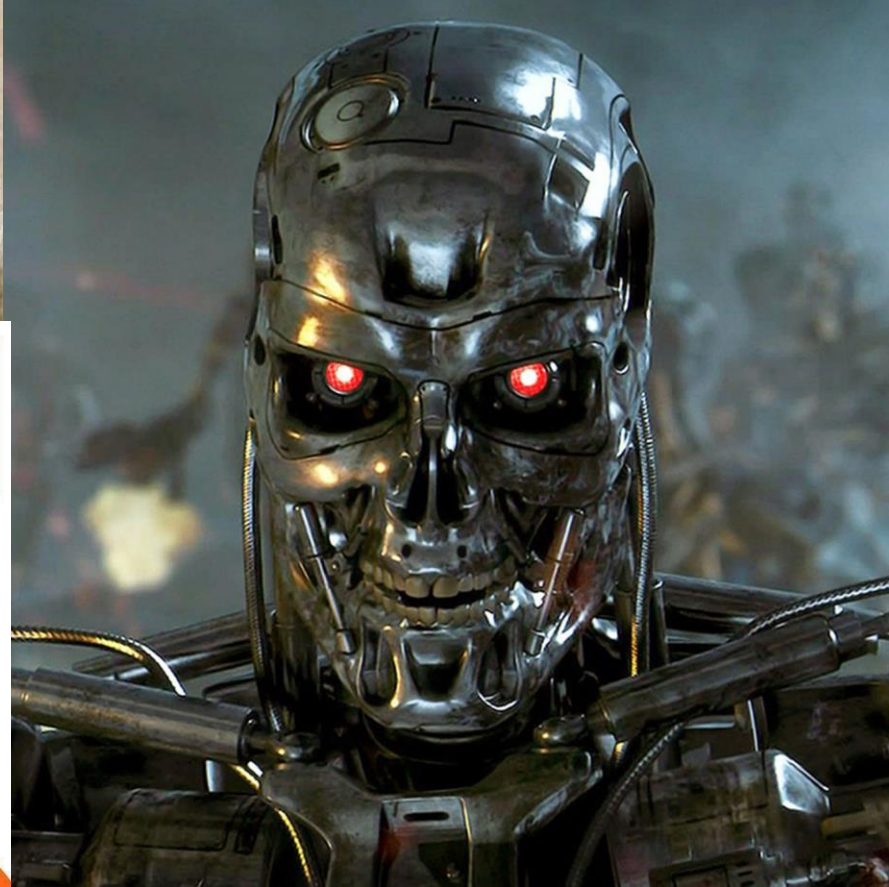
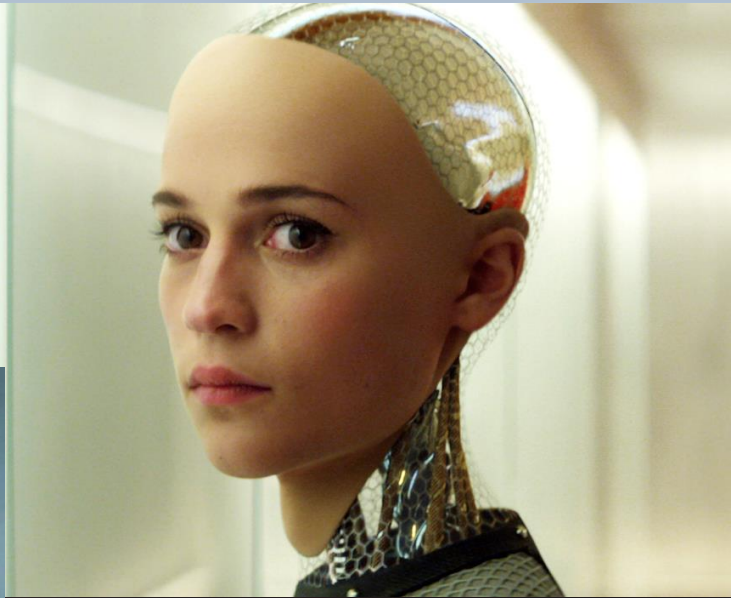
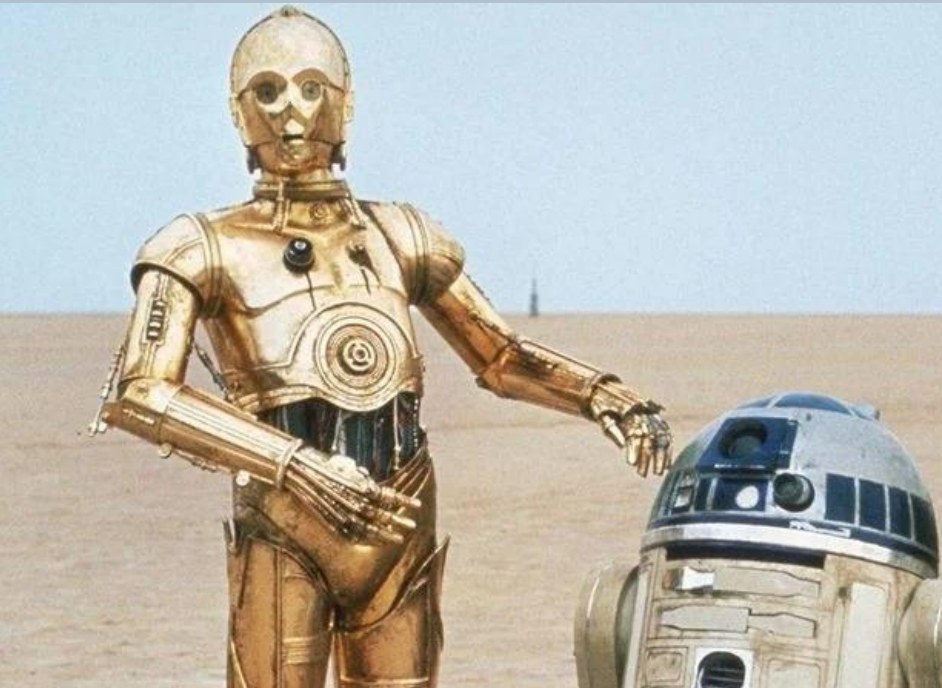


