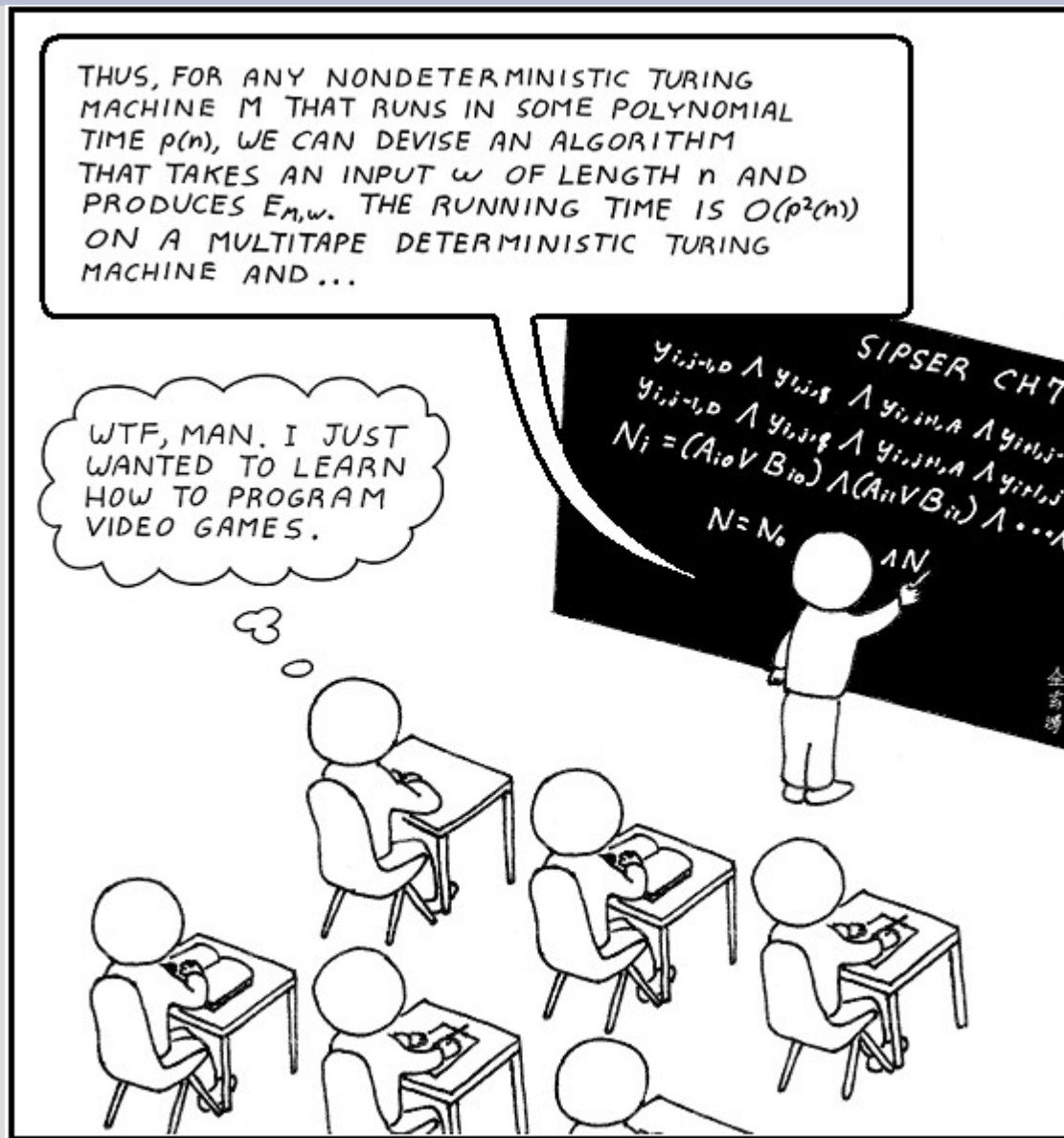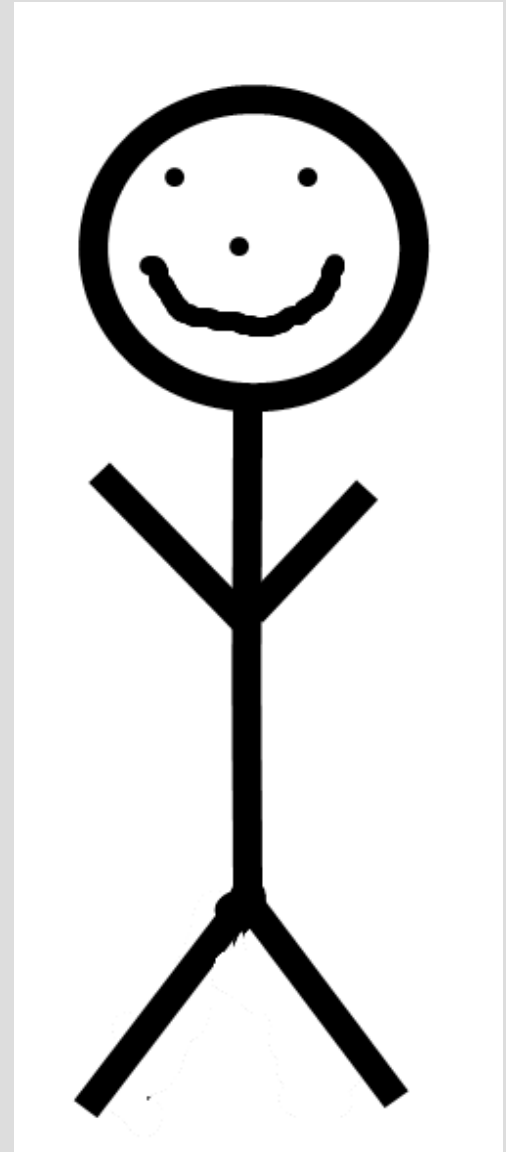# Welcome to CSci 4511W