

CAP 6635 – Artificial Intelligence

Lecture 1



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College of Engineering and Computer Science

College of Business



@ProfessorOge



ProfessorOgeMarques

Introductions



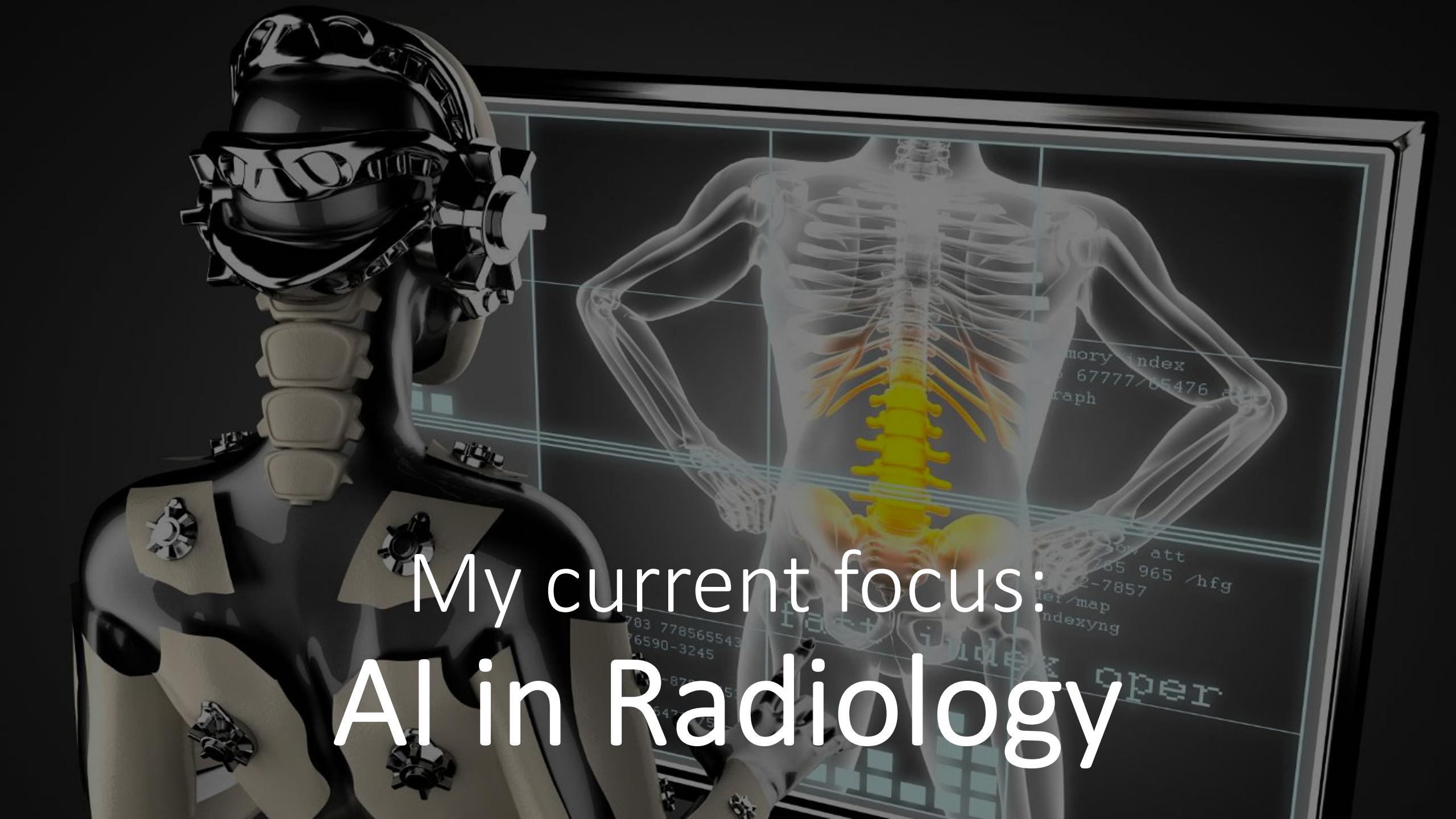
My research interests

Intelligent processing of visual information

- image processing
- medical image analysis
- computer vision
- human vision
- artificial intelligence
- machine learning
- deep learning

My work: selected books



A robotic arm with multiple joints and a gripper is positioned in front of a computer monitor. The monitor displays a grayscale image of a human skeleton from the chest up. A bright yellow heatmap highlights the spine area. The background is dark, and the overall theme is a blend of advanced robotics and medical technology.

My current focus:
AI in Radiology

Your turn

Why are you taking this course?



