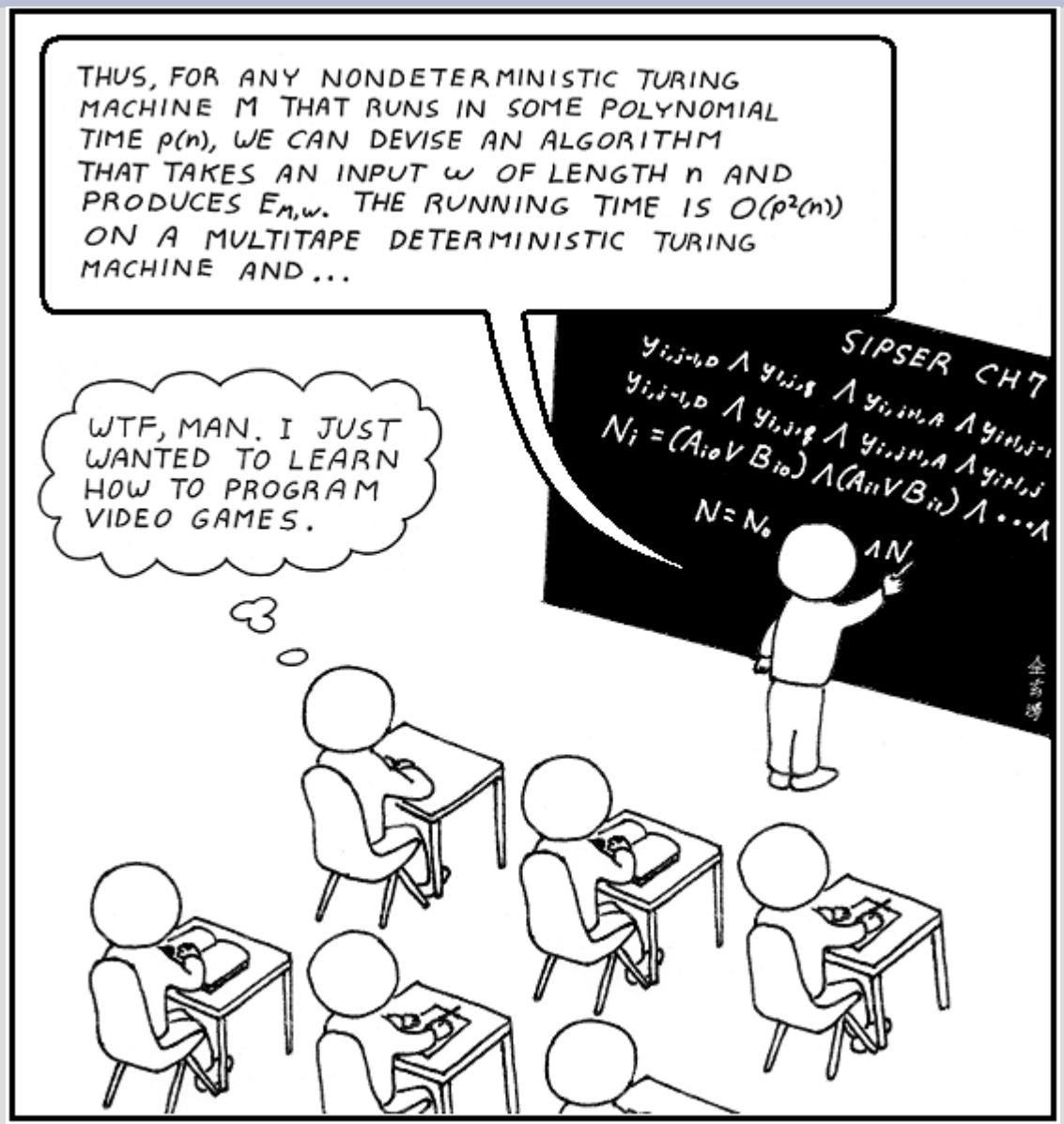
Welcome to CSci 4511W
Introduction to Artificial Intelligence I



Instructor (me)