Introduction to Artificial Intelligence I
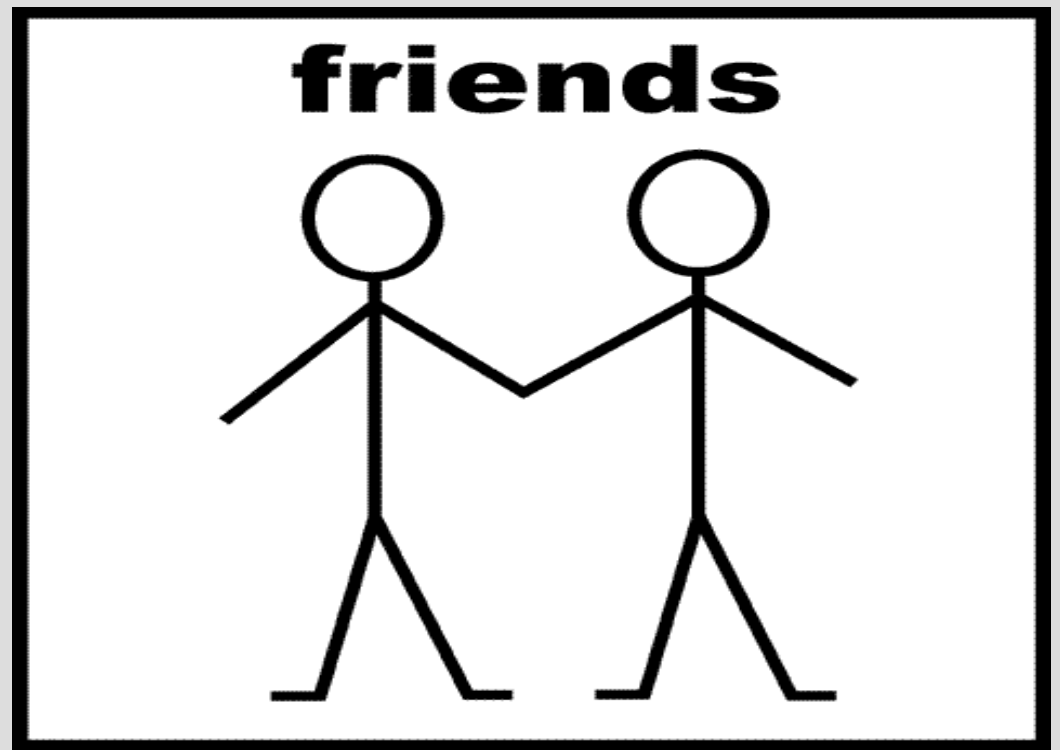
Instructor (me)