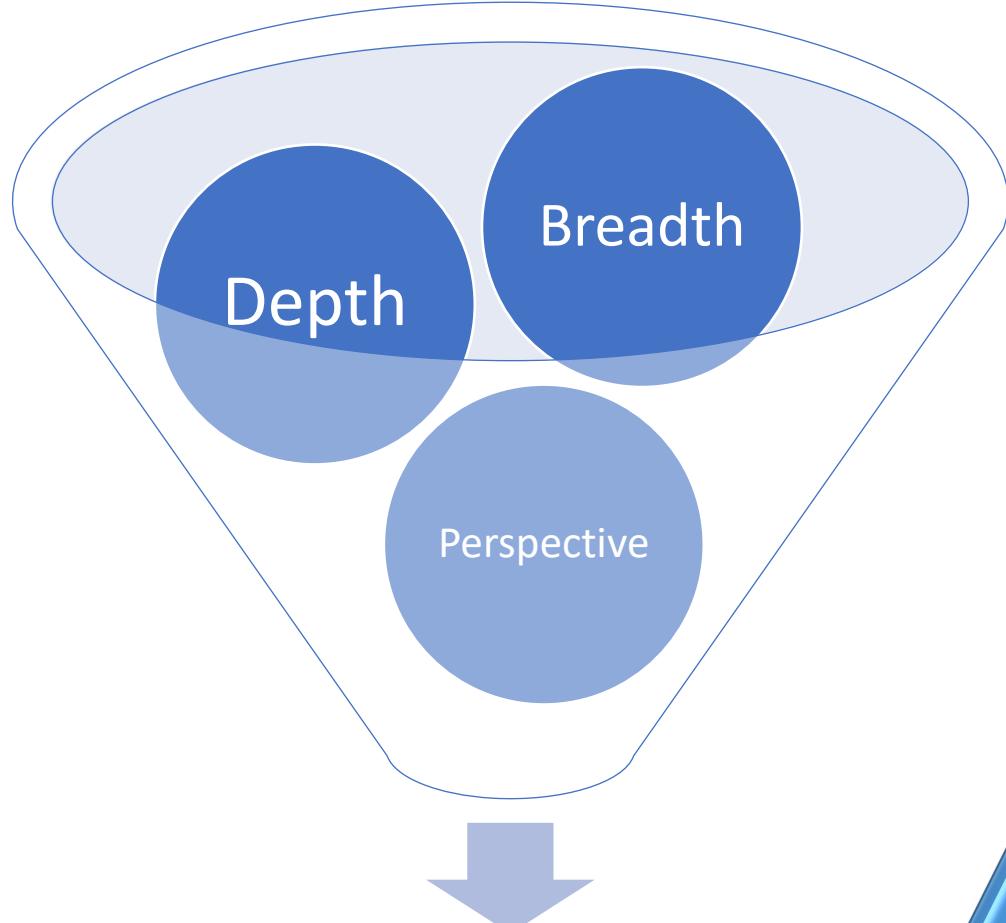
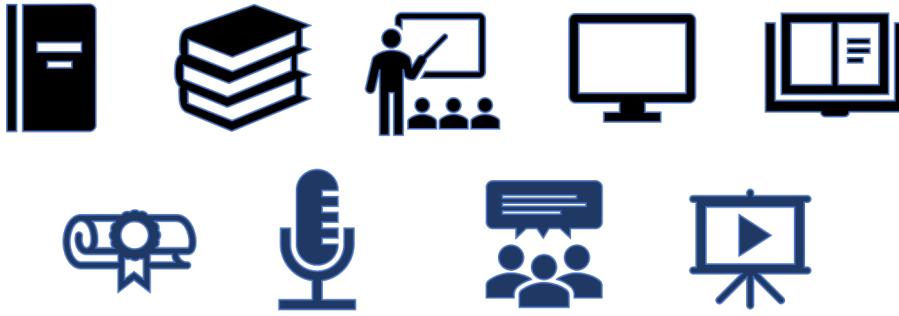


Today's agenda

- Course goals and scope
- Course logistics
- A brief overview of AI

What I hope you will get out of this course

1. Understand what it is to develop AI models, when and why models are needed, the limitations of models, and how models can be used to support conclusions.
2. Compare and contrast different AI approaches, including machine learning and deep learning methods.
3. Become resourceful and capable of navigating the web of online AI resources.
4. Become more discriminating in their assessment of published results in the field of AI.
5. Improve your philosophical understanding of both computational and human intelligence.
6. Improve your ability to work independently on creative and novel projects.



Deliverables

AI

Implications

Applications

Tools

Latest developments

Foundations

In this class you will...



Read (and summarize portions of) **books**



Read (and summarize) **key papers**



Watch (and summarize) **videos**



Listen to / watch (and summarize) **podcasts**



Follow **key people/lists/channels** on
Twitter/YouTube/reddit/LinkedIn



“Play with” contemporary **AI tools (no coding needed)**



Take short **online courses**



Call for talent



Bloggers / Writers / Editors



Social media experts



Video creators/producers



App designers



Game designers



Web designers / Webmasters



Course overview

- AI: the big picture
- Foundations of AI
- The age of machine learning and deep learning
- AI: applications
- AI: implications
- AI: beyond machine learning and deep learning

Grading scheme

Book and paper summaries	50%
Online quizzes	25%
Hands-on Assignments	20%
Participation	5%

Keys to success

- Keep up with the **reading**
- Put the time and effort
- Use the best tools
- Participate in discussion board forums
- Communicate often
- Start assignments early
- Stay curious



Questions



ARTIFICIAL INTELLIGENCE



Google

ai will |



Google

ai will |



- ai will smith
- ai will take over
- ai will replace jobs
- ai will take over the world
- ai will destroy us
- ai will kill us all
- ai will replace doctors
- ai will change the world
- ai will replace humans
- ai will rule the airwaves

Google Search

I'm Feeling Lucky

Report inappropriate predictions

Key idea:

