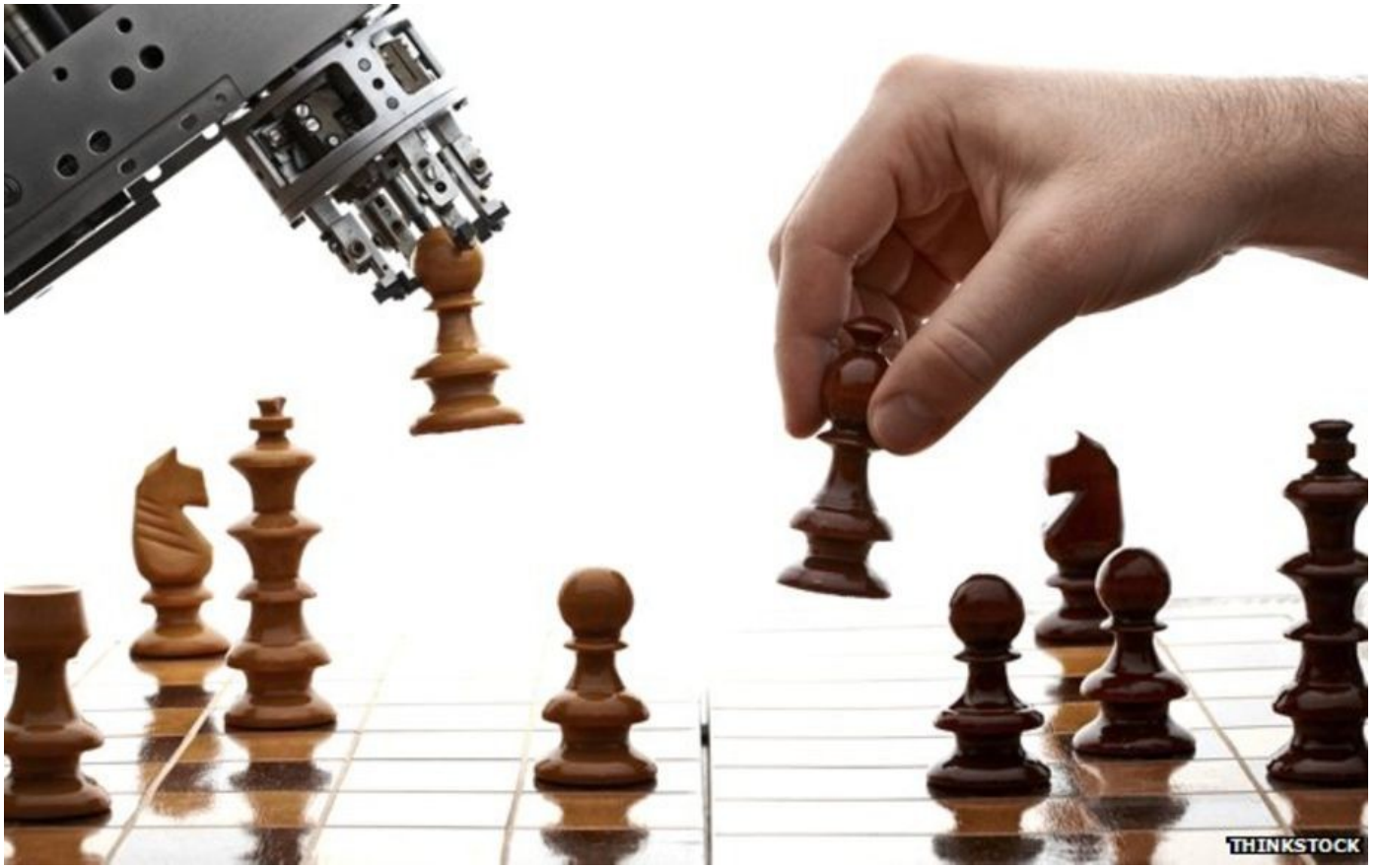


Introduction to Artificial Intelligence

COSC 4550 / COSC 5550

Professor Cheney

9/1/17

Logistics Cont...

Course Project

Perform a hands-on AI research project!

Can be something new or a variation on
an assignment or exercise from class

So keep it in mind when we do something in class
that you find really cool/exciting!
(then get it approved by me, and you can start working)

Create a 2-5 minute research video to share
with your classmates (and the world!)

Maybe even get it published at a scientific conference?!

COCS 4550 vs. COCS 5550

Grad students (COCS 5550) will have:

Larger expectation in terms of scope
for the class project

Additional exercises during homeworks

Some additional readings

Late Policy

One class: 25% off

Two classes: 50% off

Three classes: 75% off

Four+ classes: no credit

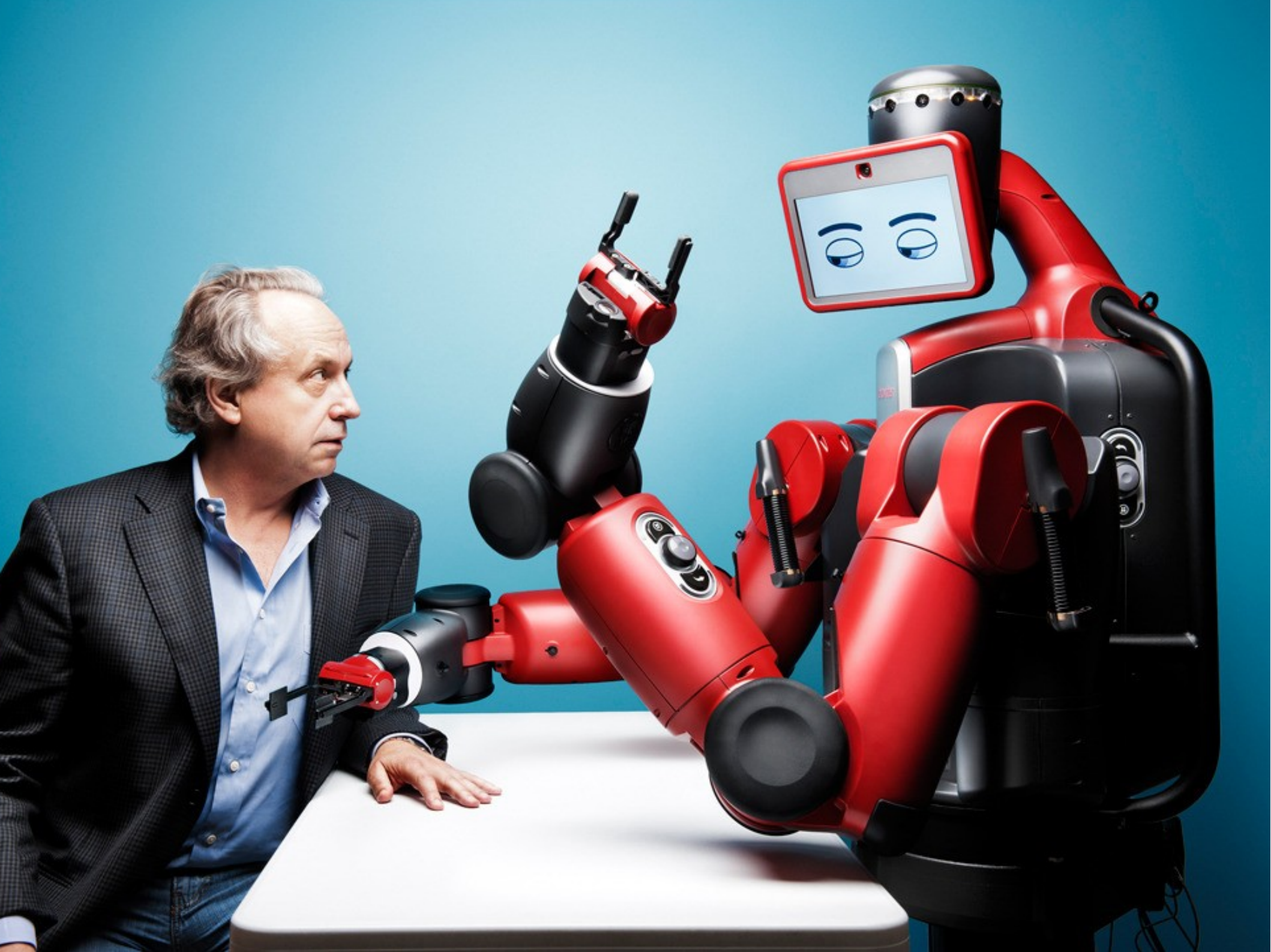
Piazza!

