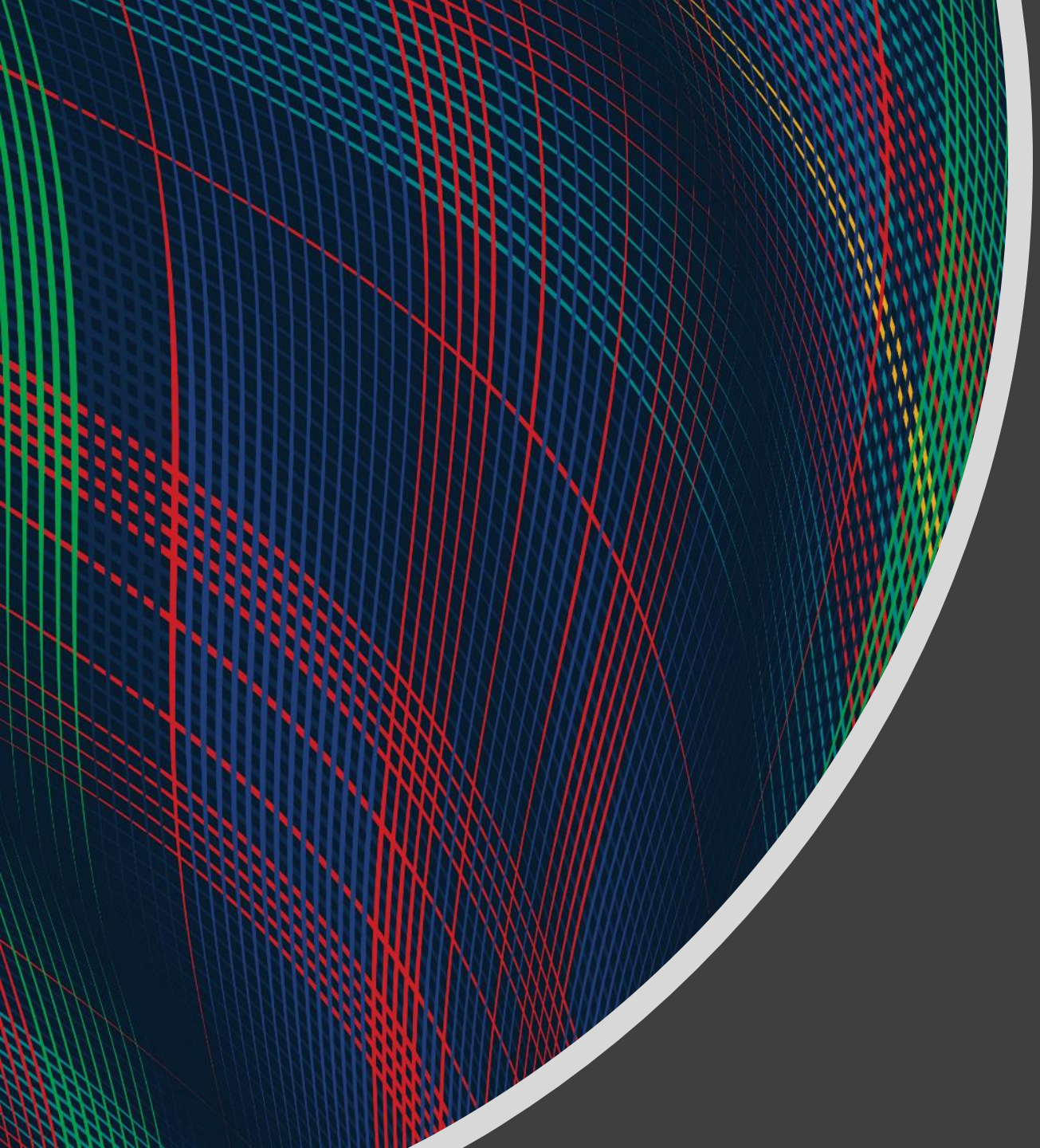


15-181 Demystifying AI

Overview & Intelligence

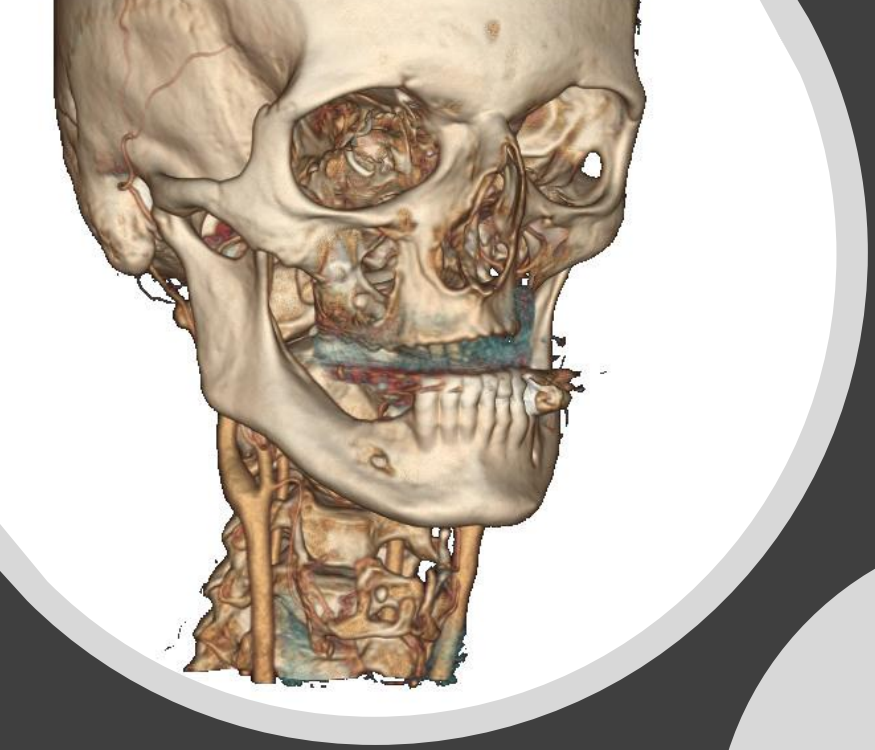
Instructor: Pat Virtue

Warm-up as we get started

Candy Grab game!

Shared Drive Folder/Lec1

https://drive.google.com/drive/folders/1JXonj8iPWRXngauDaR6vRUYbjm79aYo_?usp=sharing



Instructor
Pat Virtue

CS and ML Departments
Teaching Professor

Plan

Course Info (part 1)