James Parker
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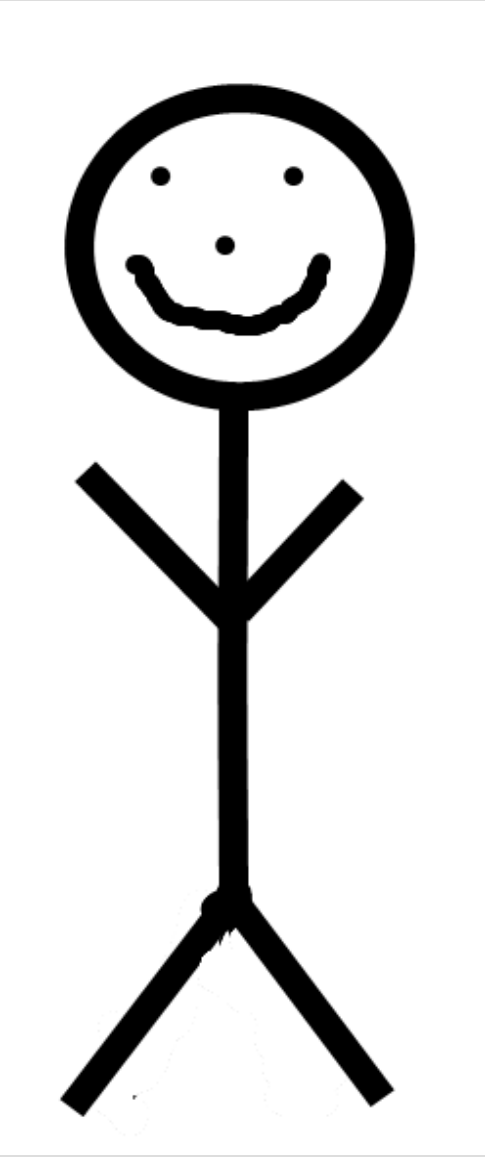
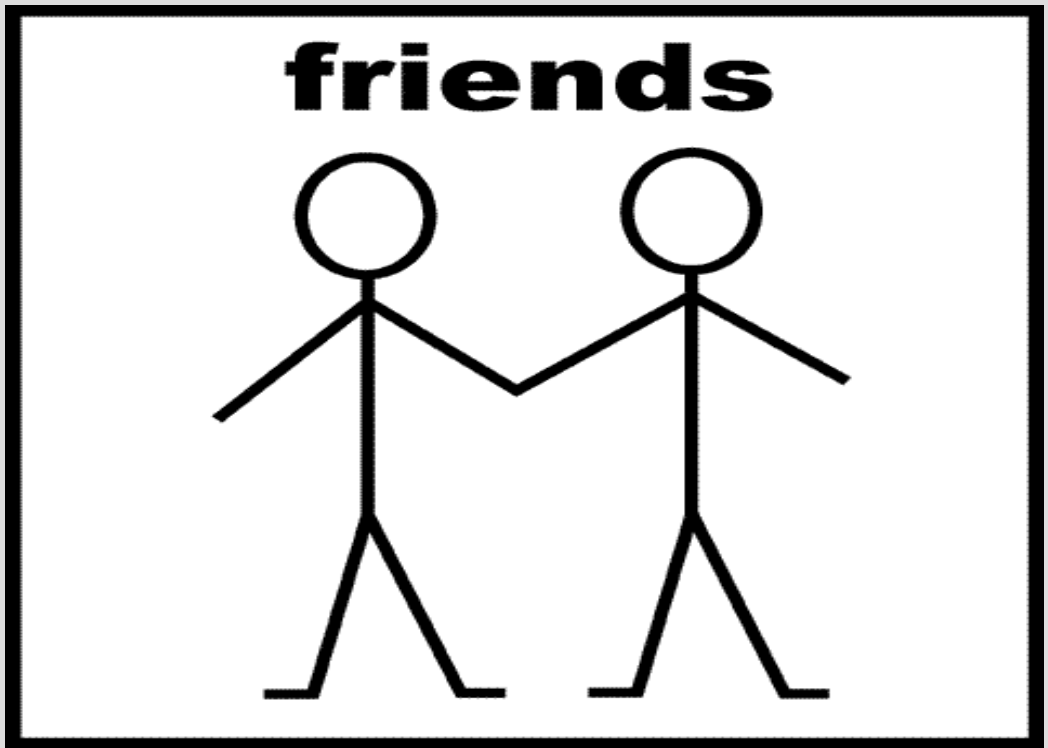