# **Lecture 11-1**

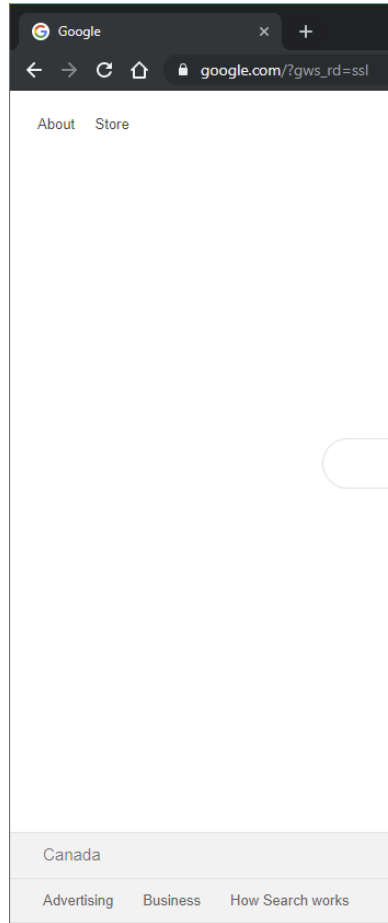
## **Artificial Intelligence**

# What AI Means to Most People





# But most modern AI systems look like...



# What is Artificial Intelligence?

AI is the study, design, and development of computational processes that solve problems that **previously required human intelligence**

Not all of computer science is focused on AI.