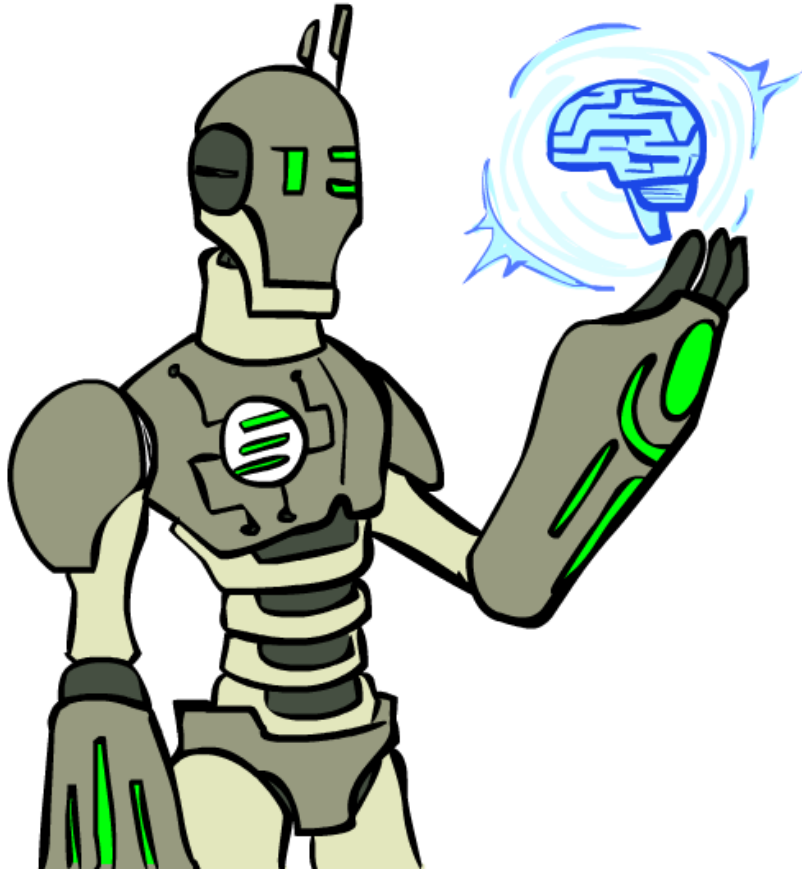
Candy Grab

Discussion on Intelligence

AI focus in this course

- Weak AI
- “Scholarly” AI
- Agents that act rationally

Course Info (part 2)



Images: ai.berkeley.edu

Demystifying AI

Pilot Course!

Explaining AI

- What it is
- What it can do
- How to use it
- How it works
- What can go wrong

Prereqs

- 15-110
- (High school algebra)

Quick Logistics

Slides will be available

Asking questions in main room

- Use the hand-raise icon
- Prof. can’t really see the chat

Asking questions in breakout room

- Press request help button
- Pop back into main room

Quick Logistics

Breakout rooms

- Cameras on
- Unmuted
- Introduce yourself if you haven’t met
  - At least just a quick, “Hi, I’m Pat”
- One person share screen

Warm-up as we get started

Candy Grab game!

Shared Drive Folder/Lec1

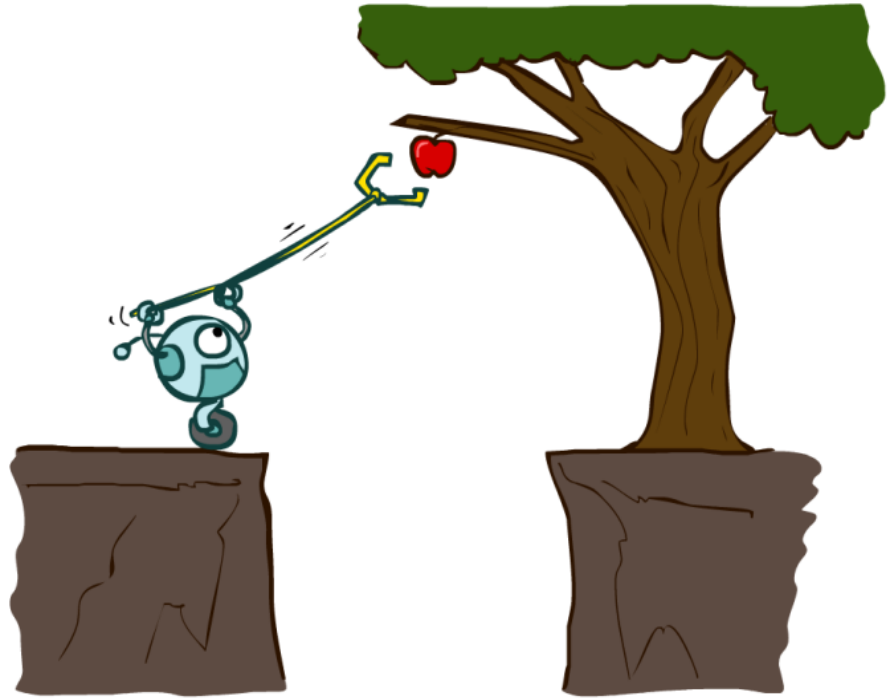
https://drive.google.com/drive/folders/1JXonj8iPWRXngauDaR6vRUYbjm79aYo_?usp=sharing