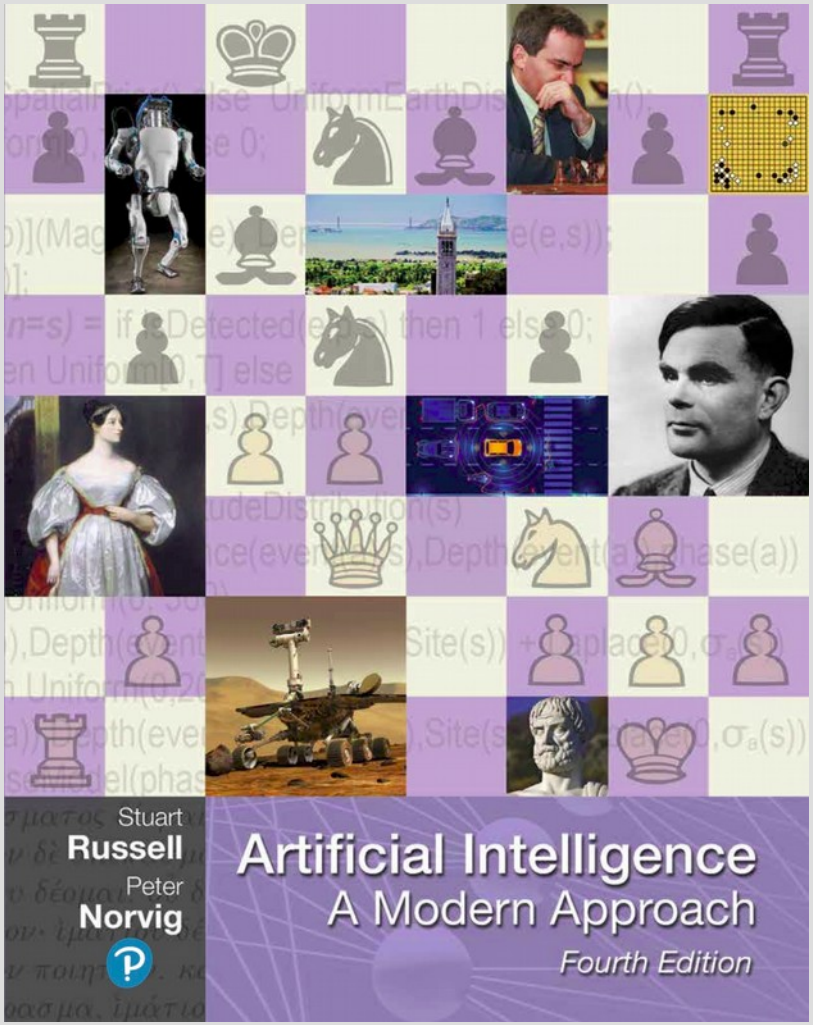
Teaching Assistants

Arvind Renganathan,
Ivan Radkevich



Textbook

Artificial Intelligence
A Modern Approach,
Russel and Norvig,
4th edition



Class website

www.cs.umn.edu/academics/classes
Or google “umn.edu csci class”

Syllabus, schedule, slides, homework posting

Class website

Campuses: Twin Cities | Crookston | Duluth | Morris | Rochester | Other Locations

UNIVERSITY OF MINNESOTA
Driven to Discover℠

myU | One Stop

COLLEGE OF Science & Engineering

CSE Home | CSE Directory | Give to CSE | Student Dashboard

- Home
- Office Hours
- Syllabus
- Canvas (grades and hw submission)

CSci 4511W: Artificial Intelligence

Schedule*

This is an approximate schedule. It will be updated as the class progresses.

Week	Week Of	Topics	Lecture Materials	Readings	Exams	Due
1	Jan. 20	Introduction: HI!	1/22	Ch. 1-2		
2	Jan. 27	Agents, Problem Solving and Search		Ch. 2-3		
3	Feb. 3	Search		Ch. 3-4		HW 1, Monday Feb. 3 at 11:55 P.M.
4	Feb. 10	Search and Heuristics		Ch. 4		Writing 1, Monday Feb. 10 at 11:55 P.M.
5	Feb. 17	Local Search and Game Playing		Ch. 5		HW 2, Monday Feb. 17 at 11:55 P.M.
6	Feb. 24	Game Playing		Ch. 5	**Midterm 1, Monday Feb. 24**	
7	March 2	Game Theory		Ch. 17.5		Writing 2, Monday March 2 at 11:55 P.M.
	March 9	Spring Break				
8	March 16	Constraint Satisfaction		Ch. 6		HW 3, Monday March 16 at 11:55 P.M.
9	March 23	Propositional Logic		Ch. 8		Writing 3, Monday March 23 at 11:55 P.M.
10	March 30	First Order Logic		Ch. 9		HW 4, Tuesday Monday March 30 at 11:55 P.M.
11	April 6				**Midterm 2, Monday**	

Class websites: recap

Public CS website:
post HW, slides, schedule,
office hours

Canvas: grades (discussion?)

Gradescope: HW submission,
feedback for HW & tests (rubric)

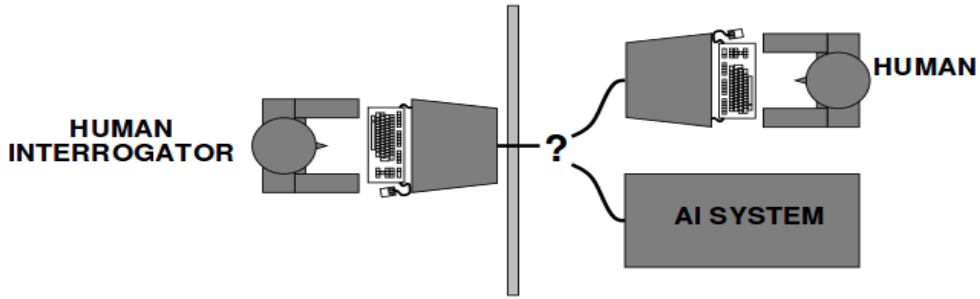
Don't like my slides? =(

http://aima.eecs.berkeley.edu/slides-pdf/

Acting humanly: The Turing test

Turing (1950) "Computing machinery and intelligence":

- "Can machines think?" ⟶ "Can machines behave intelligently?"
- Operational test for intelligent behavior: the Imitation Game



- Predicted that by 2000, a machine might have a 30% chance of fooling a lay person for 5 minutes
- Anticipated all major arguments against AI in following 50 years
- Suggested major components of AI: knowledge, reasoning, language understanding, learning

Problem: Turing test is not **reproducible**, **constructive**, or amenable to **mathematical analysis**

Prerequisites

1. Competent programmer and understand big-O

2. Understanding of data structures (graphs and trees)

3. Basic knowledge of formal logic (truth tables, boolean ops)

Syllabus

30% Homework (-15% per day late)
20% Writing assignments (-15% pdl)
15% Project
10% Midterm (Tuesday Oct. 14)
10% Midterm 2 (Tuesday Nov. 16)
15% Final (Thursday Dec. 16)

Homework

Homework and written assignments are individual assessments (unless explicitly stated otherwise)

Please ensure the work you turn in is your own

Writing assignments

The writing assignments will use Latex (down with docx!)

