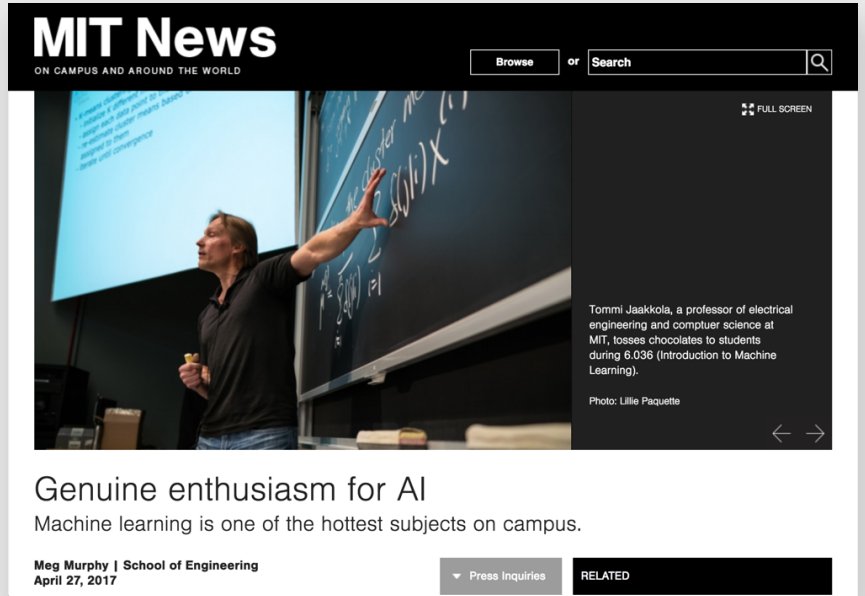


Dr. Dario Gil
Vice President
IBM Research

AI is the new IT



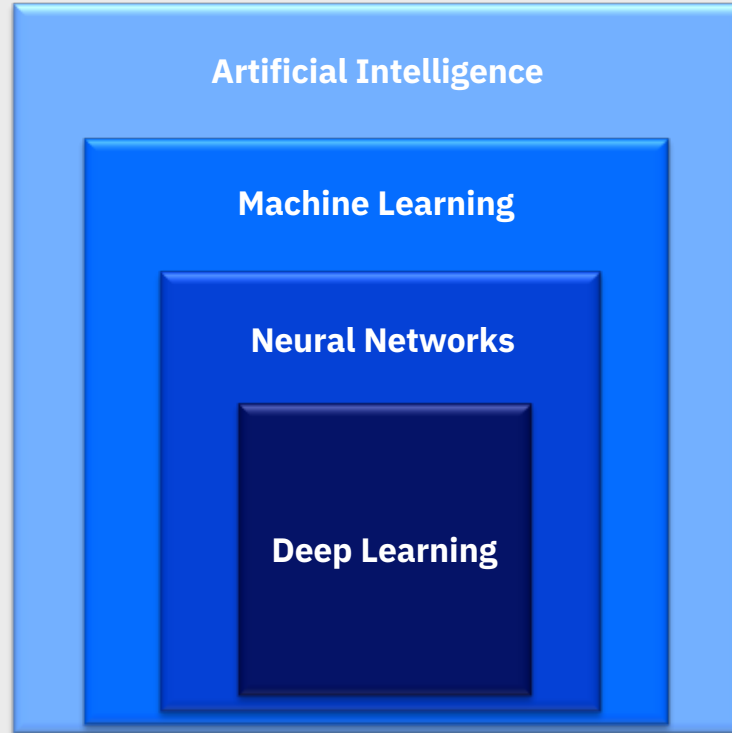
A screenshot of a Twitter post from Andrew Ng (@AndrewYNg). The post text reads: "Stanford's first day of class--record-breaking 1040 people already enrolled for on-campus Machine Learning (CS229). Wow! @danboneh". The post is dated "1:23 PM - 25 Sep 2017 from Stanford, CA" and has "1,085 Retweets" and "3,567 Likes". The interface shows a "Following" button and a row of user avatars who interacted with the post.



A snippet of an MIT News article. The header reads "MIT News ON CAMPUS AND AROUND THE WORLD" with a search bar. The main image shows Tommi Jaakkola, a professor, pointing at a chalkboard with mathematical equations. The article title is "Genuine enthusiasm for AI" and the sub-headline is "Machine learning is one of the hottest subjects on campus." The author is "Meg Murphy | School of Engineering" and the date is "April 27, 2017". There are buttons for "Press Inquiries" and "RELATED".