**Artificial Intelligence
has made promises
and predictions before**

Dartmouth Workshop 1956



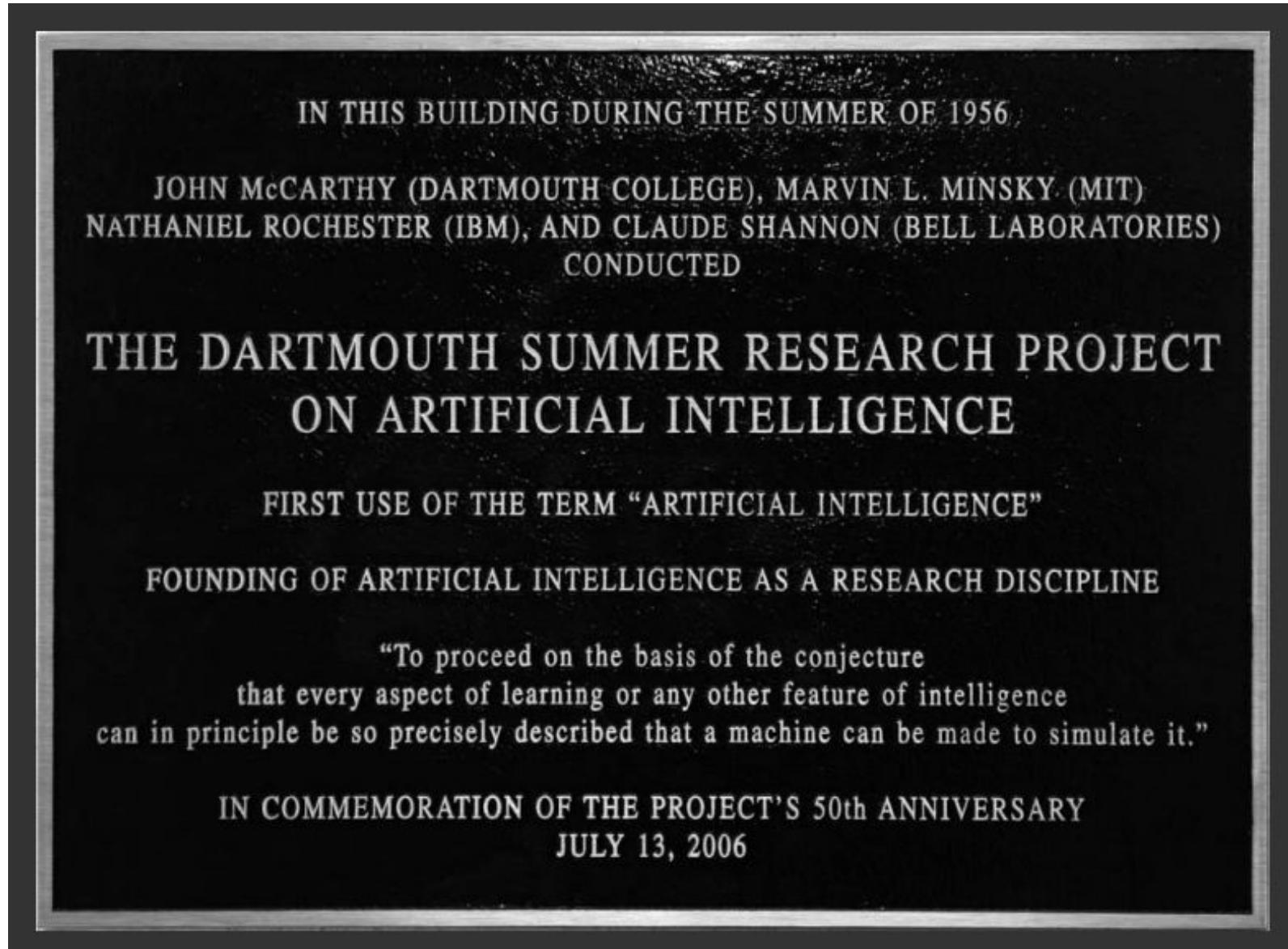
“

every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it .

”



John McCarthy



"machines will be capable, within twenty years, of doing any work a man can do."

Herbert Simon (1965)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
PROJECT MAC

Artificial Intelligence Group
Vision Memo. No. 100.

July 7, 1966

THE SUMMER VISION PROJECT

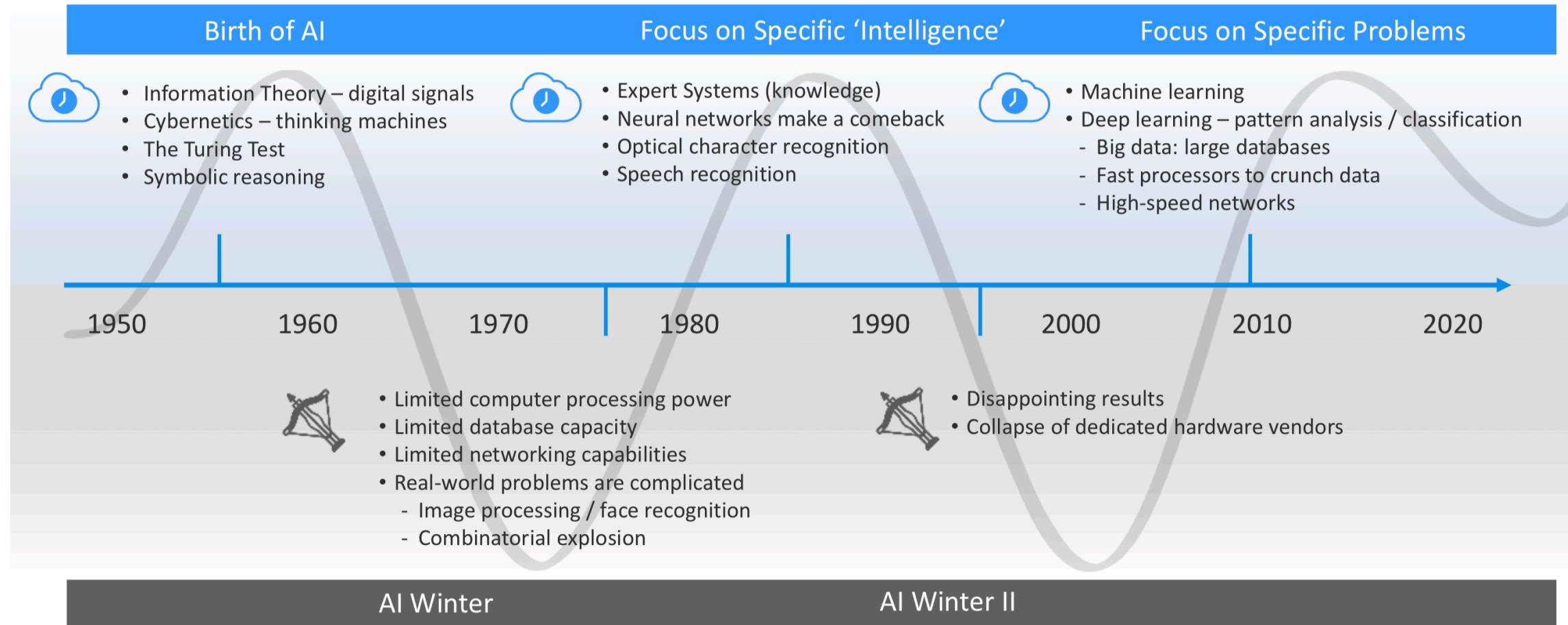
Seymour Papert

The summer vision project is an attempt to use our summer workers effectively in the construction of a significant part of a visual system. The particular task was chosen partly because it can be segmented into sub-problems which will allow individuals to work independently and yet participate in the construction of a system complex enough to be a real landmark in the development of "pattern recognition".

“In from three to eight years we will have a machine with the general intelligence of an average human being.”

Marvin Minsky (1970)

An AI Timeline



Key idea:

AI has had several
highly visible
successes

1997



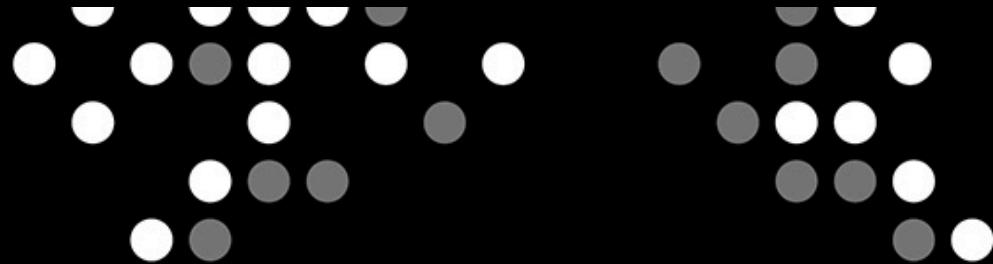
Garry Kasparov, left, plays chess
against Deep Blue in 1997.