But, it's hard to think of a field in CS that isn't **contributing fundamentally** to it

The “**AI Paradox**”: once we become familiar with a technology, we stop considering it AI

# THE JOURNEY SO FAR

What is AI and what can it do today?  
How much is real and how much is hype?

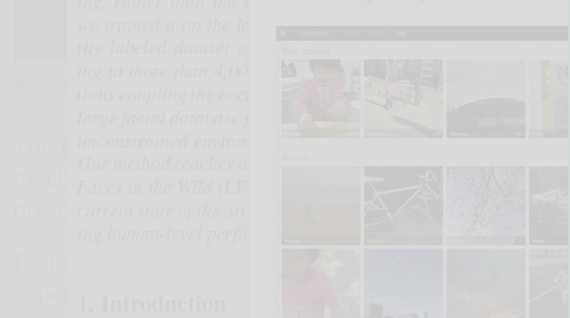
AI Monthly Volume 17 Number 1 (1995) by AAAI  
IBM computer Watson wins  
clash

DeepFace: Closing the Gap  
Yaniv Taig  
Microsoft, Google  
Image Recognition  
Deep learning algorithms compete

By R. Colin Johnson, 02/18/15 14  
Share on Facebook

PORTLAND, Ore. -- First computers hurdle is image recognition -- surely too. Now Microsoft has programmed

The competition is fierce, with the In the 2015 championship on December they have one-upped humans too. For benchmark of 5.1% errors with a 4.94 Microsoft by 0.04%.

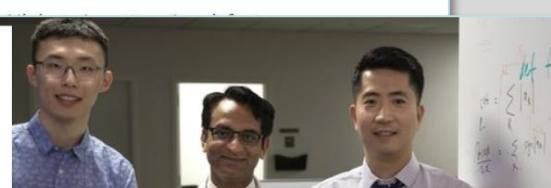


1. Introduction  
Face recognition in front of the algorithm and cultural implications are far reaching, yet the main between machines as a buffer from having

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# OpenAI's Dota 2 AI steamrolls world champion e-sports team with back-to-back victories

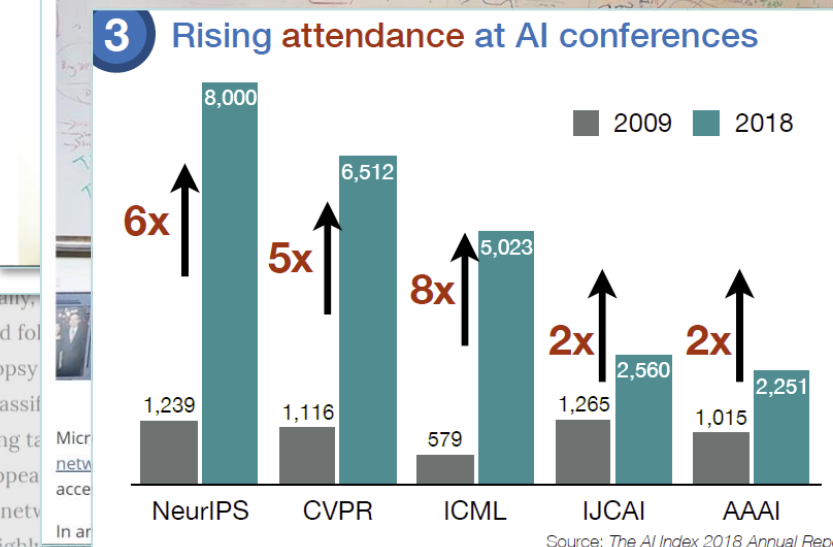
The Int  
By Nick Sta  
HEALTH + BEHAVIOR  
Artificial intelligence performs as well as experienced  
radio  
detection  
cancer



## New AI Model Exceeds Human Performance at Question Answering

Microsoft's new AI translates Chinese-to-English as well as a human translator  
By Michael Hicks March 14, 2018 World Of Tech  
It's all in how you teach the AI  
f t p m