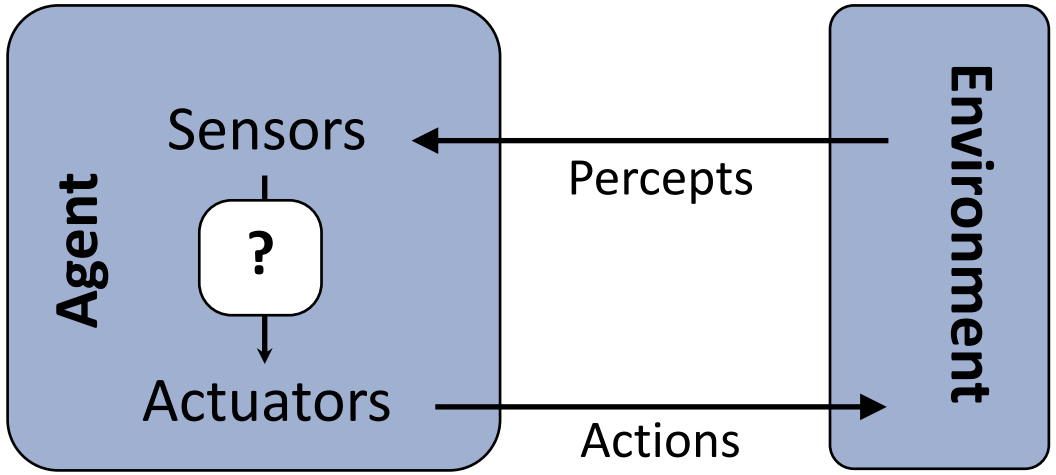
Designing Agents

An **agent** is an entity that *perceives* and *acts*.

Actions can have an effect on the *environment.*

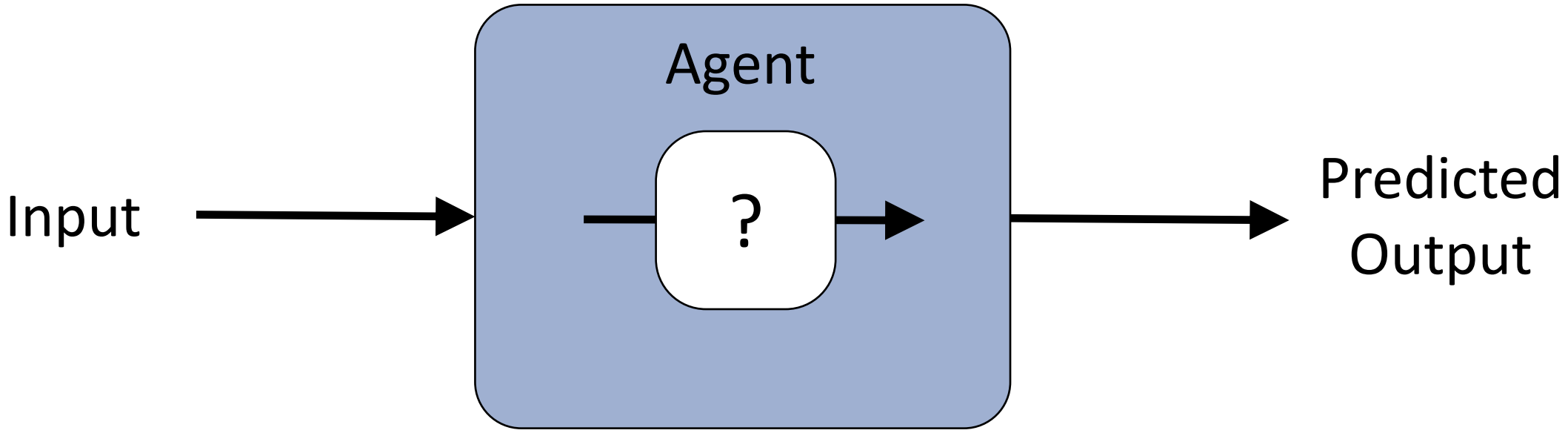
The specific *sensors* and *actuators* affect what the agent is capable of *perceiving* and what *actions* it is capable of taking





Slide credit: ai.berkeley.edu

Agent Model: Simple Input/Output Version



Nim Agent

```
class Agent

    function getAction(state)

        return action
```

Nim Agent

Agent 001 – Always choose 1

```
function getAction(                    )

    return 1
```

Nim Agent

Agent 002 – Always choose 2

```
function getAction( numPiecesAvailable )

    return 2
```

Nim Agent

Agent 004 – Choose the opposite of opponent

```
function getAction( numPiecesAvailable )

    return ?
```

Nim Agent

Agent 007 – Whatever you think is best

```
function getAction( numPiecesAvailable )

    return ?
```

Nim Agent

Agent 007 – Whatever you think is best

```
function getAction( numPiecesAvailable )

    remainder = numPiecesAvailable % 3
    if remainder == 2
        return 2
    else
        return 1
```

Poll 1

Games – Three “Intelligent” Agents

Which agent code is the most “intelligent”?