The first few will be reviews of related topics and the last couple will tie into the project

These can be resubmitted within two weeks of being returned for another regrade (once) for a maximum of +20

Exams

All exams are open book/notes (most people think they are hard)

You can use an electronic device if you want on exams, but no:

- phones
- internet
- running code (ish)

Exams

For now the exams are planned to be in-class for the whole period

However, this is subject to change if things get unsafe

Syllabus

Grading scale:
93% A
90% A-
87% B+
83% B
80% B-
77% C+
73% C
70% C-
67% D+
60% D
Below F

Schedule

Week 1-4, Ch 1-4 - Intro & Search
Week 5-6, Ch 5, 17.5 - Game playing
Week 7-11, Ch 6-9 - Logic
Week 12-14, Ch 10, 12 - Planning
Week 15 - Special topics

There will be one assignment (or exam) every week (first assignment due Sept. 21)

Project

The project will be a large part of the class and should be about 10-12 pages and include:

-Title, authors, abstract
-Introduction & problem description (1-2 pg)
-Literature review (2-3 pages)
-Description of your approach (2-3 pages)
-Analysis of results (1-2 pages)
-Conclusion and summary
-Bibliography

Project

You may work on the project with partner, but we will expect higher quality of work

If you form a group, you must also submit a the specific contributions of each member

The project should reflect about 50 hours of work per person (including reading, programing and writing)

Project

You pick the project, but must use knowledge representation (something interesting)

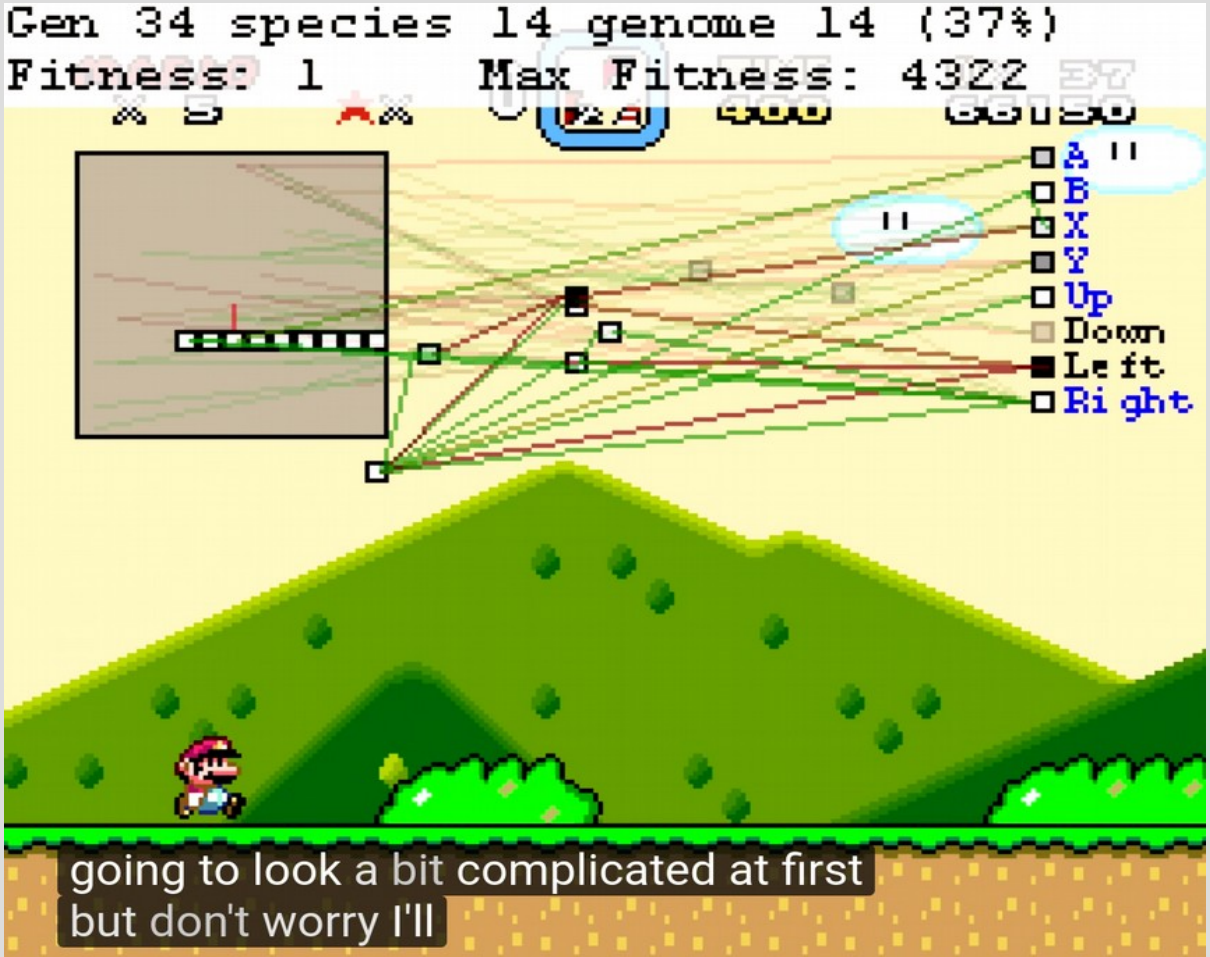
Some ideas:

-AI for a game (3D tic-tac-toe, board games...)
-Spam filter (naive Bayes probability)
-Use A* to plan paths around Minneapolis
-Agent behavior in a system (evacuation or disaster rescue)
-Planning (snail-mail delivery, TSP)