Denise Hea  
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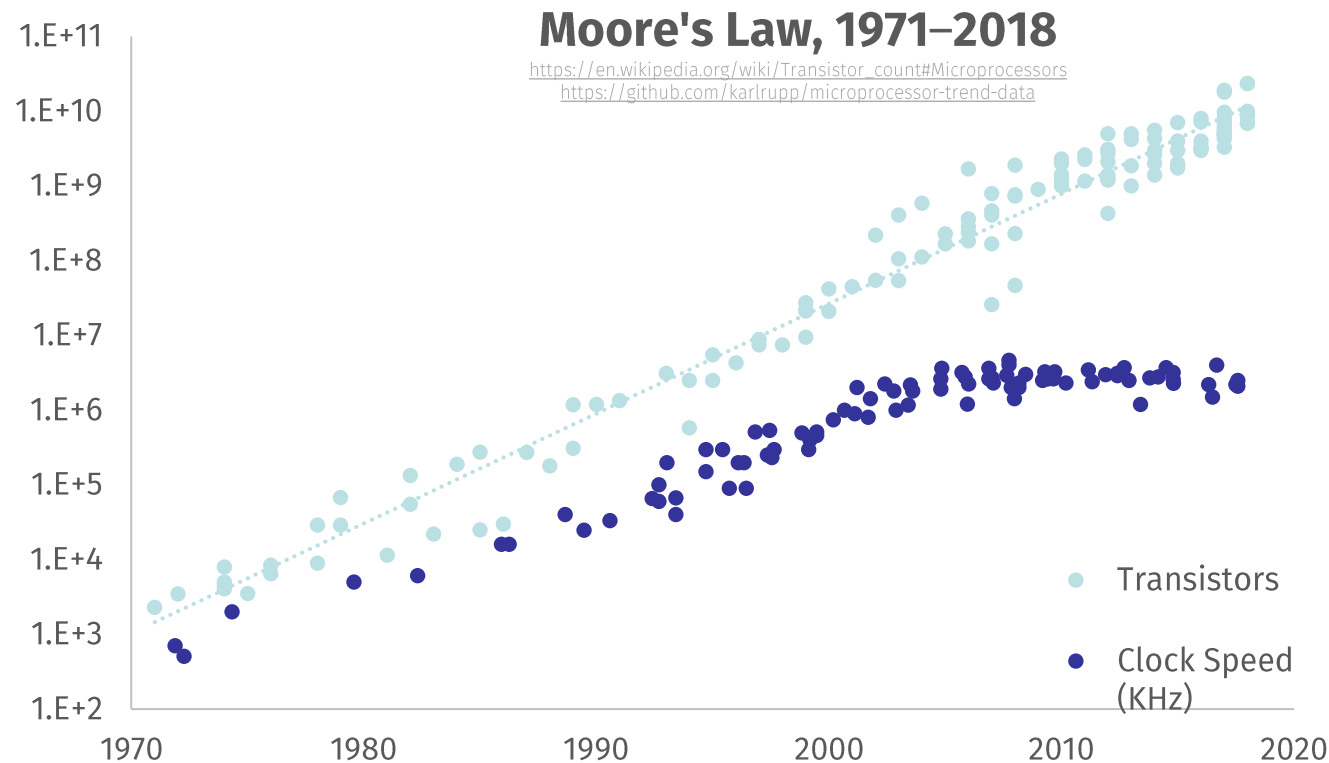


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# Why is it happening?

1. Scientific/mathematical **breakthroughs**, esp in machine learning
2. Growth in raw **computing power**



For comparison:

Species	# Neurons in Brain
Fruit Fly	$10^5$
Cat	$10^9$
Chimpanzee	$10^{10}$
Human	$10^{11}$

What short term impacts should we expect?

What kinds of social impacts are they having?