Feng-Hsiung Hsu, one of Deep
Blue's designers, moves the
pieces for the computer.

2011



2016



ALPHAGO



2018: AlphaZero

The New York Times

ESSAY

One Giant Step for a Chess-Playing Machine

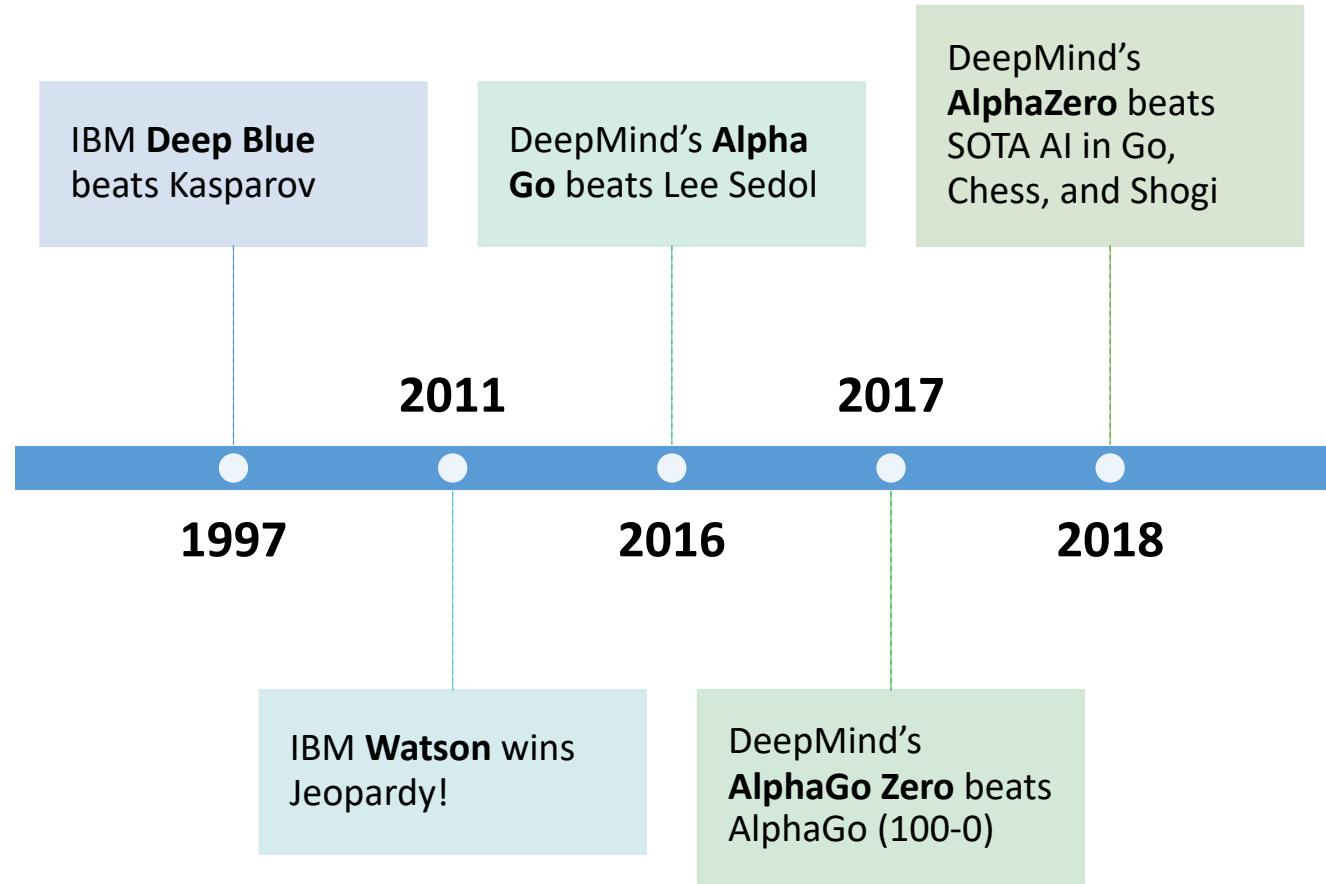
The stunning success of AlphaZero, a deep-learning algorithm, heralds a new age of insight — one that, for humans, may not last long.

By Steven Strogatz

Dec. 26, 2018



Selected high-profile successes



What do they have in common?

Key idea:

Once it becomes a product,
we don't call it AI anymore

Emmy-winning US TV Shows



Police Detective TV Dramas



Critically Acclaimed Witty TV Shows







Smart Home



Security



Lighting



Network



Camera



40%



21°C
69.8°F



09:37



ON

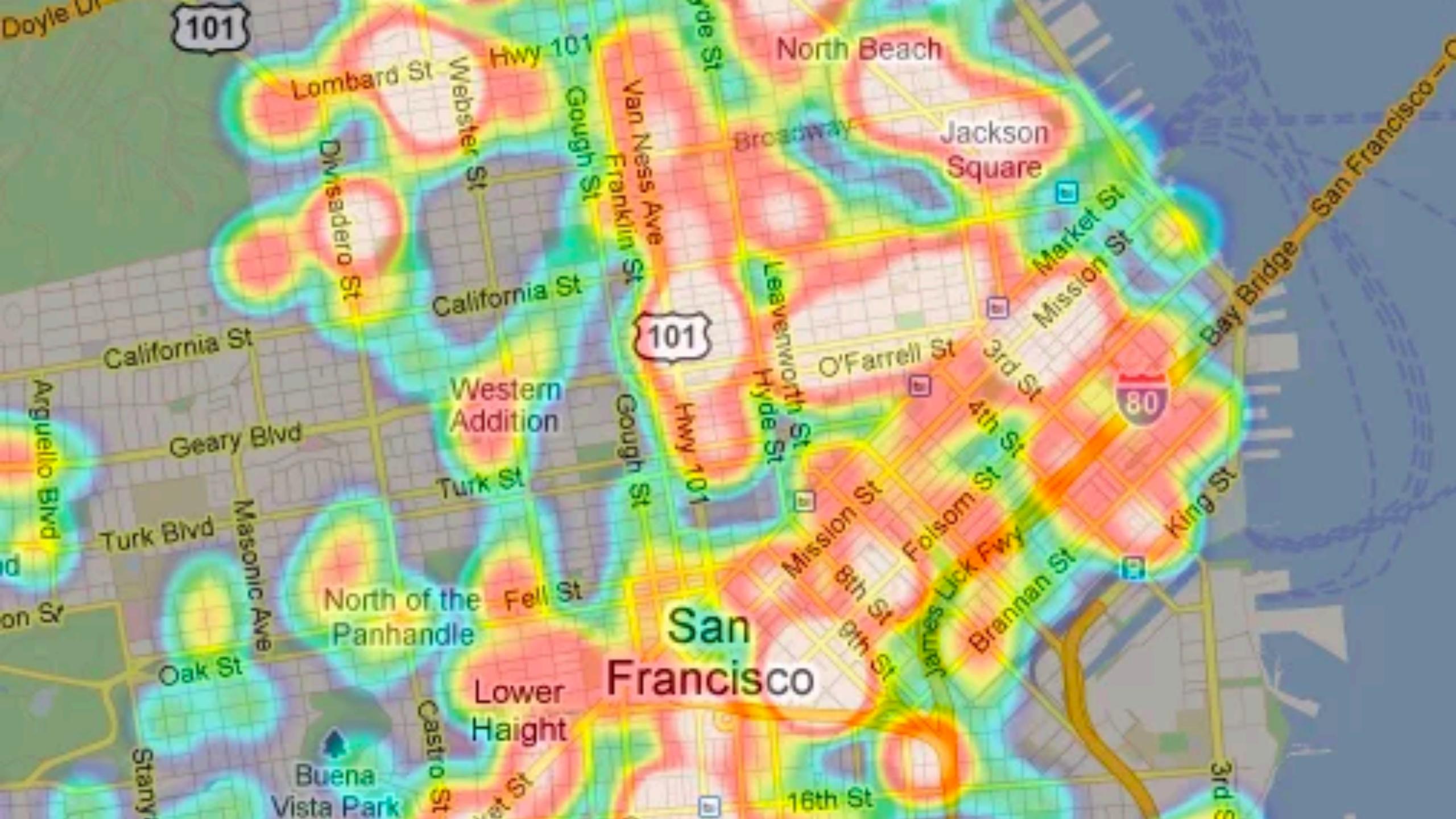


37°C
98.6°F



CLOUDY





84% 10:19

Your location

Arrivals

14 min

1 hr 44

1 hr 46

14 min

BERBAGAI SIRI
MERPATI

TUNAK
MERICA

SEA PEARL
ISLAND

SOUTH HOMES

16 min

KAMPUNG
PERLIS

KAMPUNG
MASJID

14 min

Snake Temple

ZON
PERINDUSTRIAL
DEBAS



	Row #	Plate #	State	Time Captured	Camera
	1	0966IP	Florida	7/24/2013 2:09 PM	Gate Camera - Outgoing
	2	171LKR	Florida	7/24/2013 2:09 PM	Gate Camera - Outgoing
	3	436LAZ	Florida	7/24/2013 2:08 PM	Gate Camera - Outgoing
▶	4	171LKR	Florida	7/24/2013 2:08 PM	Gate Camera - Outgoing
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	6	171LKR	Florida	7/24/2013 2:07 PM	Gate Camera - Outgoing
	7	436LAZ	Florida	7/24/2013 2:07 PM	Gate Camera - Outgoing
	8	0966IP	Florida	7/24/2013 2:07 PM	Gate Camera - Outgoing
	9	17DLKR	Florida	7/24/2013 2:07 PM	Gate Camera - Outgoing
	10	436LAZ	Florida	7/24/2013 2:07 PM	Gate Camera - Outgoing
	11	171LKR	Florida	7/24/2013 2:03 PM	Gate Camera - Outgoing
	12	436LAZ	Florida	7/24/2013 1:57 PM	Gate Camera - Outgoing
	13	8647HP	Florida	7/24/2013 1:55 PM	Gate Camera - Outgoing
	14	436LAZ	Florida	7/24/2013 1:55 PM	Gate Camera - Outgoing
	15	U878IZ	Florida	7/24/2013 1:55 PM	Gate Camera - Outgoing
	16	8647HP	Florida	7/24/2013 1:55 PM	Gate Camera - Outgoing
	17	436LAZ	Florida	7/24/2013 1:54 PM	Gate Camera - Outgoing
	18	U878IZ	Florida	7/24/2013 1:54 PM	Gate Camera - Outgoing
	19	U878IZ	Florida	7/24/2013 1:54 PM	Gate Camera - Outgoing
	20	8647HP	Florida	7/24/2013 1:54 PM	Gate Camera - Outgoing

Images [Camera Info](#) [Plate Info](#)

FLORIDA

171LKR



Source Image (Click to Enlarge)



Exact Details
7/24/2013 14:08:27
Captured by PlateSmart

[Cancel Plate Change](#)

[Save Plate Change](#)

[Delete Plate](#)

Number of records to display

20



[Show 5 More](#)

[Hide 5 Oldest](#)

[Stop Showing Updates](#)









 26, 2017 at 13:35 • 0

Pixie Me Productions added 3 new photos.

 André Vallecillo • 26, 2017 at 13:34



ADVERTISING

CREATIVE

CREATIVE





Hi, how can I help?



Key idea:

AI is hard to define

What is
Artificial
Intelligence?

Defining artificial intelligence isn't just difficult; it's impossible, not the least because we don't really understand human intelligence.

AI is a field concerned with producing machines able to autonomously perform tasks that would normally require human intelligence by giving them the ability to perceive, learn from, abstract, and act using data.

WHAT IS AI?



- Interchangeable with the term machine intelligence, or “MI”
- Able to perform certain narrowly defined tasks as well as or better than humans
- A substitute for human intelligence in *certain rote tasks* within jobs

WHAT ISN'T AI?



- Interchangeable with the term “data science”
- Able to perform wide-ranging tasks as well as or better than humans
- A substitute for any human’s entire job

Artificial
intelligence is
hard to
define...