James Parker
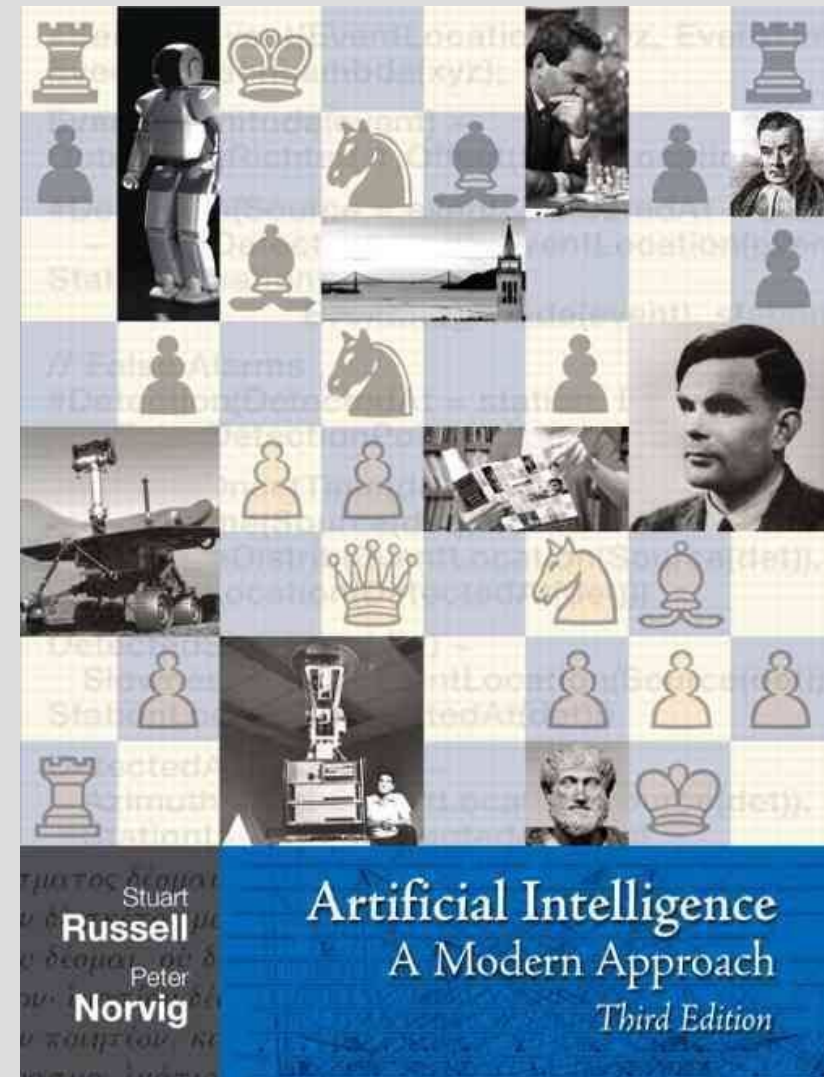Shepherd Laboratories 391

Primary contact:
jparker@cs.umn.edu

Teaching Assistants

Rahul Bhojwani,
Benjamin Hillmann,
Yan Luo,
Fei Wu

Textbook

Artificial Intelligence
A Modern Approach,
Russel and Norvig,
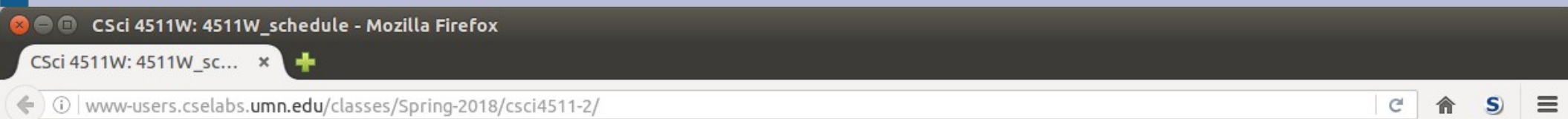3rd edition

Class website

www.cs.umn.edu/academics/classes

Or google "umn.edu csci class"

Syllabus, schedule, other goodies

Moodle page will have grades and homework submission

www.cs.umn.edu

Campuses: Twin Cities Crookston Duluth Morris Rochester Other Locations

UNIVERSITY OF MINNESOTA
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Search U of M Web Sites   **Search**