Schedule Updates!

What is AI?

Thinking? or Acting?


COGITO
ERGO
SUM

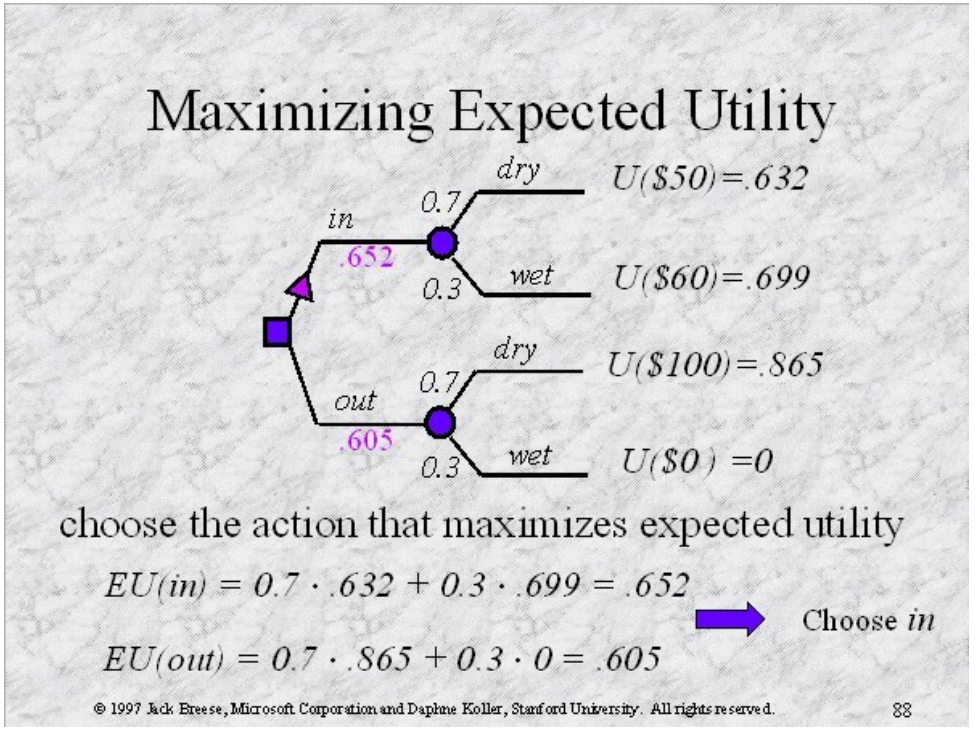


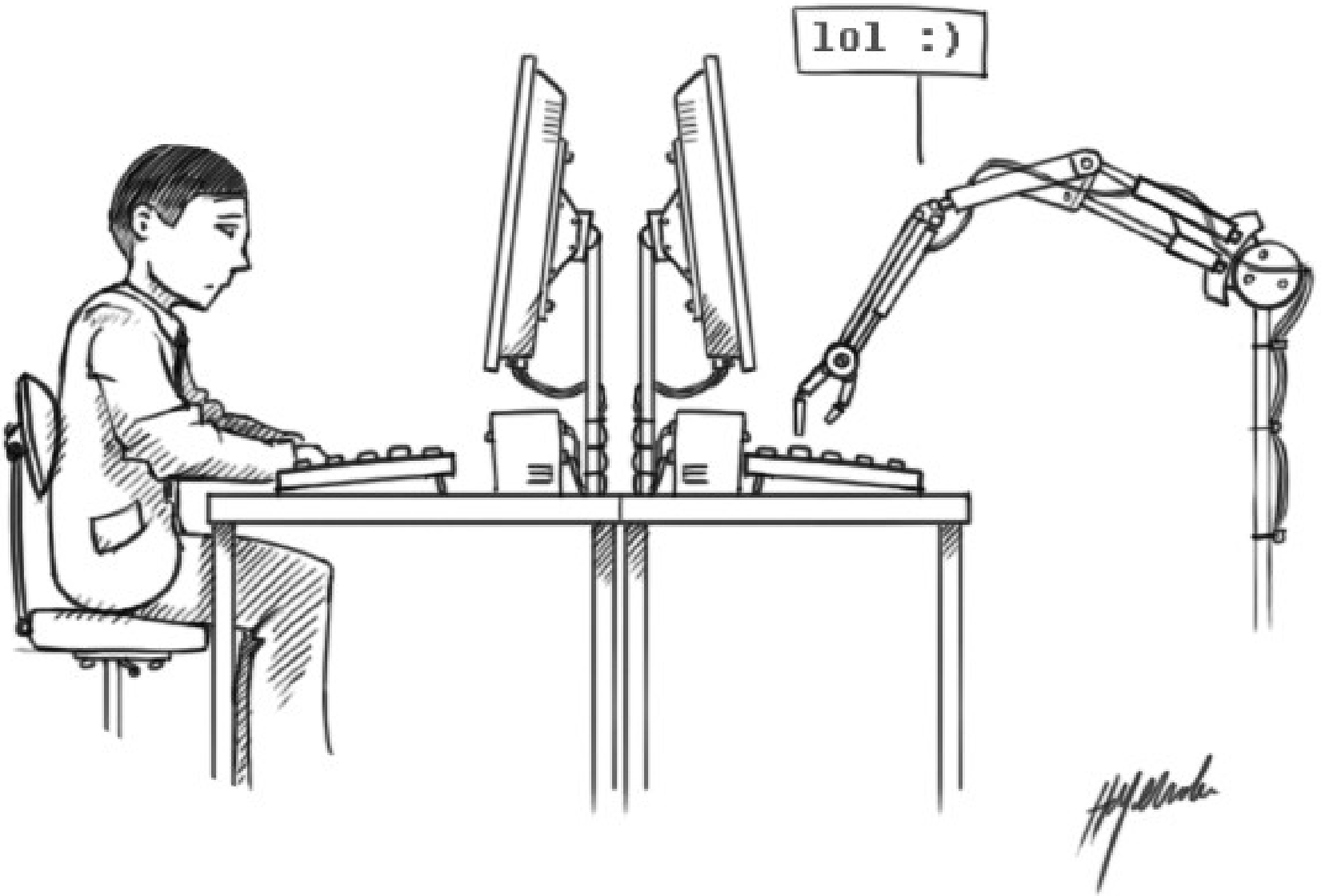
Rodney A. Brooks
MIT Artificial Intelligence Laboratory, Cambridge, MA 02139, USA