MIT Intro to Machine Learning course:
2013 – 138 students
2016 – 302 students
2017 – 700 students

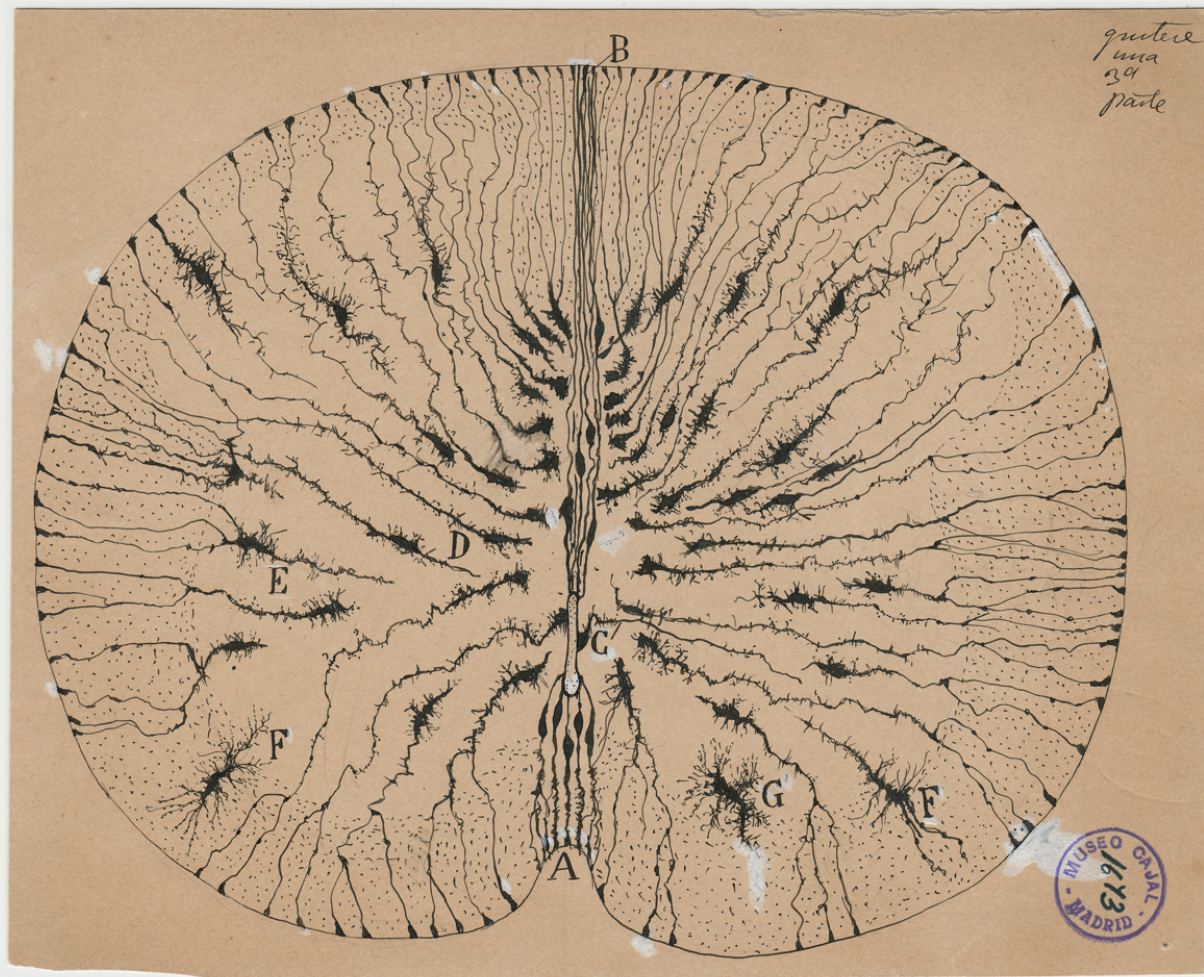
What is AI?