Games – Three “Intelligent” Agents

A: Search / Recursion

Games – Three “Intelligent” Agents

A: Search / Recursion

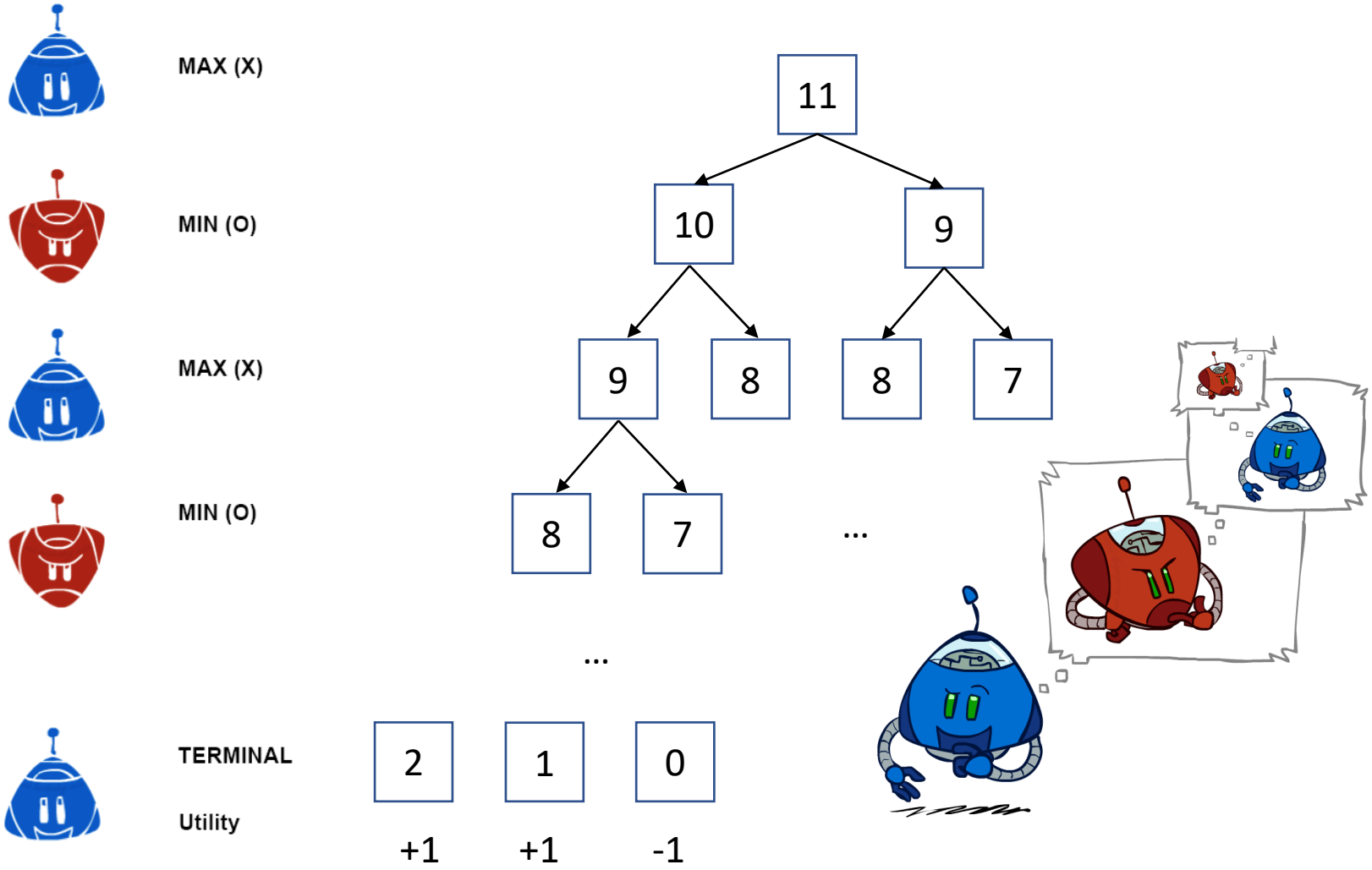


Image credit: ai.berkeley.edu

Games – Three “Intelligent” Agents

B: Encode the pattern

```
function getAction( numPiecesAvailable )

      if numPiecesAvailable % 3 == 2
            return 2
      else
            return 1
```

```
10’s value:Win
9’s  value:Lose
8’s  value:Win
7’s  value:Win
6’s  value:Lose
5’s  value:Win
4’s  value:Win
3’s  value:Lose
2’s  value:Win
1’s  value:Win
0’s  value:Lose
```

Games – Three “Intelligent” Agents

C: Record statistics of winning positions