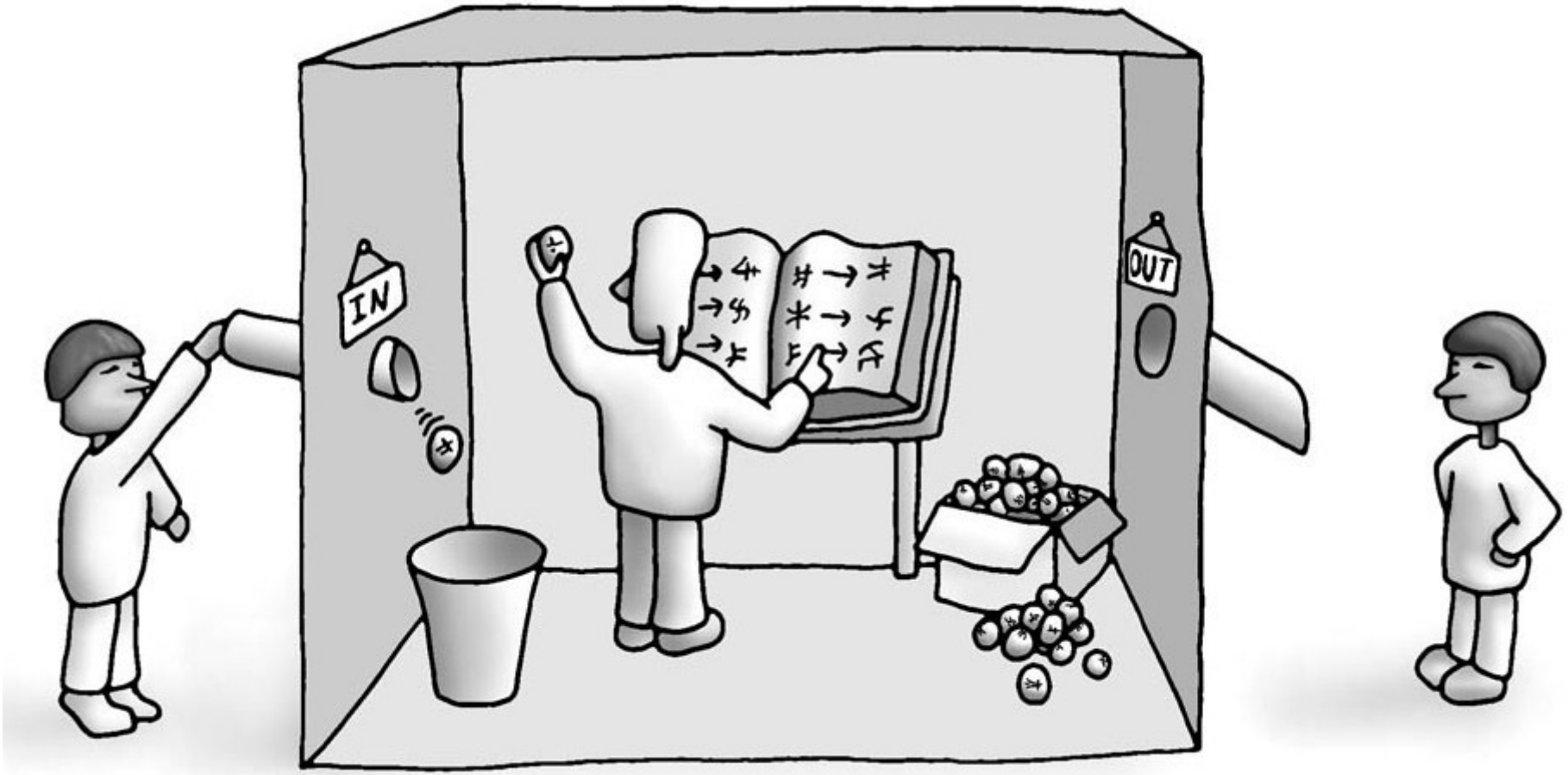
There is an alternative route to Artificial Intelligence that diverges from the directions pursued under that banner for the last thirty some years. The traditional approach has emphasized the abstract manipulation of symbols, whose grounding in physical reality has rarely been achieved. We explore a research methodology which emphasizes ongoing physical interaction with the environment as the primary source of constraint on the design of intelligent systems. We show how this methodology has recently had significant successes on a par with the most successful classical efforts. We outline plausible future work along these lines which can lead to vastly more ambitious systems.

What is AI?

Rationally? or Humanly?




lol :)


IN
OUT

What is AI?

"*The study of how to make computers do things at which, at the moment, people are better*"
(Rich and Knight, 1991)