AI foundations

1900's

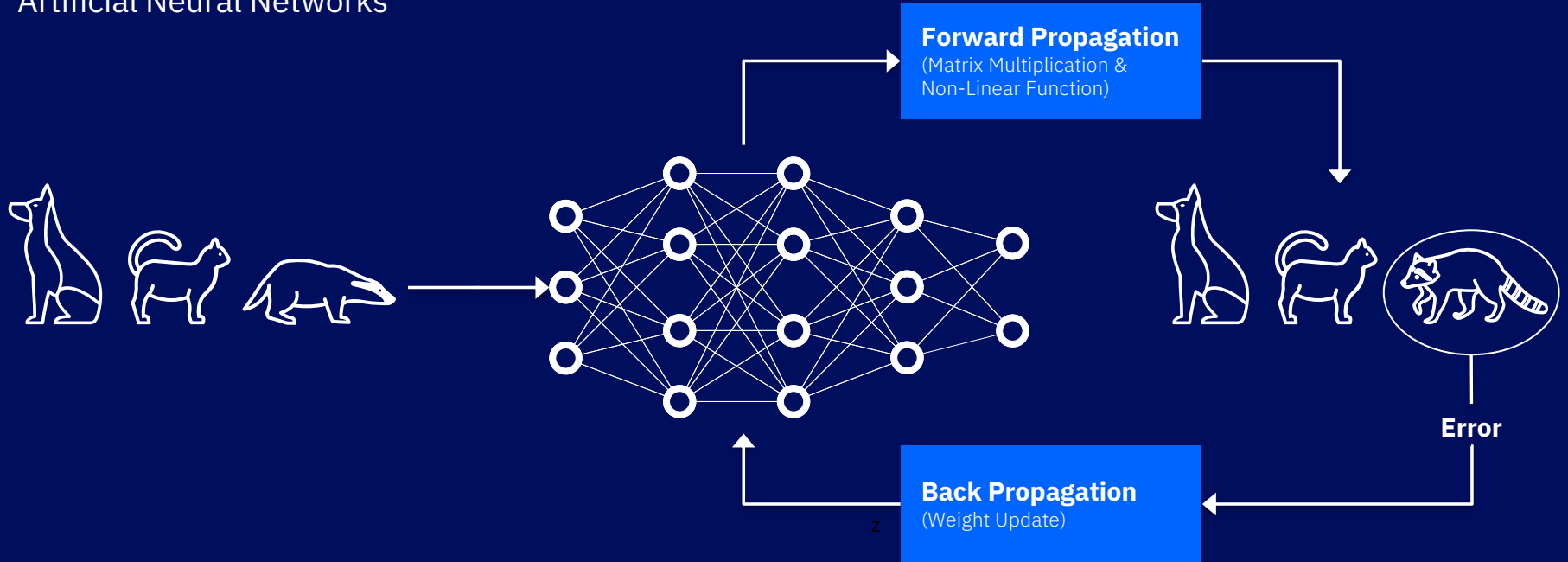
Santiago Ramón y Cajal



AI foundations

Starting in the 1940's

Artificial Neural Networks



2012

The Deep Learning Explosion

YouTube

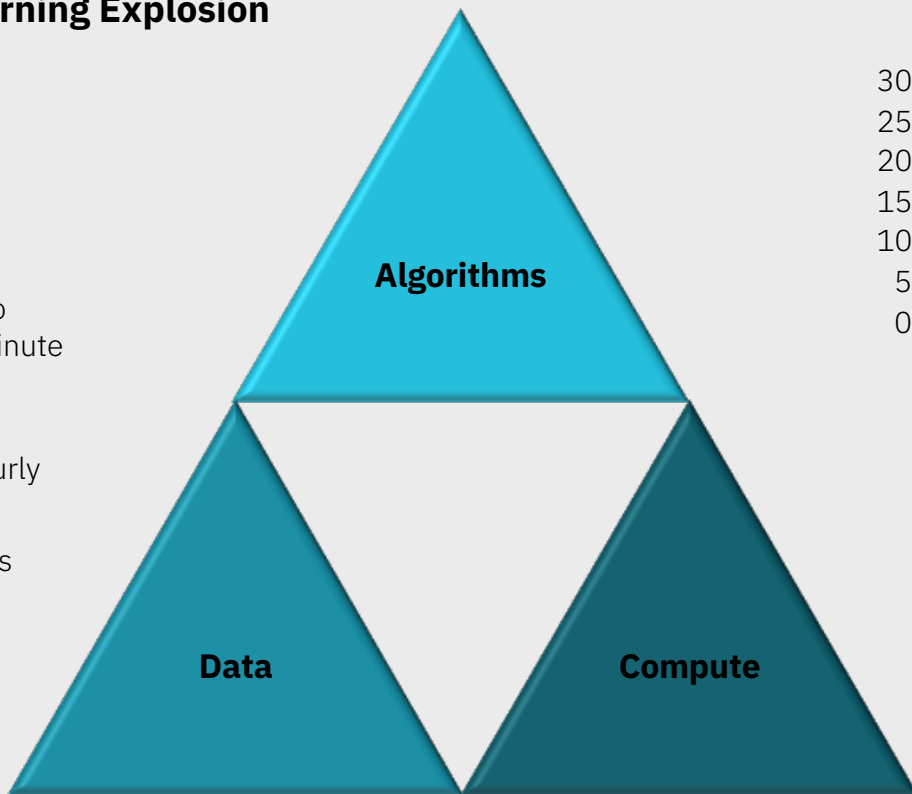
400 hours of video
uploaded every minute