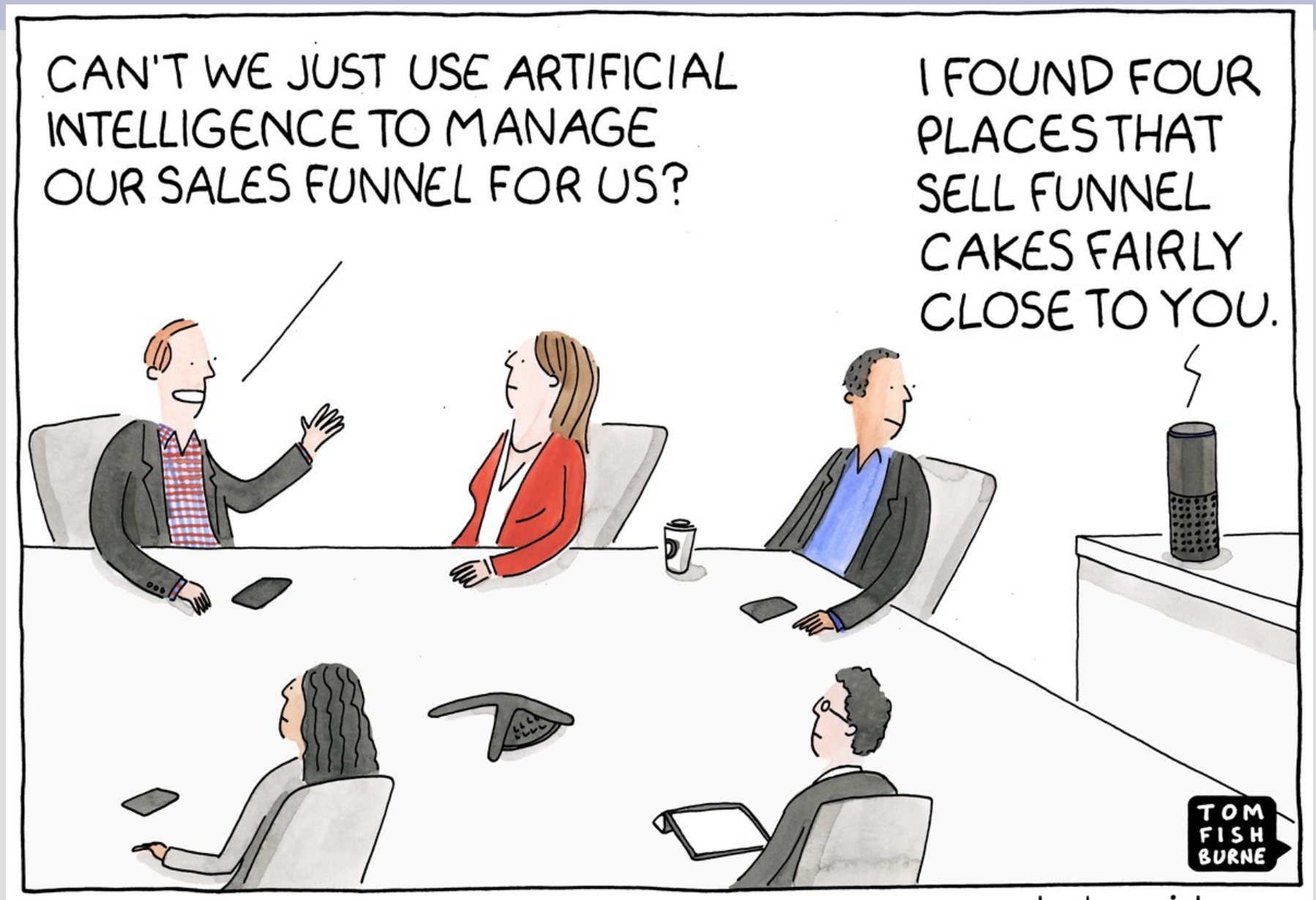
Project

Mario?

https://www.youtube.com/watch?v=qv6UVOQ0F44



Artificial Intelligence



Agent/robot

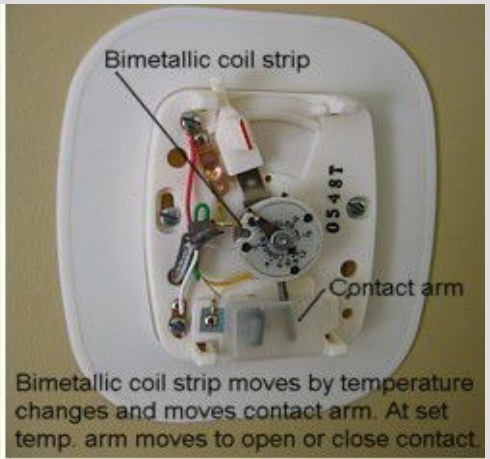
Let's start by defining what we mean by artificial (i.e. robot)

For our purpose, a robot/agent:
- Perceives the environment
- Pursues a goal (and knows it)
- Can manipulate/affect environment

Agent/robot

Is this a robot?

.... How about this?



Intelligence

What is intelligence?

Intelligence

What is intelligence?
-No convenient definition

What is rational?

Intelligence

What is intelligence?
-No convenient definition

What is rational?
-Acts on knowledge to achieve “best outcome”

Rationality

Thus a rational agent acts to achieve the best outcome or goal (or best in expectation with uncertainty)

A limitedly rational agent makes the best choice with limited computation (also called “online algorithms”)

Rationality

Often times, fully exploring all the options is too costly (takes forever)

possible positions

possible ways to play out every game

Chess: 10^{47} states (tree about 10^{123})

Go: 10^{171} states (tree about 10^{360})

At 1 million states per second...