Pieces Available	Take 1	Take 2
2	0%	**100%**
3	2%	0%
4	**75%**	2%
5	4%	**68%**
6	5%	6%
7	**60%**	5%

Poll 1

Games – Three “Intelligent” Agents

Which agent code is the most “intelligent”?

A. Search / Recursion

B. Encode multiple of 3 pattern

C. Keep stats on winning positions

Games – Three “Intelligent” Agents

C: Record statistics of winning positions

Pieces Available	Take 1	Take 2
2	0%	**100%**
3	2%	0%
4	**75%**	2%
5	4%	**68%**
6	5%	6%
7	**60%**	5%

Plan

Course Info (part 1)

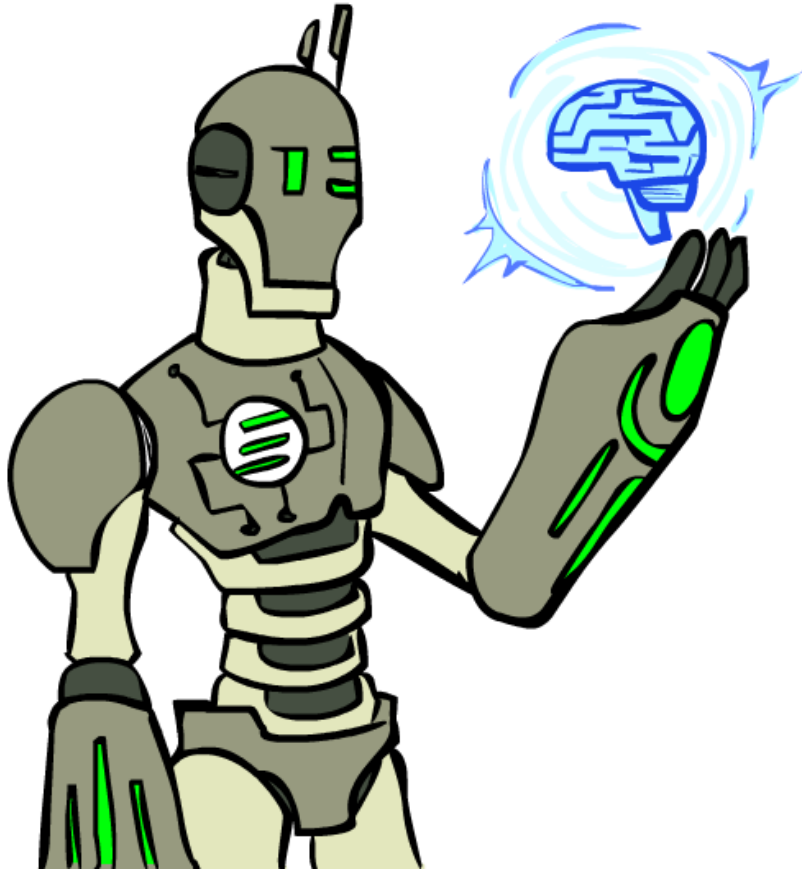
Candy Grab

Discussion on Intelligence

AI focus in this course

- Weak AI
- “Scholarly” AI
- Agents that act rationally

Course Info (part 2)