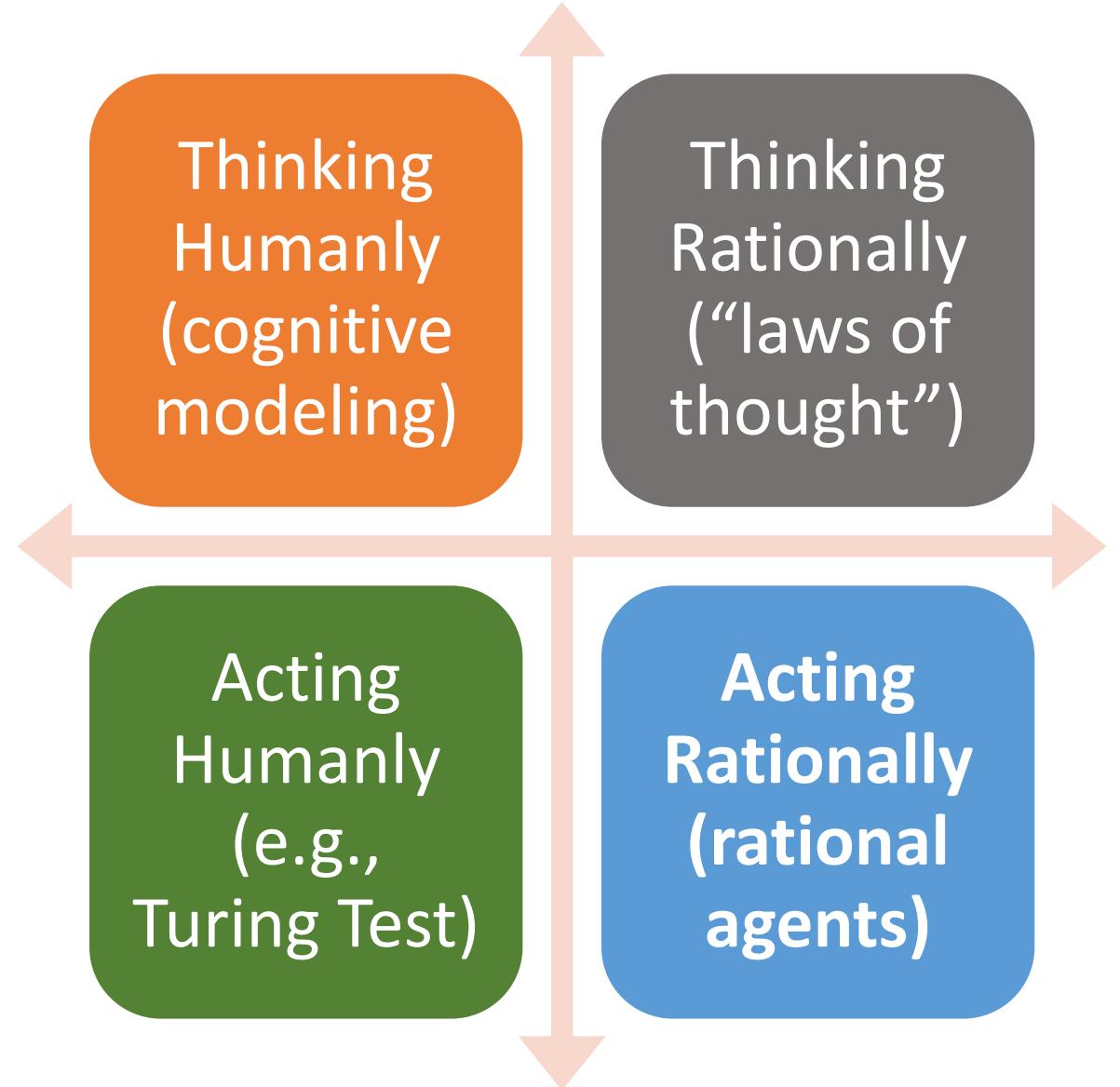
Merriam-Webster:

- a branch of computer science dealing with the simulation of intelligent behavior in computers
- the capability of a machine to imitate intelligent human behavior

Encyclopedia Britannica:

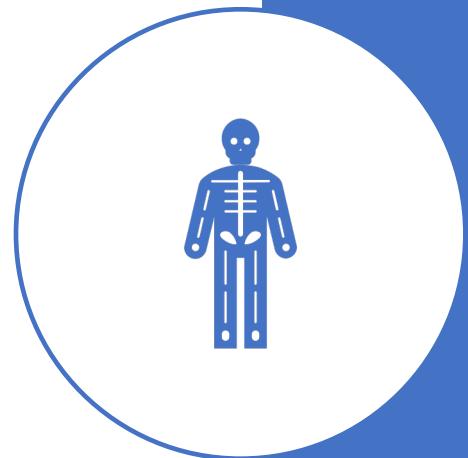
- the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings