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Home

Office Hours

Syllabus

Moodle (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. 15	Introduction: HI!	1/16	Ch. 1-2		
2	Jan. 22	Agents, Problem Solving and Search		Ch. 2-3		
3	Jan. 29	Search and Heuristics		Ch. 3-4		HW 1, Sunday Feb. 4 at 11:55 P.M.
4	Feb. 5	Other search algorithms		Ch. 4		Writing 1, Sunday Feb. 11 at 11:55 P.M.
5	Feb. 12	Game playing		Ch. 5		HW 2, Sunday Feb. 18 at 11:55 P.M.
6	Feb. 19	Game playing		Ch. 17.5		
7	Feb. 26	Constraint satisfacation		Ch. 6	**Midterm 1, Tuesday Feb. 27**	Writing 2, Sunday March 4 at 11:55 P.M.
8	March 5	Propositional logic		Ch. 7		HW 3, Sunday March 11 at 11:55 P.M.
	March 14	Spring Break				
9	March 20	First-order logic		Ch. 8		Writing 3, Sunday March 25 at 11:55 P.M.
10	March 26	Inference in logic		Ch. 9		HW 4, Sunday April 1 at 11:55 P.M.

Don't like my slides? (tough)

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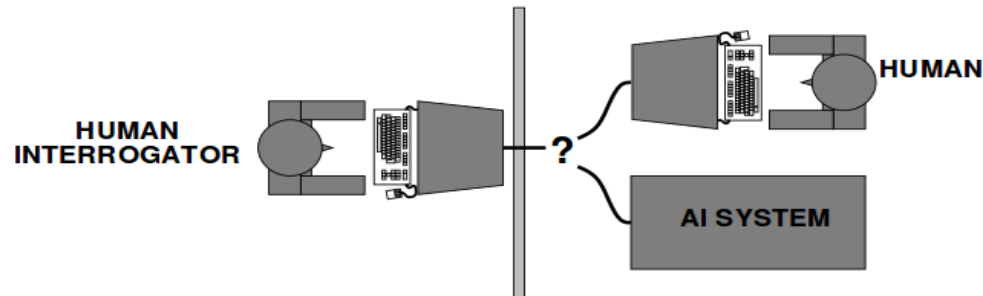
◇ Predicted that by 2000, a machine might have a 30% chance of fooling a lay person for 5 minutes
◇ Anticipated all major arguments against AI in following 50 years
◇ Suggested major components of AI: knowledge, reasoning, language understanding, learning

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

Prerequisites

1. Competent programmer

2. Understanding of data structures (graphs and trees)

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

Syllabus

25% Homework (-15% per day late)

20% Writing assignments (-15% pdl)

15% Project

10% Midterm (Tues. Feb. 27)

10% Midterm (Tues. April 10)

20% Final (Tues. May 6,
    8:00-10:00am)

3%   Extra credit in-class activies

Syllabus

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

Syllabus

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

Please ensure the work you turn in is your own

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 on Sundays (first one due Feb. 4)

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)

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 with partner if you wish, 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