Chess: 10^{109} years

Go: 10^{346} years

Turing Test

For a long time, the Turing Test was a supposed indication of intelligence

A person would question two entities and have to determine which one is the computer and human

This is not very popular anymore

Turing Test

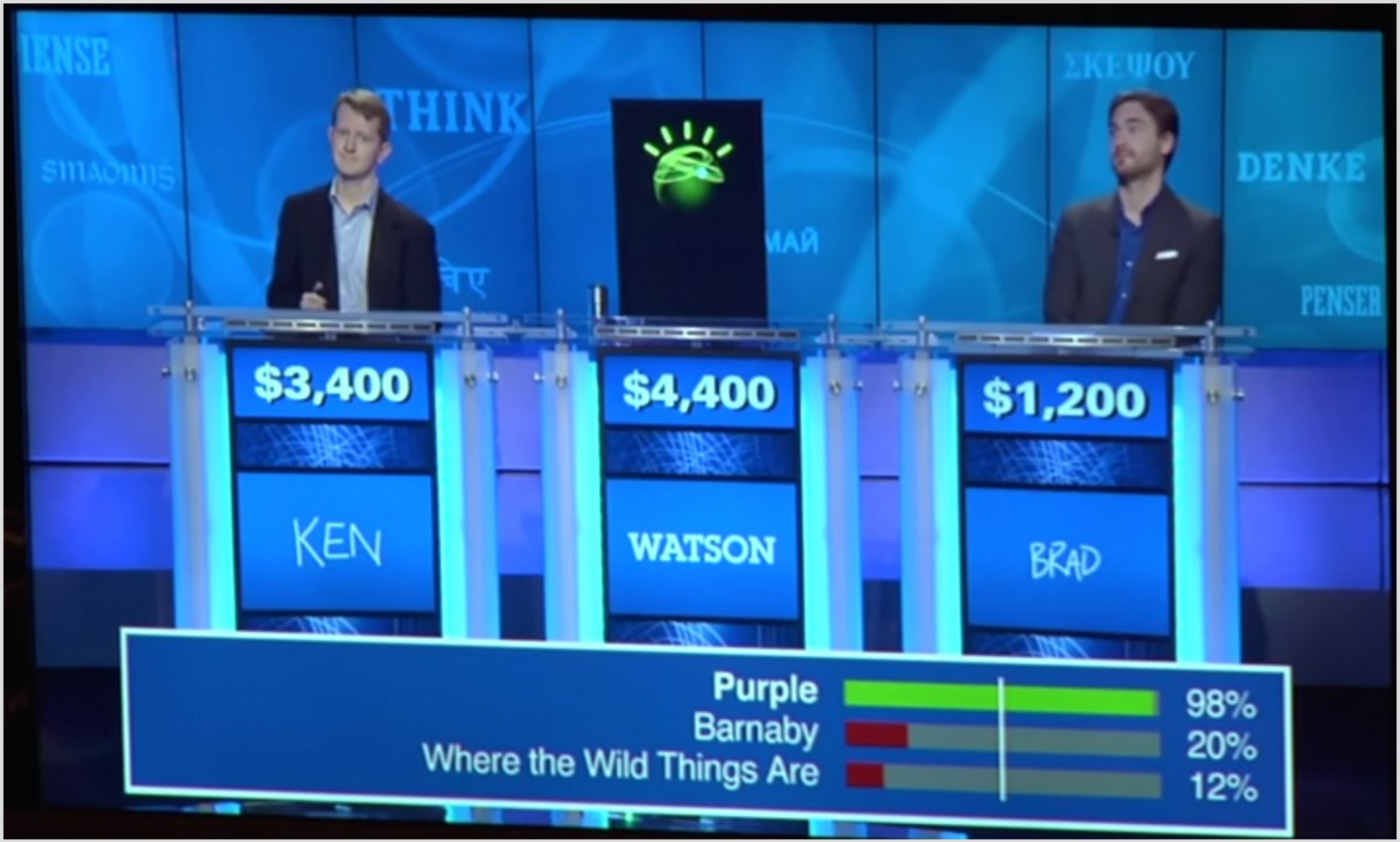
To pass the Turing Test, a computer needs the following:

- Natural language processing (as the test is written and not verbal)
- Knowledge representation (storage)
- Reasoning (logical conclusions)
- Machine Learning (extrapolation)

Turing Test

Jeopardy!