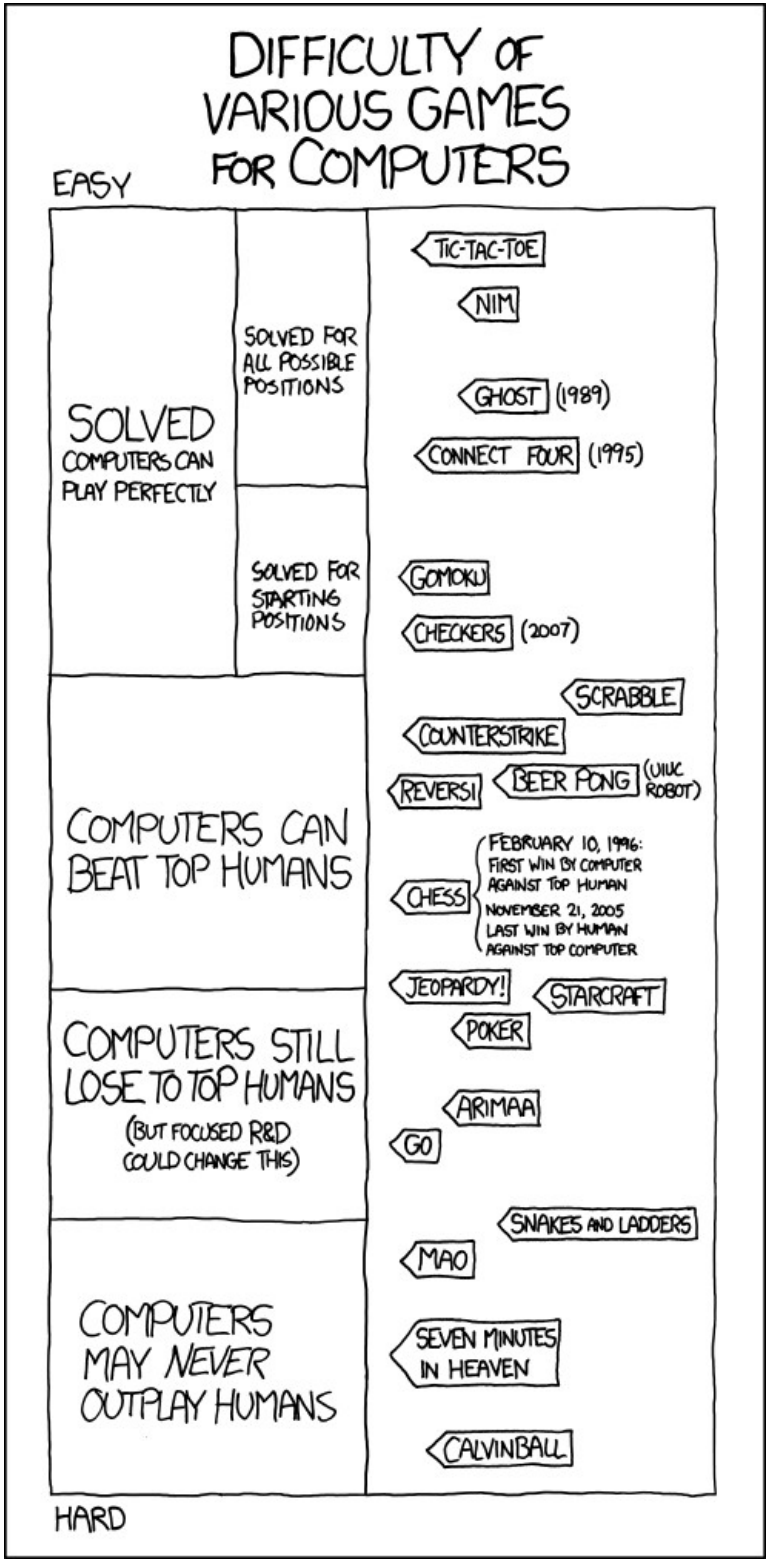
Can we produce AI?

Can we produce AI?

Should we?

What is AI?

"*The study of how to make computers do things at which, at the moment, people are better*"
(Rich and Knight, 1991)


DIFFICULTY OF VARIOUS GAMES FOR COMPUTERS
EASY
SOLVED
COMPUTERS CAN PLAY PERFECTLY
SOLVED FOR ALL POSSIBLE POSITIONS
SOLVED FOR STARTING POSITIONS
COMPUTERS CAN BEAT TOP HUMANS
COMPUTERS STILL LOSE TO TOP HUMANS
(BUT FOCUSED R&D COULD CHANGE THIS)
COMPUTERS MAY NEVER OUTPLAY HUMANS
HARD
TIC-TAC-TOE
NIM
GHOST (1989)
CONNECT FOUR (1995)
GOMOKU
CHECKERS (2007)
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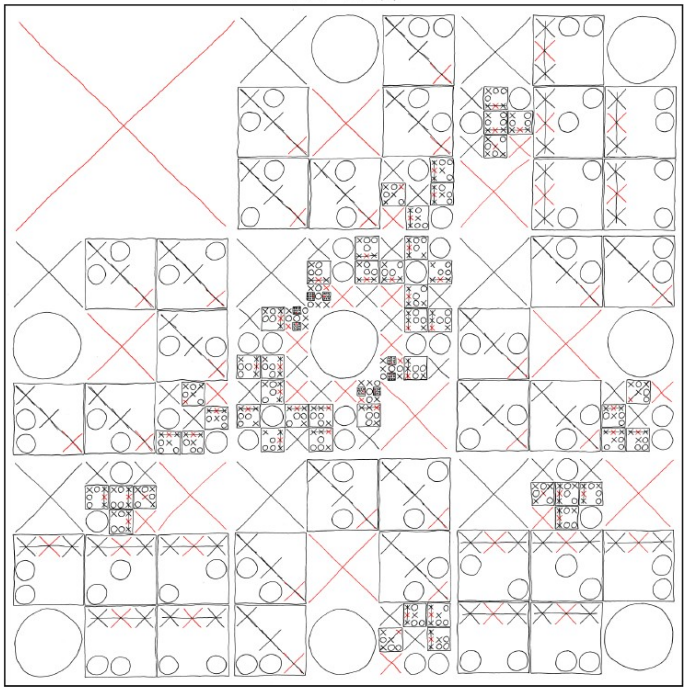
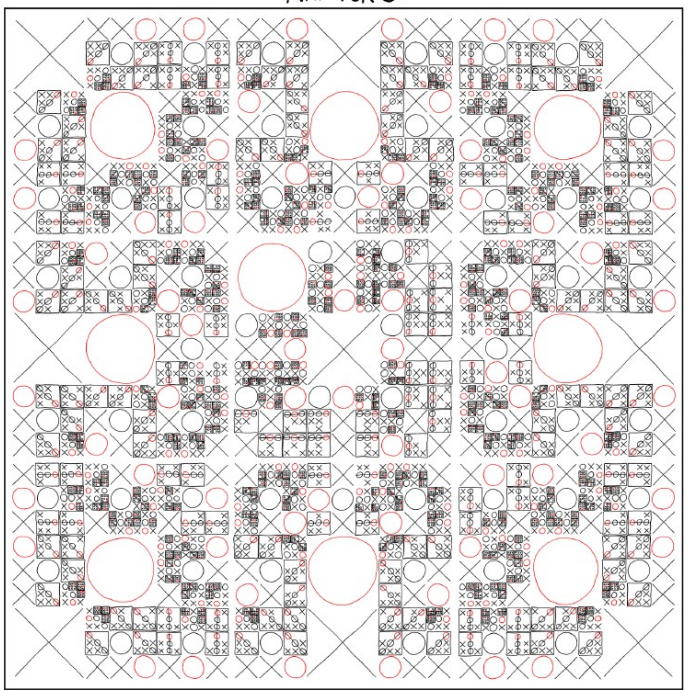
COMPLETE MAP OF OPTIMAL TIC-TAC-TOE MOVES

YOUR MOVE IS GIVEN BY THE POSITION OF THE LARGEST RED SYMBOL ON THE GRID. WHEN YOUR OPPONENT PICKS A MOVE, ZOOM IN ON THE REGION OF THE GRID WHERE THEY WENT. REPEAT.