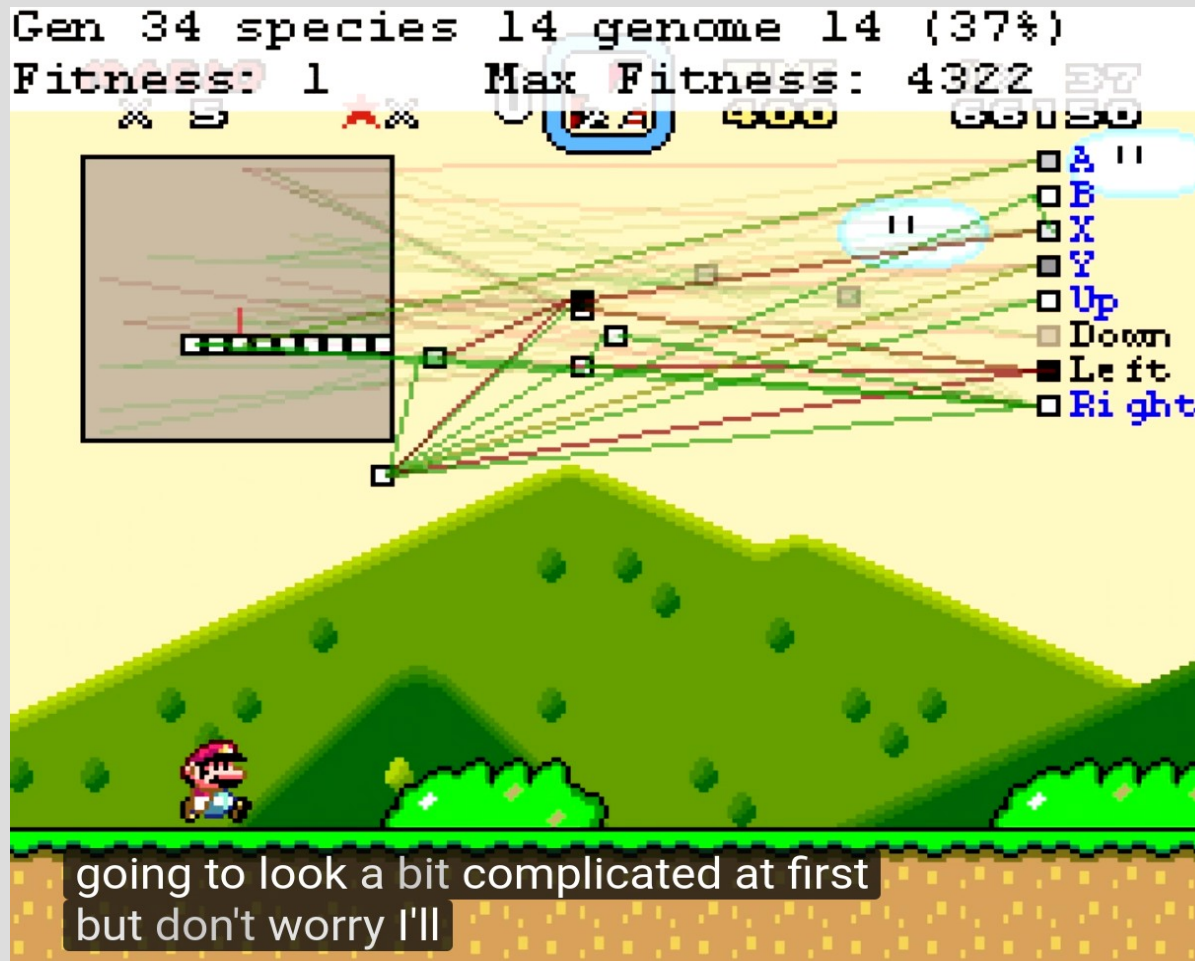You pick the project, but must use knowledge representation (something interesting)

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 resuce)
-Planning (snail-mail delivery, TSP)

Project

Mario?

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

Syllabus

Any questions?

AI

What is intelligence?

AI

What is intelligence?
-No convenient definition

What is <u>rational</u>?

AI

What is intelligence?
-No convenient definition

What is <u>rational</u>?
-Acts on knowledge to achieve "best
  outcome"

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

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

Agent/robot

The formal definition of a robot is not very useful either

For our purpose, a robot/agent:
- Perceives the environment
- Adapts to changes
- Pursues a goal

Agent/robot

Is this a robot?

HUGE MESS: YOU MAD BRO?

ROOMBA 880!

.... How about this?

MECHANICAL CONTACT THERMOSTAT

Bimetallic coil strip

Bimetallic coil strip moves by temperature changes and moves contact arm. At set temp. arm moves to open or close contact.
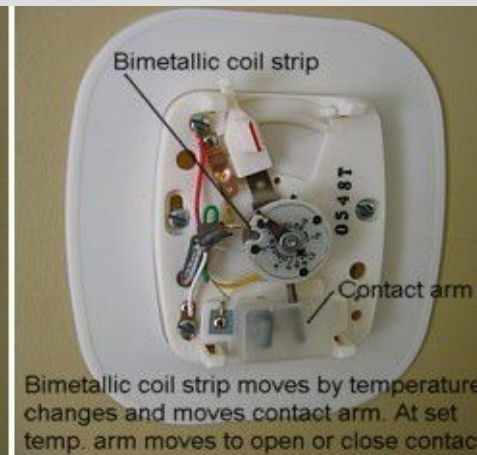
Agent/robot

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

A <u>limitedly rational agent</u> makes the best choice with limited computation (also called online algorithms)