https://www.youtube.com/watch?v=WFR3lOm_xhE



AI

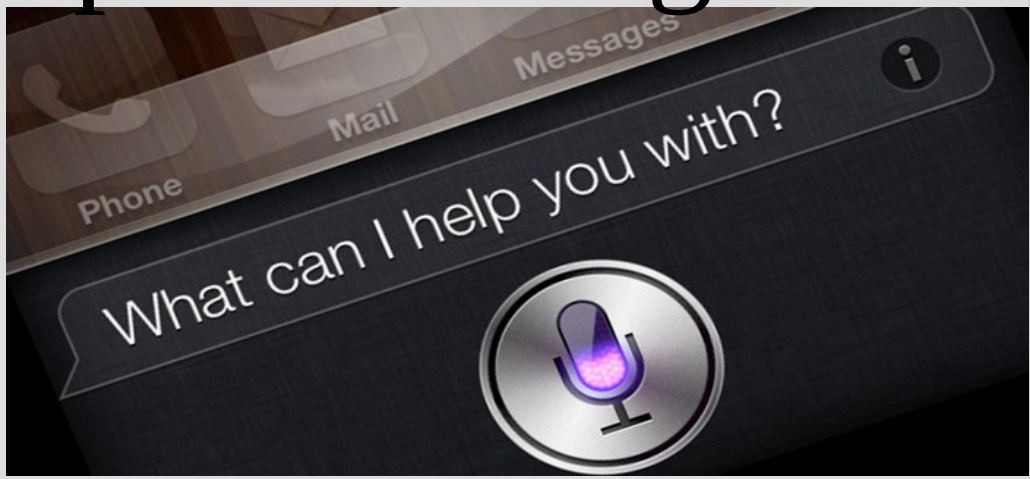
Simple computers have been built for hundreds of years

For artificial intelligence to mature, it needed to borrow from other fields:
Math - logic and proofs
Statistics - probability
Economics - utility