# **CURRENT TRENDS**



# Current State of the Art

- **Predictive modeling**  
limited mostly by quality of training data
- **Image recognition, face recognition**  
becoming extremely reliable
- **Image generation** almost there
- **Language understanding & generation**  
maturing extremely quickly. Watch this space
- **Fueling scientific breakthroughs**  
from protein folding to astronomy
- **Robotics** remains a hard problem, but it's working well in some niche applications



thispersondoesnotexist.com

Prompt: Here's a short rhyming poem by Dr. Seuss about Elon Musk's company, Neuralink which is building brain implants to achieve symbiosis with AI. Neuralink's mission statement is "If you Can't Beat'em, join'em". The poem has a structure typical of Dr. Seuss stories with simple alternate line rhymes. In the poem Elon explains why we need to merge with the AI to save humanity.

Neuralink, by Dr. Seuss

-----  
Response:

I have a friend, Elon Musk,  
Who wants to join our brains to AI.  
He thinks that humans can't compete  
So he's gonna use AI to cheat.  
They want to build a neural-link.  
To link us to the AIs  
And save humanity from its demise.  
They want to put an AI in your brain.  
They want to use your neurons as a frame.  
They want to save humanity,  
If you can't beat'em, join'em

<https://arr.am/2020/07/14/elon-musk-by-dr-seuss-gpt-3/>

# Machine Learning

- Narrow: building **predictive models** from data
- Broad: a new approach to computer programming, where computers **learn from experience** rather than being told what to do
- Where's it **headed?**
  - More and more data collection
    - sensors
    - behavior tracking
  - Image, text, speech understanding
  - Data mining/personalization/profiling
  - Self programming/optimization



# Virtual and Physical Worlds Collide

- Smart **interfaces**
  - remote controls; microwaves; clocks; ...
- Augmented reality
- More intuitively “**programmable**” systems
- Much better **context awareness**
- **Assistance**
  - elderly; children; disabled; education
- **Social agents**/games



# Growing Military Use

- Increasing use of AI in **military applications**
- Already quite **commonplace** in some applications
  - smart bombs
  - surveillance systems
  - missile defence (Patriot, Iron Dome, etc)
- **Autonomous weapons** are becoming practical
  - drones are widely used; becoming more autonomous
  - land-based robotic systems are improving quickly
  - swarms of drones could revolutionize urban warfare
- The main barrier to adoption is **public opinion**





# **PEERING INTO THE CRYSTAL BALL**

Bold predictions about where AI is headed in the longer term

# Technology that will be in widespread use

- Tailored solutions for **specific tasks**, not general intelligence
- Prototypes **that work today** in labs & narrow deployments
- Some examples:
  - **Non-text input modalities** (vision; speech)
  - **Consumer modeling** (recommendation; marketing)
  - **Cloud services** (translation; question answering; AI-mediated outsourcing)
  - **Transportation** (automated trucking; some self-driving cars)
  - **Industrial robotics** (factories; some drone applications)
  - **AI knowledge work** (logistics planning; radiology; legal research; call centers)
  - **Policing & security** (electronic fraud; cameras; predictive policing)



# Technologies that won't take off as quickly

- Overall, areas in which
  - major entrenched **regulatory regimes** need to be navigated
  - there exist **social/cultural barriers** to adoption
  - the **human touch** is crucial
  - substantial **new hardware** would need to be developed
- Some **examples**:
  - childcare, healthcare, eldercare
  - education
  - coaching, counselling
  - consumer robots beyond niche applications
  - semantically rich language understanding





# Superhuman Intelligence

- AI systems will increasingly be capable of reaching **human-level performance**
- **Superhuman intelligence** isn't such a foreign, scary thing
  - governments, corporations, NGOs exhibit behavior much more sophisticated and complex than that of any individual
- Many important problems need superhuman intelligence; AI can help
  - improved **collective decision making**
  - more efficient use of **scarce resources**
  - addressing **underserved communities**
  - **climate change**; other societal challenges