Artificial Intelligence definitions: categories

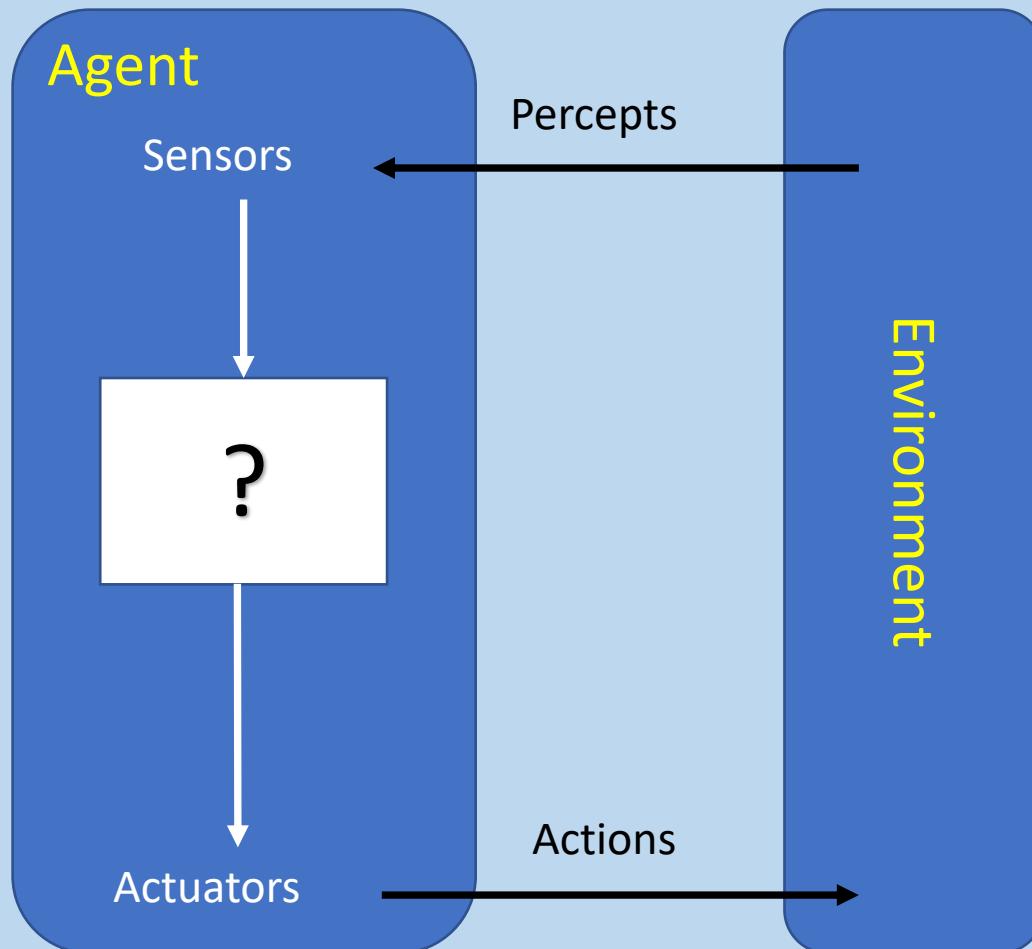


Rational agents

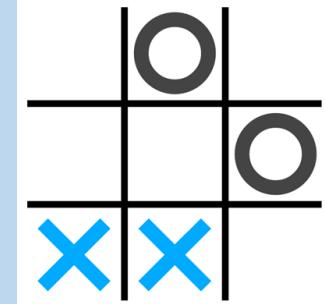
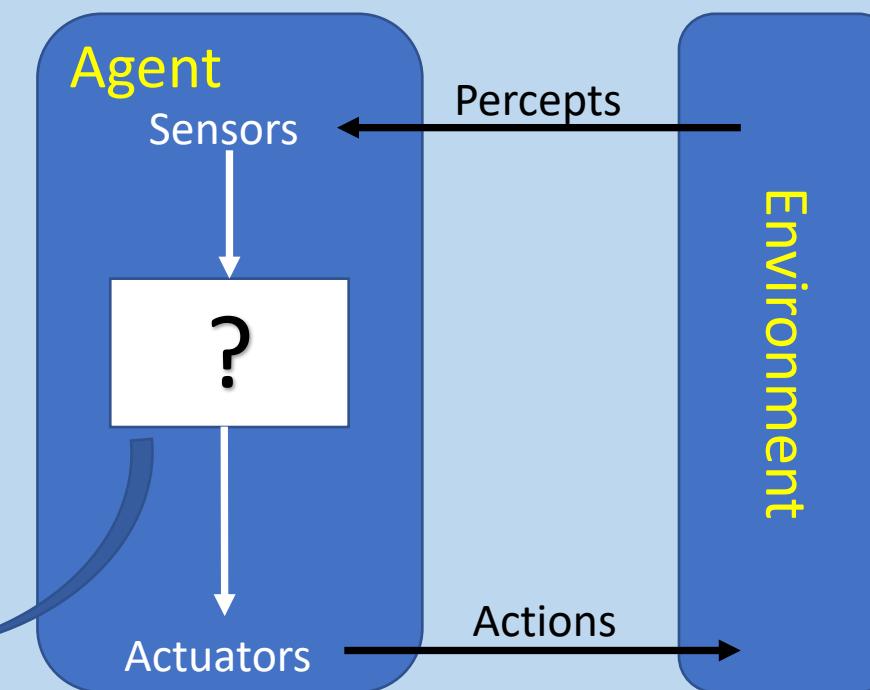
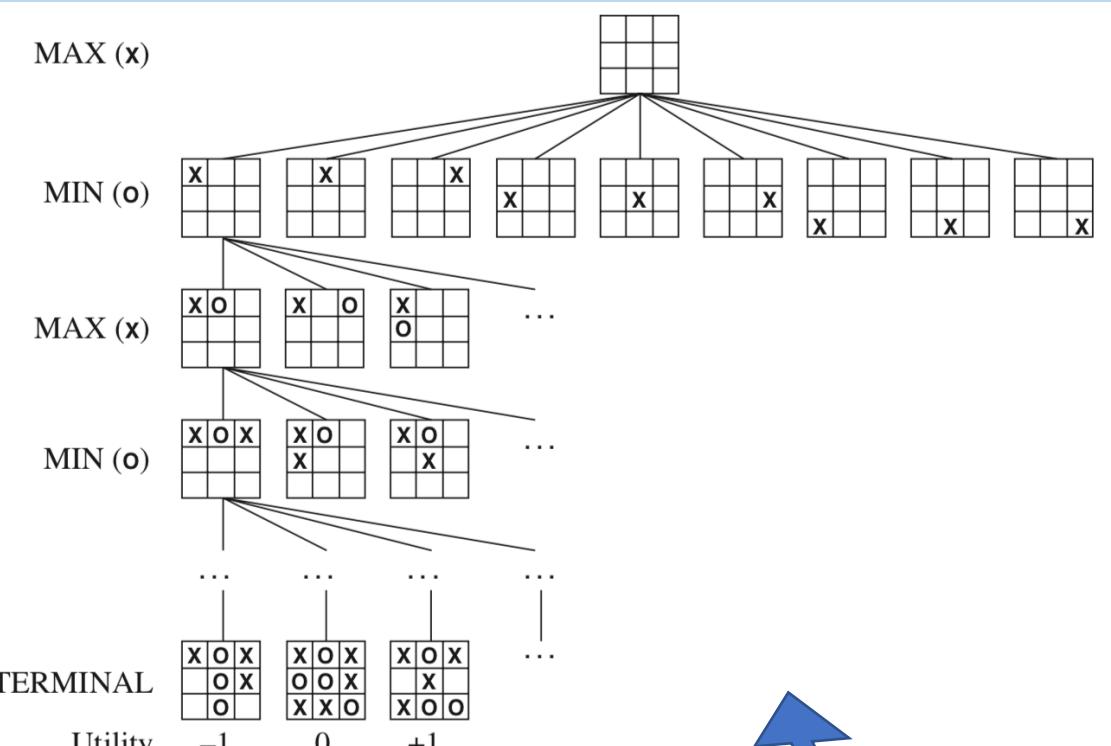
- For each possible percept sequence, a rational agent should:
 - select an action that is expected to maximize its performance measure,
 - based on the evidence provided by the percept sequence and
 - whatever built-in knowledge the agent has.