MAP FOR X:



MAP FOR O:



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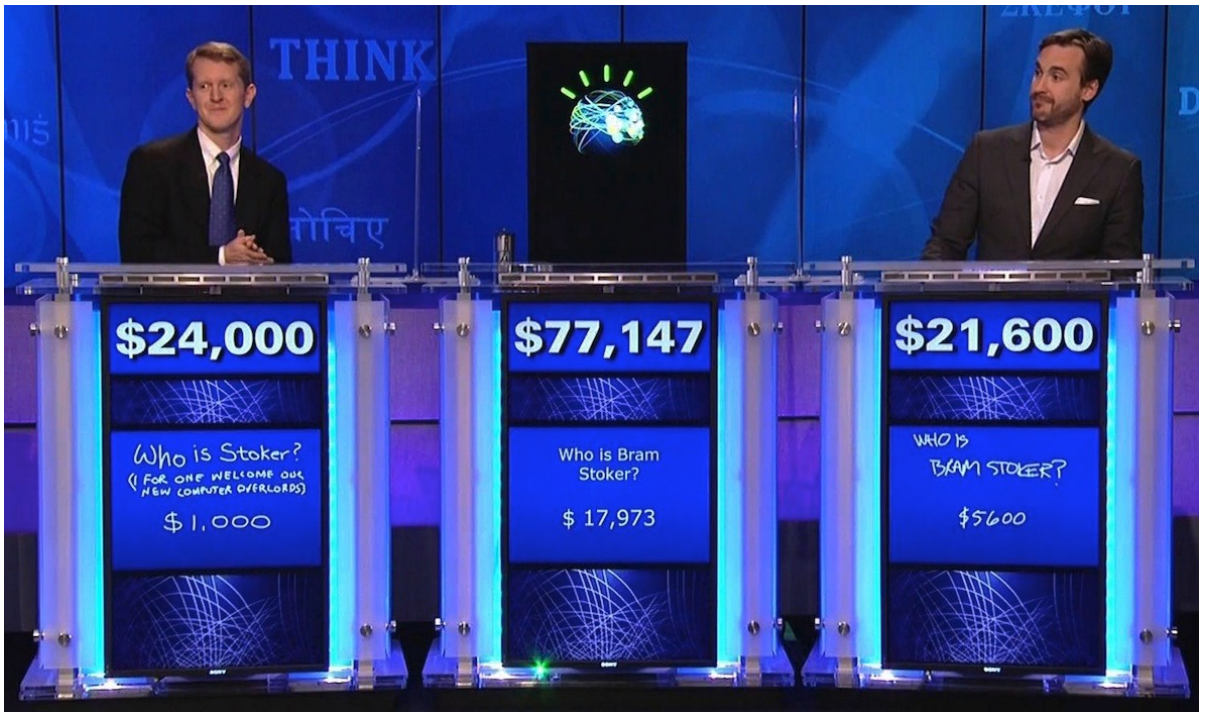

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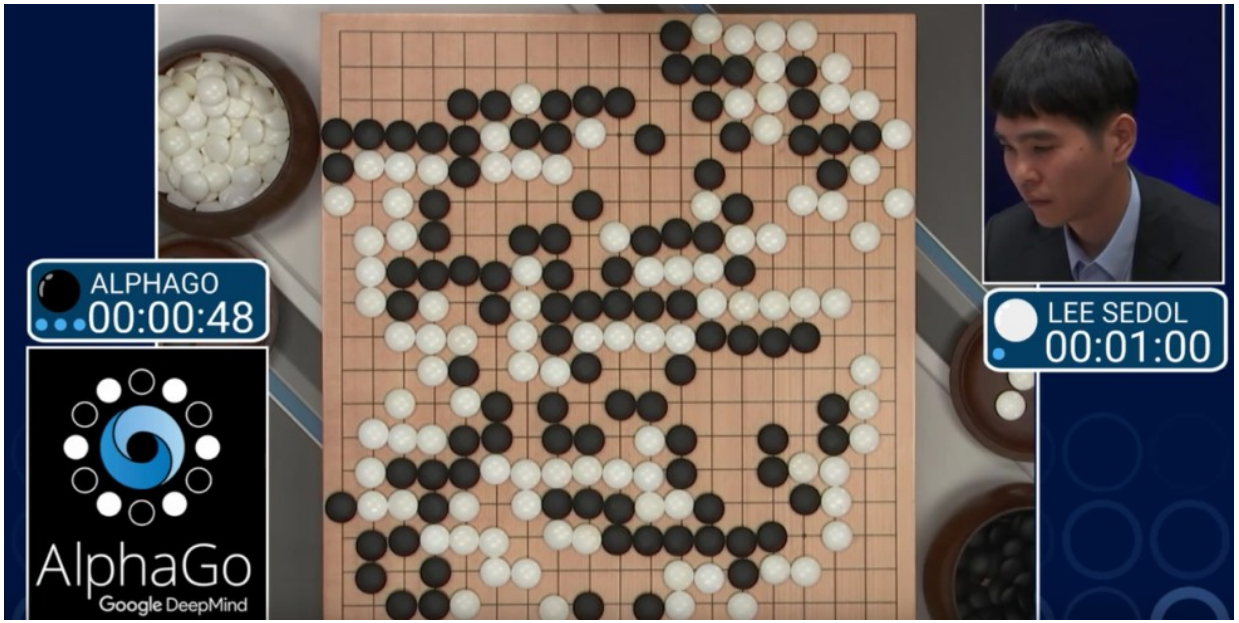

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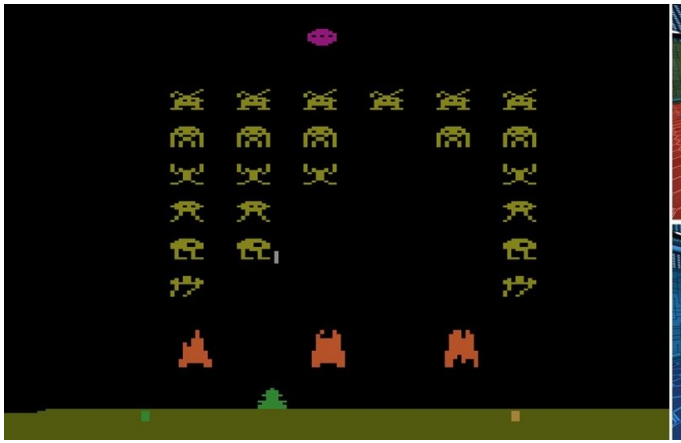