Agent/robot

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

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

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
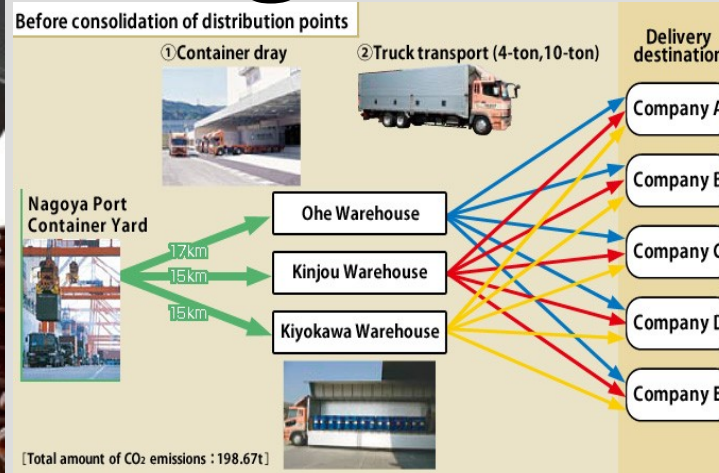Statistics - probability
Economics - utility

AI

Self driving cars

Speech recognition
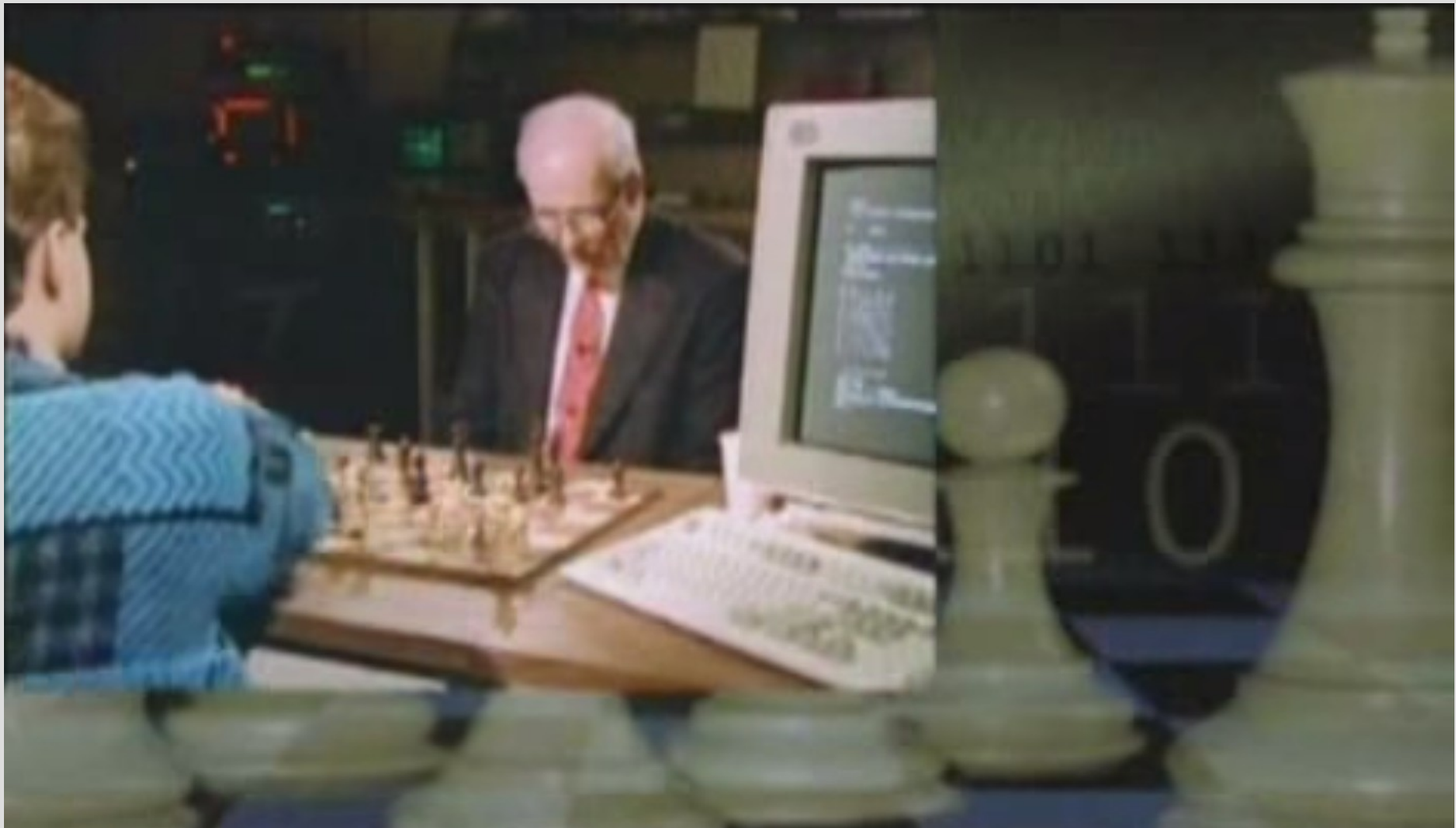

Game playing

Logistics
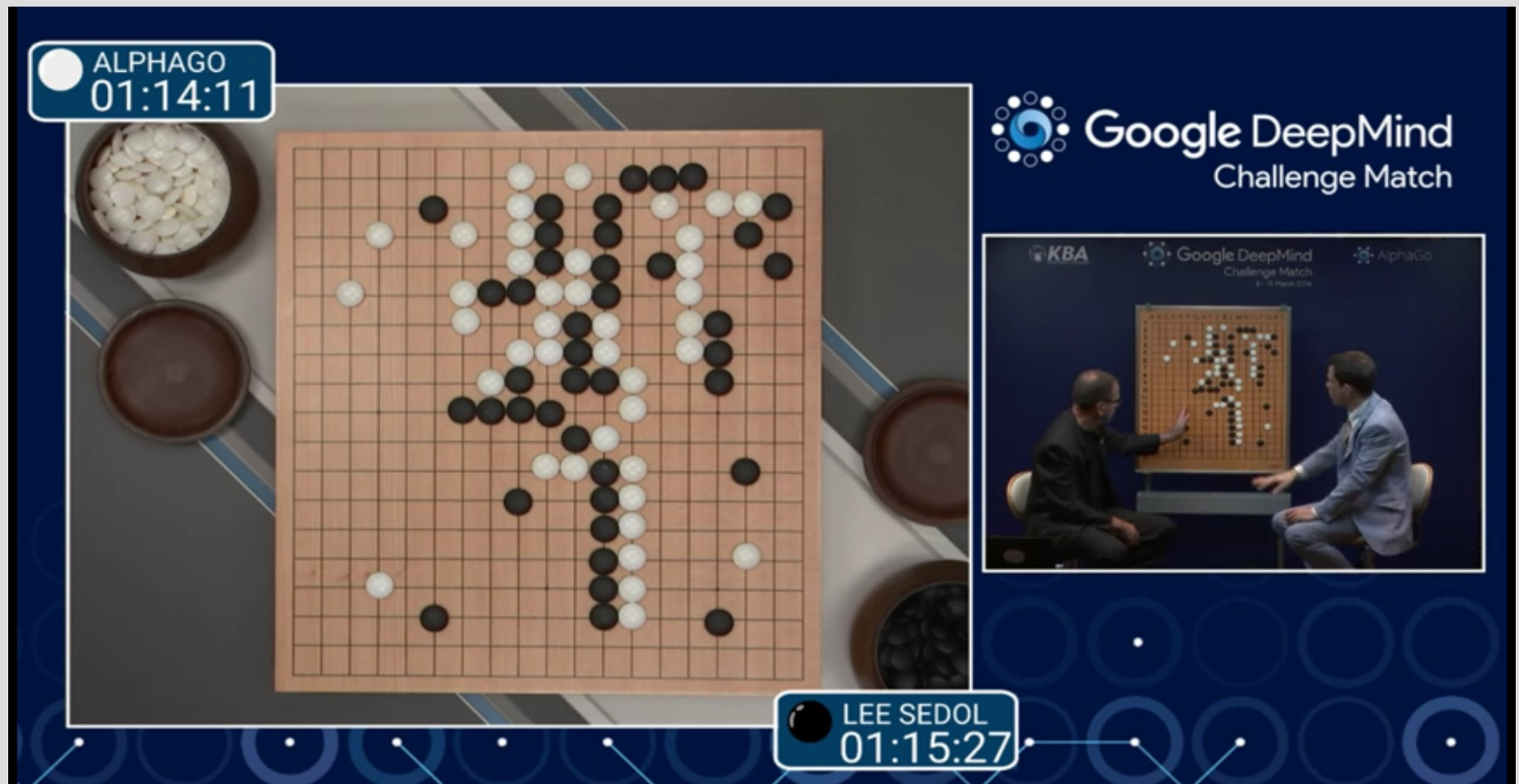

Spam filter

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