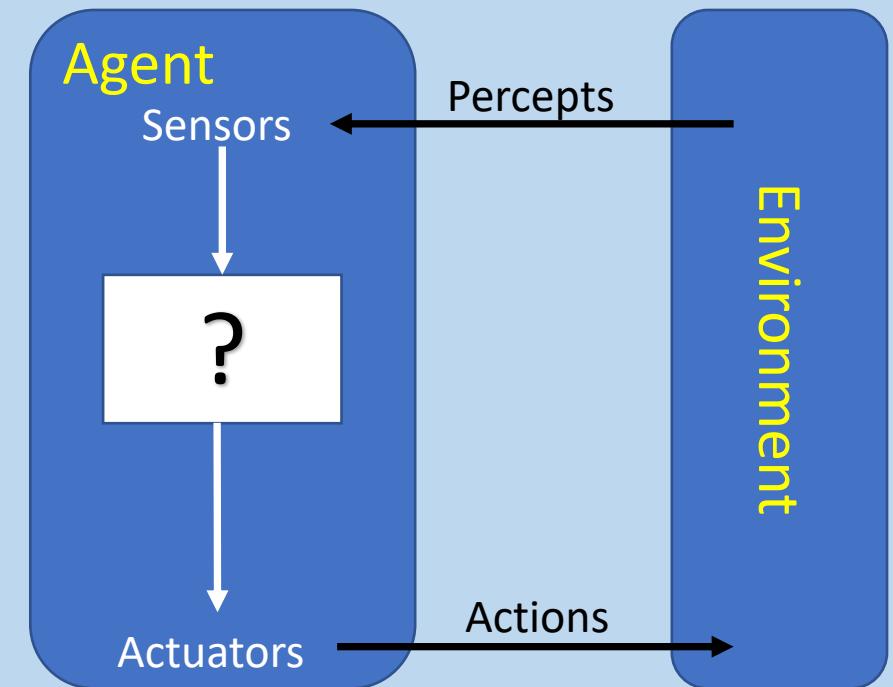
Agents and environment



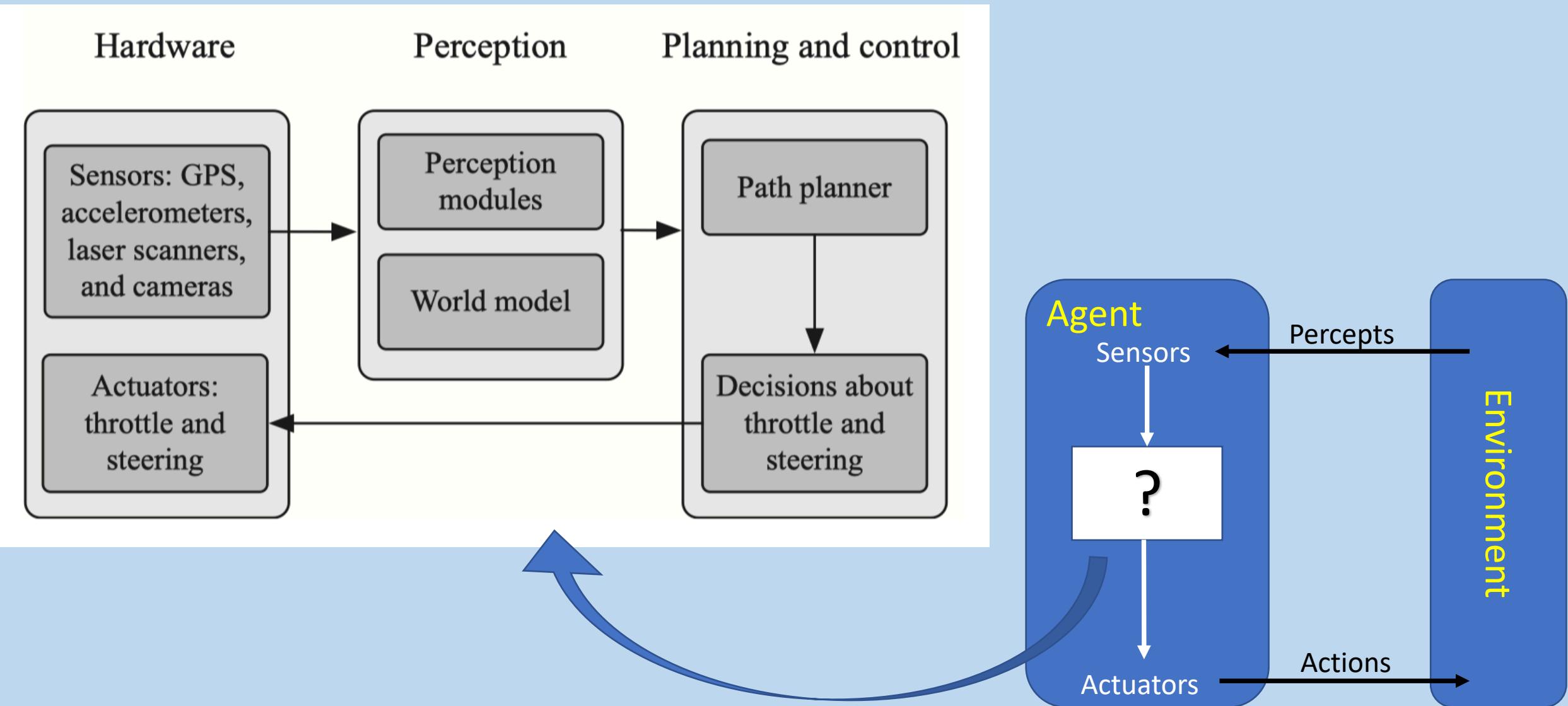
Agents and environment



Agents and environment



Agents and environment



Key idea:

Not all AI systems are
created equal

Dimensions of AI

- **Strength** (how intelligent is it?)
- **Breadth** (does it solve a narrowly defined problem, or is it general?)
- **Training** (how does it learn?)
- **Capabilities** (what kinds of problems are we asking it to solve?)
- **Autonomy** (are AIs assistive technologies, or do they act on their own?).

Key idea:

AI is a very hot area
(again) today!

AI progress: driving forces



Advances in **computer hardware**



Availability of **huge volumes of data**



Better **algorithms**



Machine learning solutions to
highly visible problems



Better **sensors**

Steven Sasson



1976 – 1st Digital Camera

0.01 MP / 3.75 lbs / \$10K

**1000x Resolution
1000x Lighter
1000x Cheaper**

1,000,000,000 x better

2014 – Digital Camera

>10 MP / 0.03 lbs / \$10

← 1 BILLION TIMES BETTER →
← 1,000x Resolution & 1,000 lighter & 1,000 cheaper

DEEP LEARNING...



What is
driving AI's
progress?