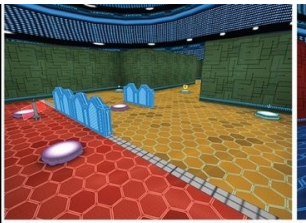

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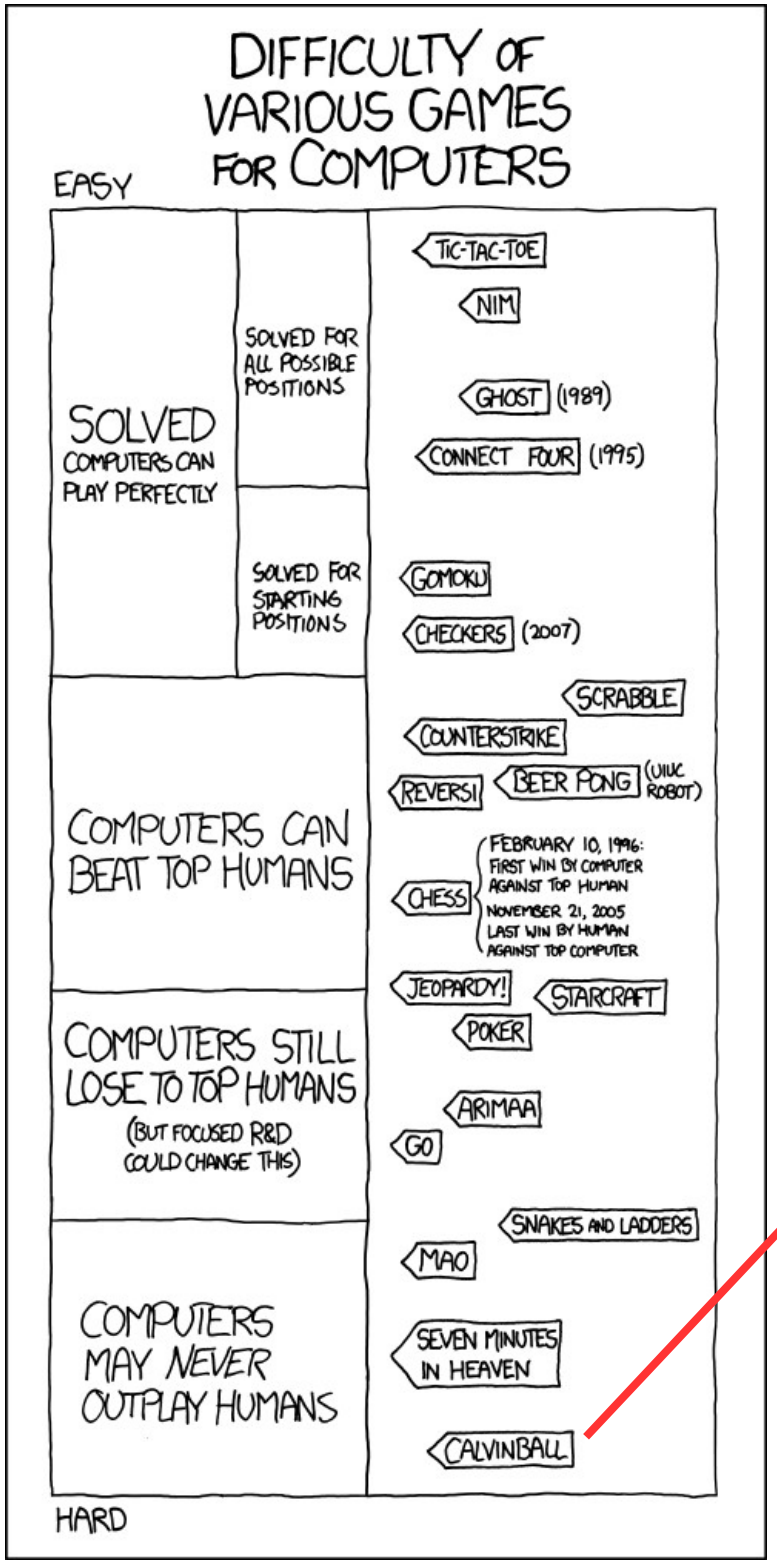
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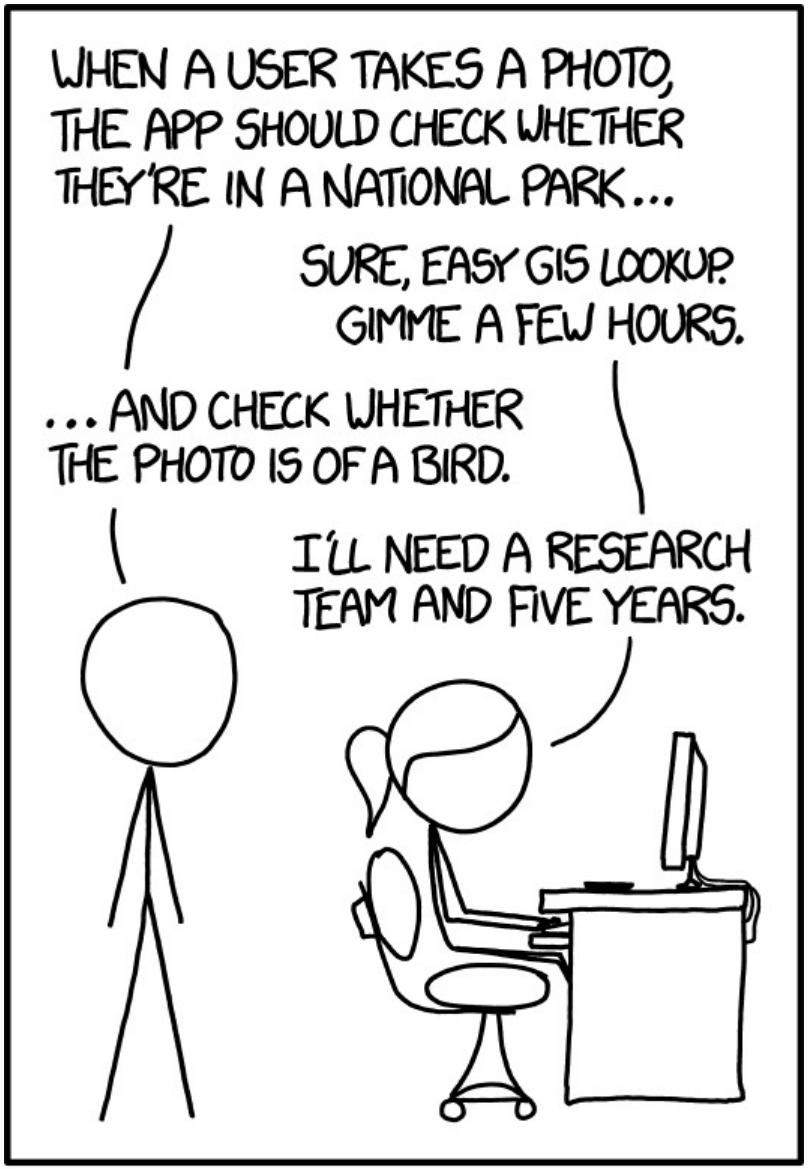
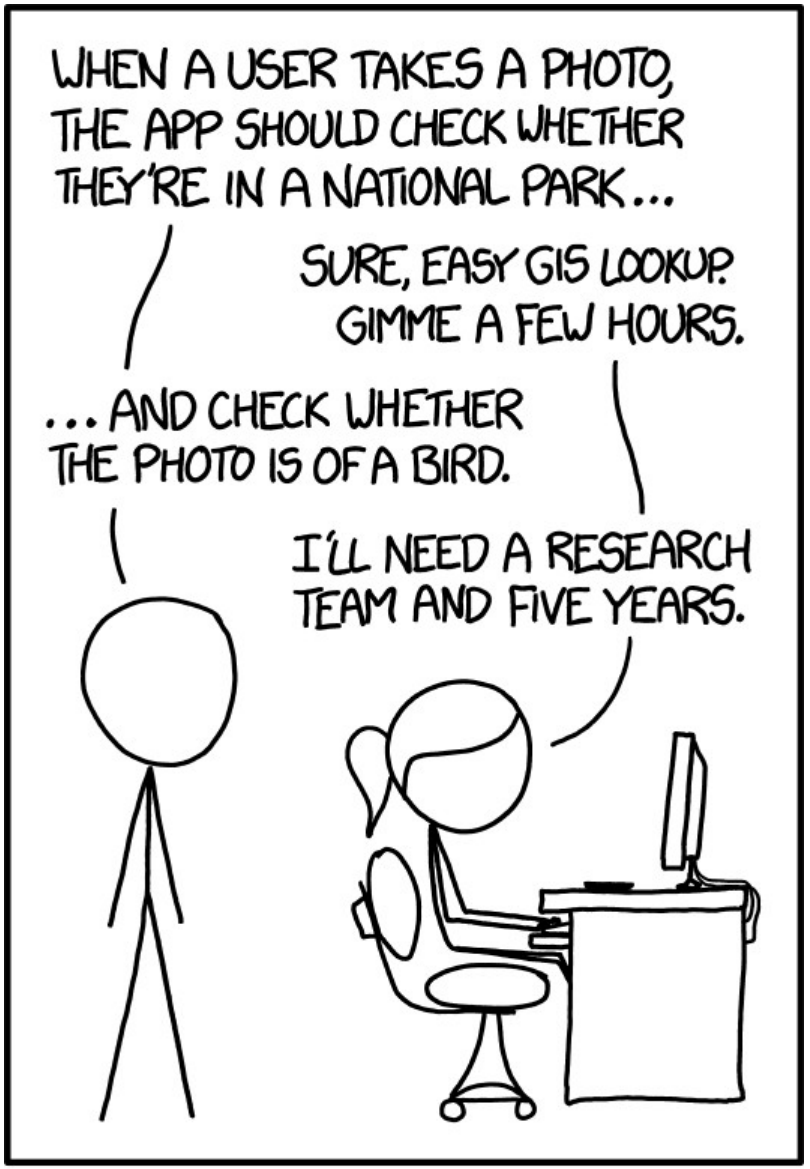
NO SPORT IS LESS ORGANIZED THAN CALVINBALL!
NEW RULE! NEW RULE! IF YOU DON'T TOUCH THE 30-YARD BASE WICKET WITH THE FLAG, YOU HAVE TO HOP ON ONE FOOT!
12
4