AI

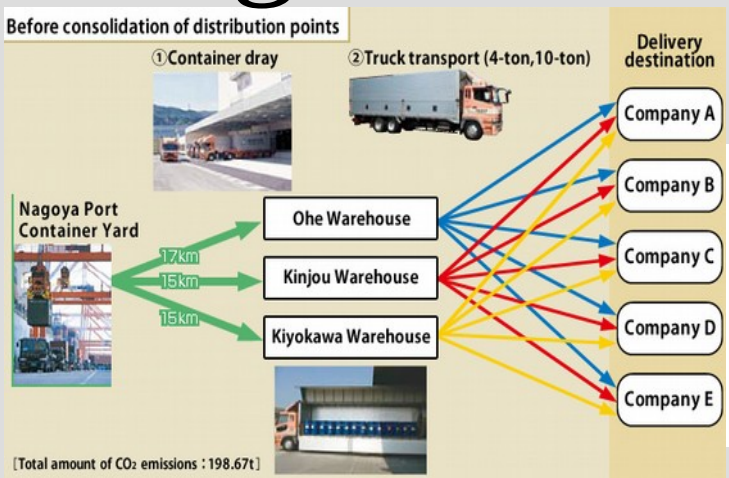
Self driving cars

Speech recognition



Game playing

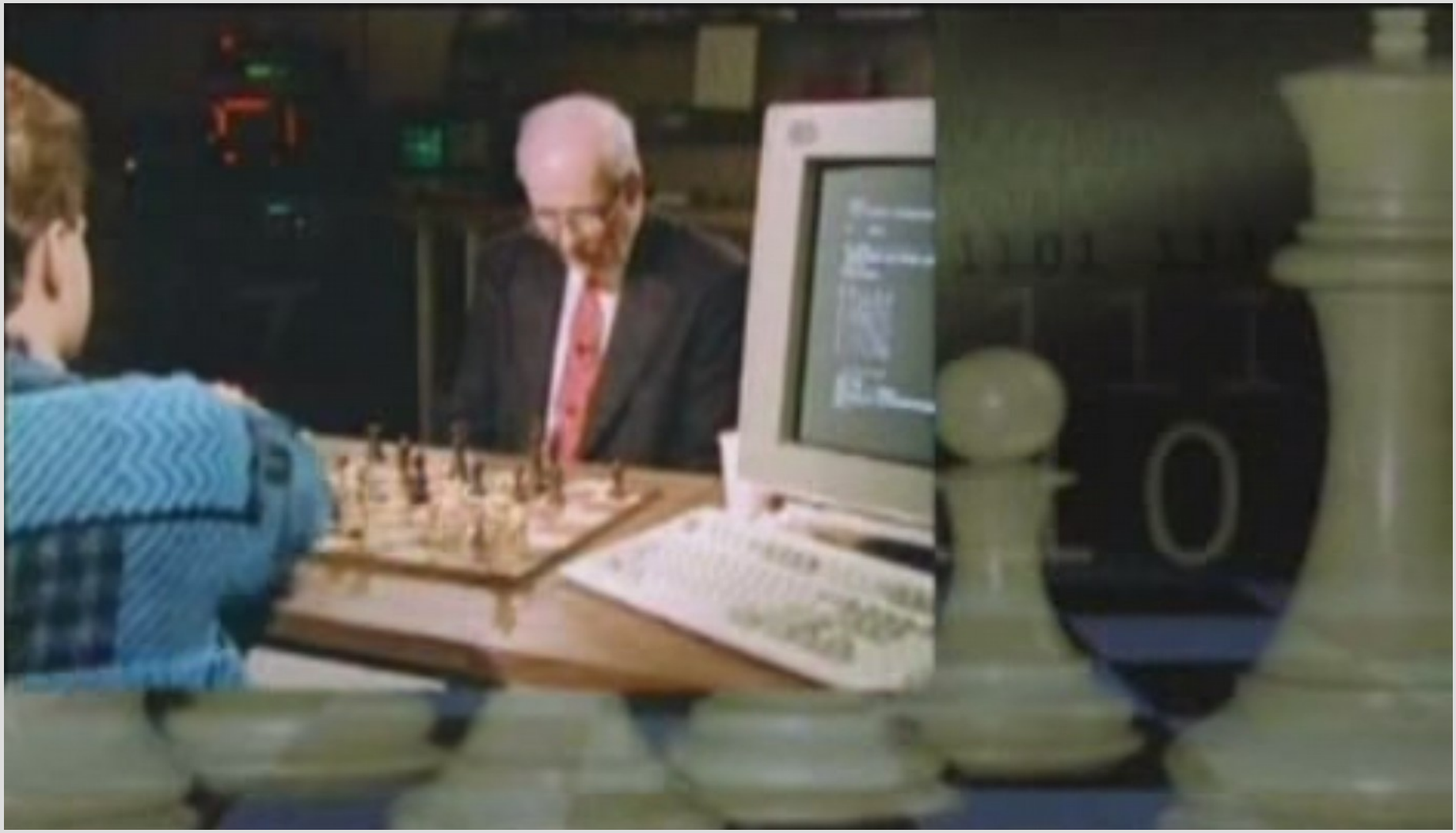
Logistics



Spam filter

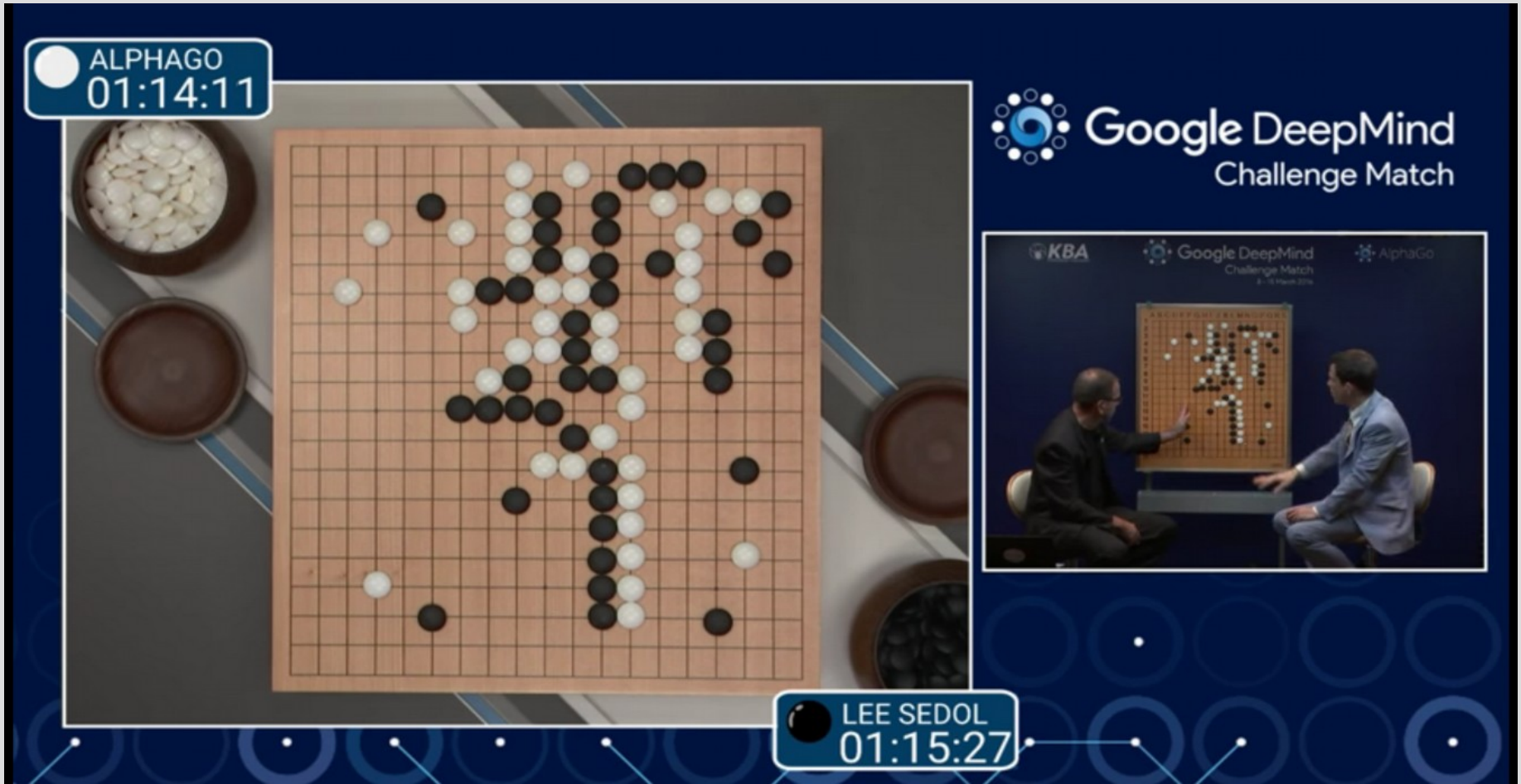
AI - Chess

Spring 1997 - Deep(er) Blue (CMU / IBM)



AI - Go

Spring 2016 - AlphaGo (Google)
December 2017- AlphaZero



AI - Dota2

August 2017 - OpenAI (Elon Musk)

https://www.youtube.com/watch?v=l92J1UvHf6M&feature=youtu.be

AlphaStar – Jan. 2019

Starcraft2

https://www.youtube.com/watch?v=cUTMhmVh1qs