Walmart

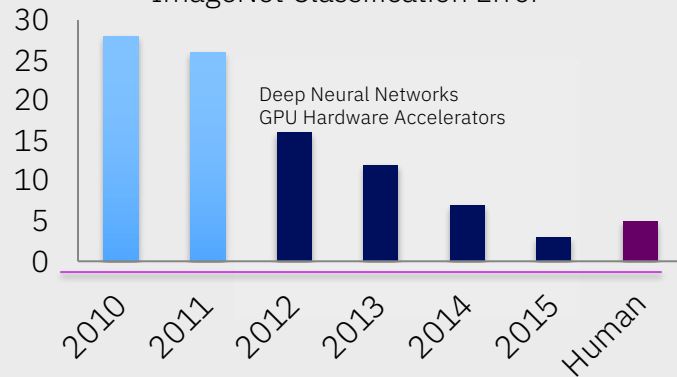
2.5 petabytes of
customer data hourly

Facebook

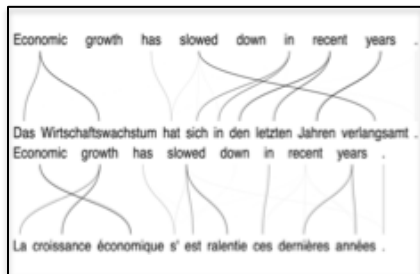
350 million images
uploaded daily



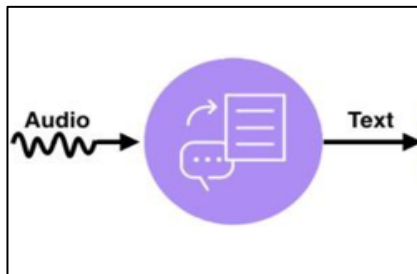
ImageNet Classification Error



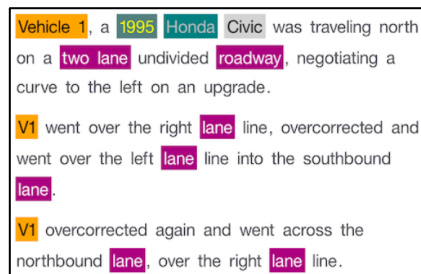
Specialized AI finally works!



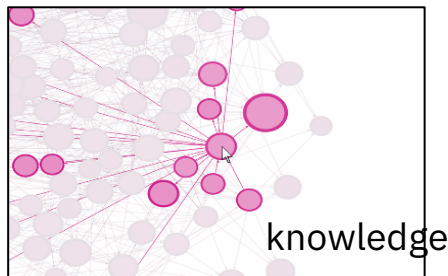
Language Translation



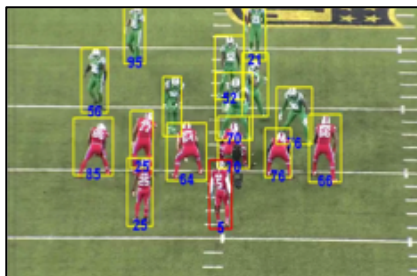
Speech Transcription



Language Understanding



Machine Reasoning



Object Detection



Face Recognition

The evolution of AI

General AI
Revolutionary

Broad AI
Disruptive and
Pervasive

Narrow AI
Emerging

▼ We are here

2050 and beyond

The evolution of AI

Narrow AI

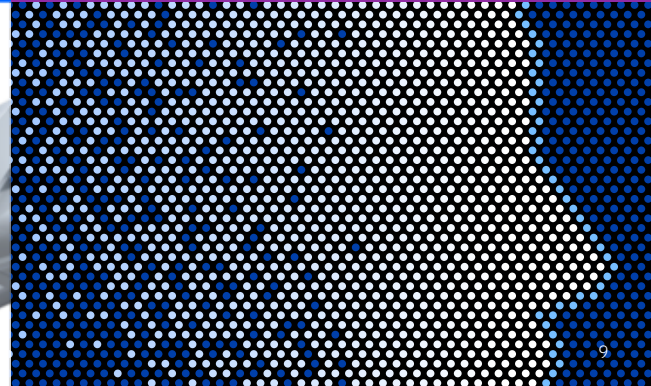
Single task, single domain
Superhuman accuracy and speed for certain tasks

Broad AI

Multi-task, multi-domain
Multi-modal
Distributed AI
Explainable

General AI

Cross-domain learning and reasoning
Broad autonomy



AI Ethics: The Main Issues

“The Singularity”

Fears that artificial intelligence will **surpass** human intelligence and then evolve beyond human ability to control.