THE ONLY PERMANENT RULE IN CALVINBALL IS THAT YOU CAN'T PLAY IT THE SAME WAY TWICE!
THE SCORE IS STILL 0 TO 12!



IN CS, IT CAN BE HARD TO EXPLAIN THE DIFFERENCE BETWEEN THE EASY AND THE VIRTUALLY IMPOSSIBLE.


WHEN A USER TAKES A PHOTO, THE APP SHOULD CHECK WHETHER THEY'RE IN A NATIONAL PARK...
SURE, EASY GIS LOOKUP. GIMME A FEW HOURS.
...AND CHECK WHETHER THE PHOTO IS OF A BIRD.
I'LL NEED A RESEARCH TEAM AND FIVE YEARS.
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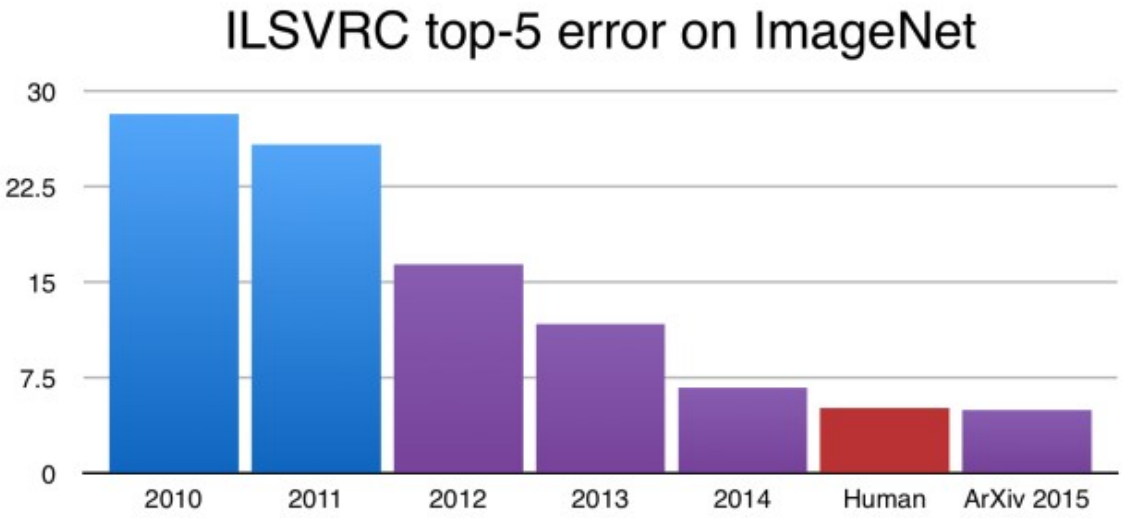
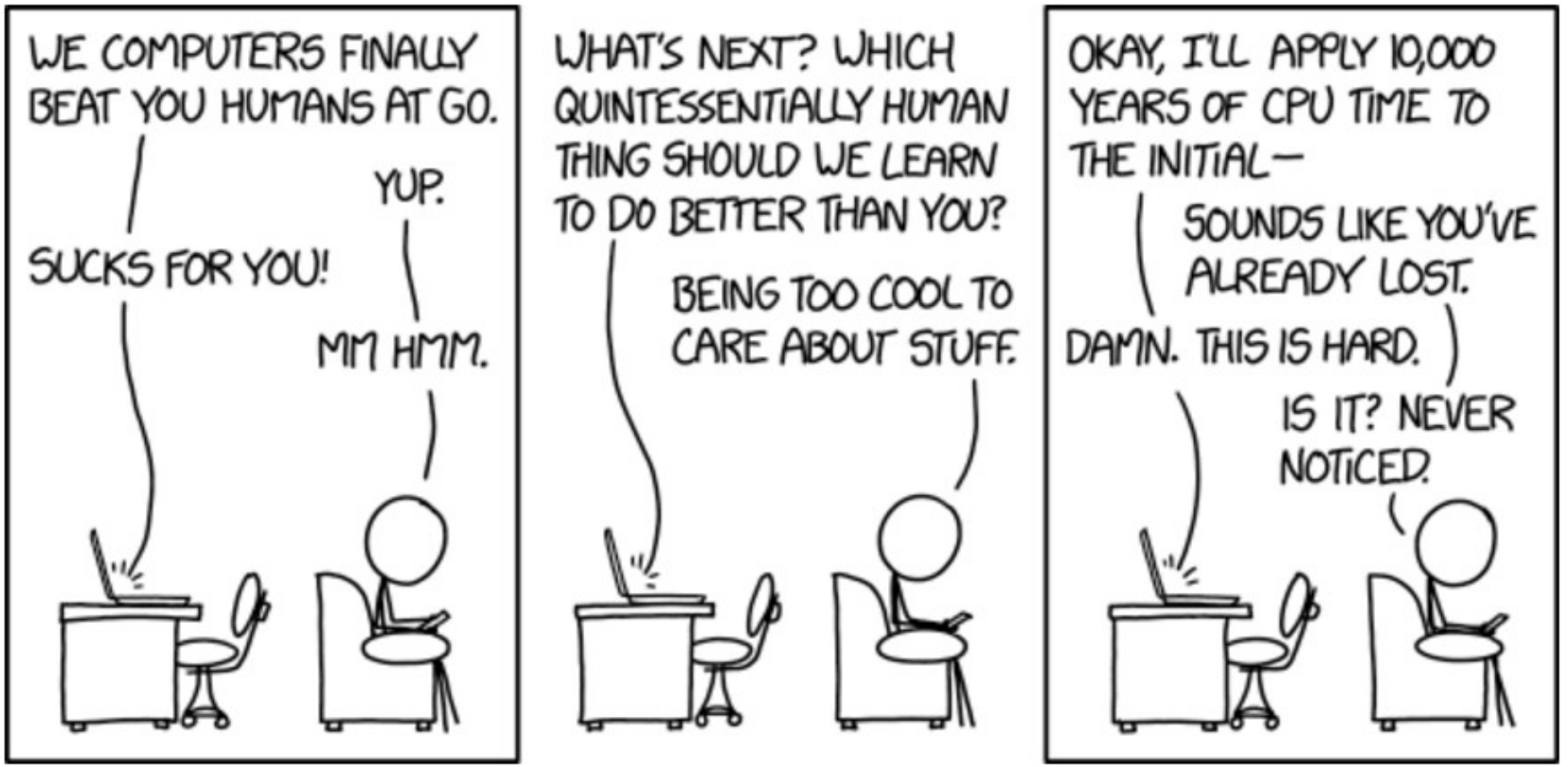

ILSVRC top-5 error on ImageNet
30
22.5
15
7.5
0
2010
2011
2012
2013
2014
Human
ArXiv 2015

Computers vs Humans



History of AI

1943 – First work in AI: McCulloh & Pitts's (artificial neuron)
1949 – First learning rule: Hebb
1950 – First neural network: Minsky and Edmonds
1950 – Alan Turing's “Computing Machinery and Intelligence” sketched out:
Turing test, machine learning, genetic algorithms, reinforcement learning
1956 – Official birth of the field of AI: Dartmouth Conference
1950-60's – “early enthusiasm, great expectations” (10 year prediction)
1960-70's – “a dose of reality” (“AI winter”)
1970s – knowledge-based expert systems (GOFAI)
1980s – industrialization of AI begins
1986 – re-introduction of backpropagation, connectionism
1990s – “AI adpots the scientific method” (HMM, Bayes, data mining)
1995 – intelligent agents (i.e. robotics)
2000s – big data
2010s – further industrialization of AI, and spread across many fields

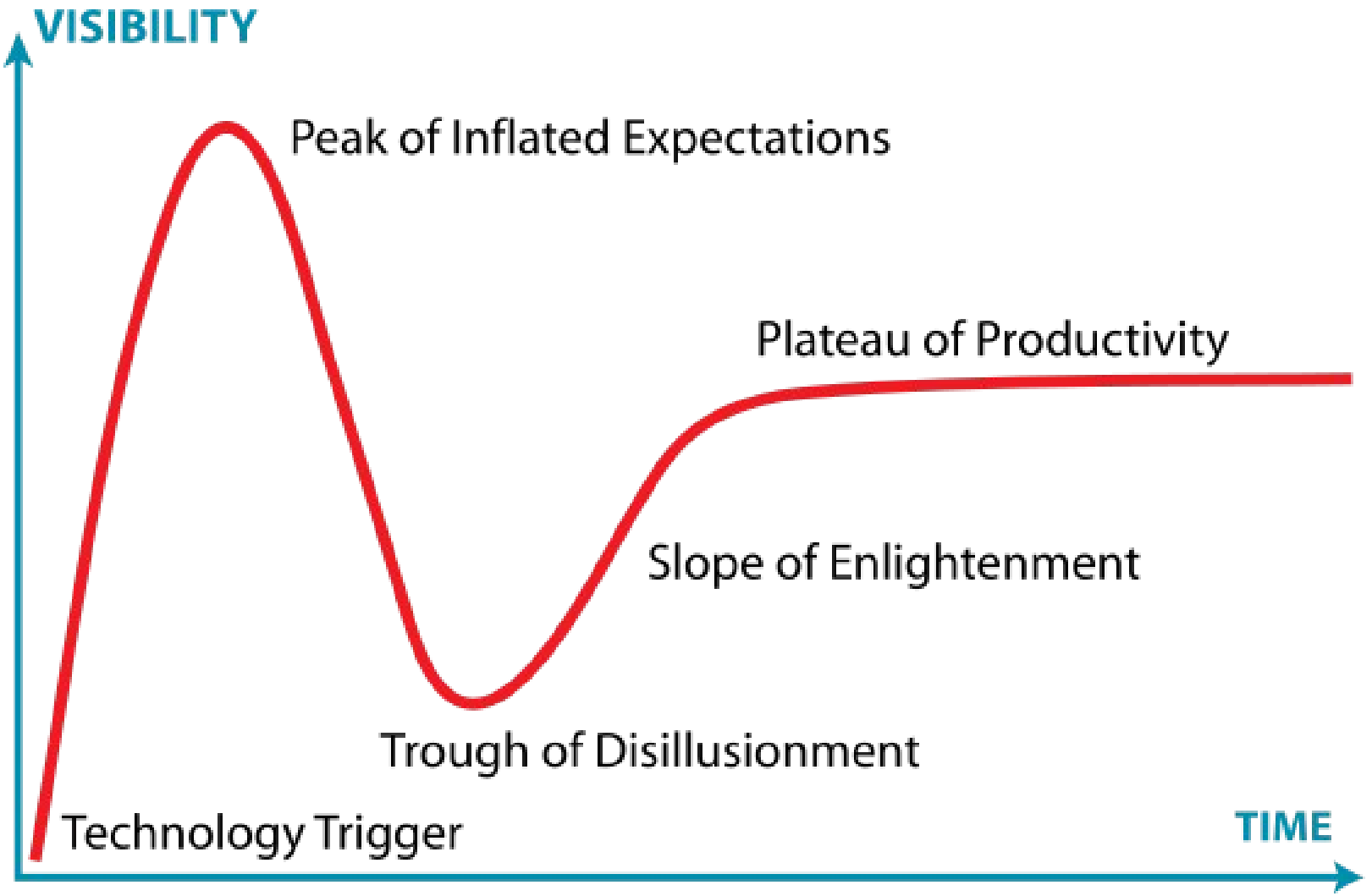
2017 – you took this class!!!

“

We propose that a **2 month**, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that 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. An attempt will be made to find **how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves**. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together **for a summer**.

”

- Dartmouth workshop proposal by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon


VISIBILITY
Peak of Inflated Expectations
Plateau of Productivity
Slope of Enlightenment
Trough of Disillusionment
Technology Trigger
TIME


WINTER
IS
COMING

Summary

(1) theories of intelligence were founded in abstract thought, but have more recently focused on behavior

(2) isn't still not entirely clear how “human” AI should be

(3) games are a great sandbox to pit human against machines (and the machines have been winning!)

(4) the history of AI is filled with great expectation (and often unrealistic ones)

Examples of class projects!

https://www.youtube.com/channel/UCeiDaur181A2lI4CBufSlXA

https://www.youtube.com/user/EvolvingRobots/videos