Trust and Explanations/algorithmic accountability

Transparency and understanding of the **purpose** of artificial intelligence and how it is being deployed in specific applications and over repeated interactions. **Explaining** and making clear the complex decision-making within AI systems.

Bias, Diversity and Inclusion

Concerns that the **data** sets and algorithms shaping the future of AI are not representative of global society.

Value alignment

Aligning AI systems to specific human codes and values.

Job Loss

Fears of mass unemployment as AI and robots take over our jobs.

IBM's Initiatives around AI Ethics

Internal:

- White paper on Trusting AI Systems
- Principles for the Cognitive Era



External

- Multi-disciplinary Initiatives
- Partnership on AI
- IBM-MIT collaboration
- AAI/ACM Conference on AI, Ethics, and Society



AAAI / ACM conference on
**ARTIFICIAL INTELLIGENCE,
ETHICS, AND SOCIETY**

IBM's White Paper on Trusting AI Systems (Sept 2016)

Internal **IBM Cognitive Ethics Board**

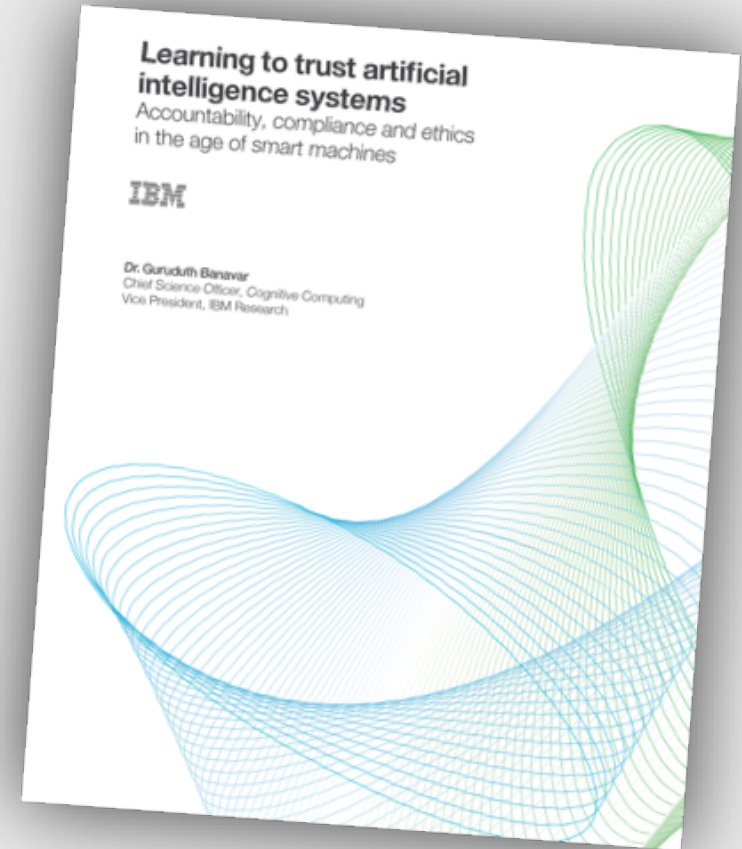
- To discuss, advise and guide the ethical development and deployment of AI.

Internal educational curriculum on the ethical development of cognitive technologies.

Creation of the IBM AI Ethics and Society research program

Participation in cross-industry, government and scientific initiatives around AI and ethics.

Regular, ongoing engagements with a robust ecosystem of academics, researchers, policymakers, NGOs and business leaders on the ethical implications of AI.



IBM's Principles for the Cognitive Era (Jan 2017)



PURPOSE

To augment, not replace, human intelligence.



TRUST & TRANSPARENCY

In the development and deployment of AI systems, and the handling of data.



SKILLS

Responsibility to education to support workforce evolution.

The MIT-IBM Watson AI Lab

\$240M 10 year commitment to jointly create the future of artificial intelligence

MIT - IBM
- WATSON
AI - LAB -
MIT - IBM
- WATSON
AI - LAB -
MIT - IBM
- WATSON
AI - LAB -



The MIT-IBM Watson AI Lab

AI algorithms

Learning
(continuous, multi-task,
small data, etc.)

Reasoning

Physics of AI

Analog AI

AI & Quantum

Applications of AI to industries

Cybersecurity

Healthcare

Advancing shared prosperity through AI

Ethics of AI

Broad economic
prosperity

<http://mitibmwatsonailab.mit.edu/>