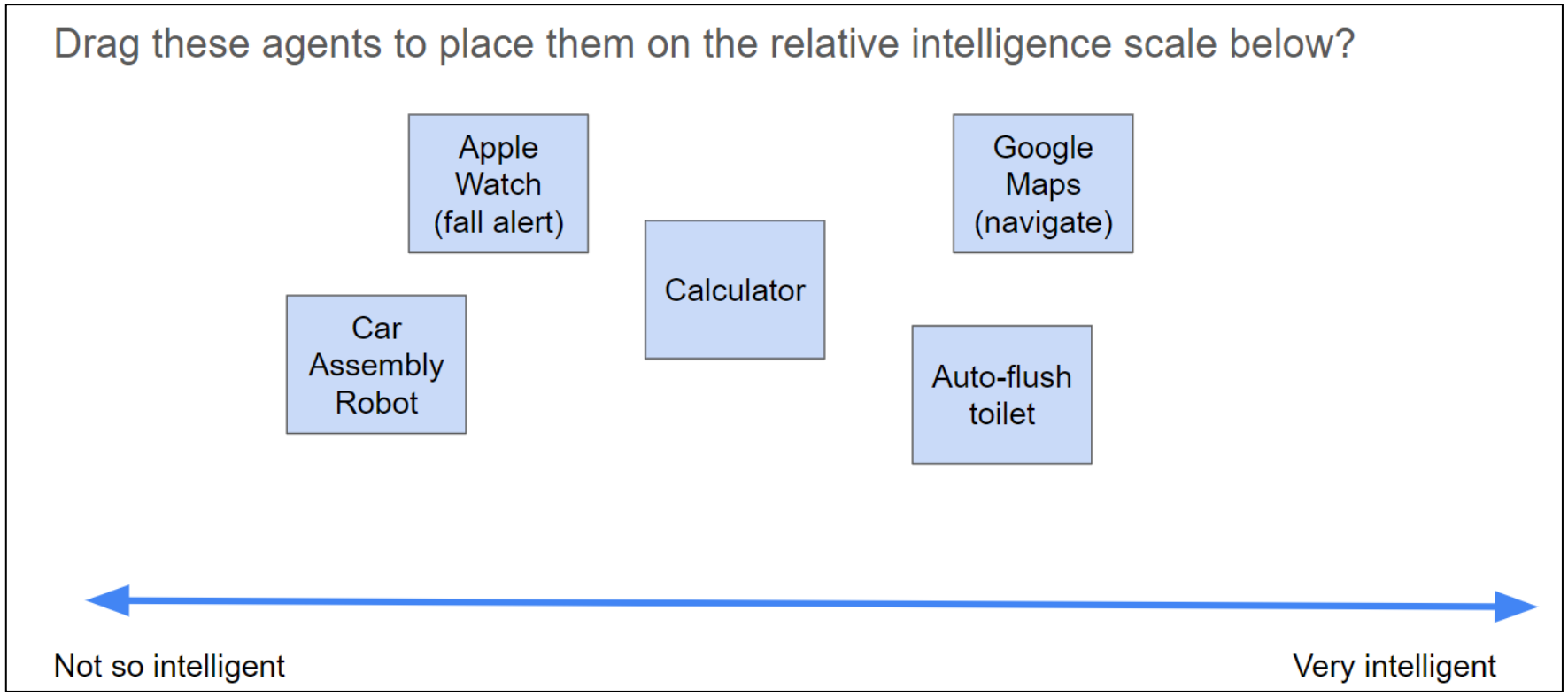


Images: ai.berkeley.edu

How intelligent are these agents?

Shared Drive Folder/Lec1

https://drive.google.com/drive/folders/1JXonj8iPWRXngauDaR6vRUYbjm79aYo_?usp=sharing



Attributes of Intelligence

Intelligence and Uncertainty

Another way to think about intelligence is to consider how much uncertainty is involved

Uncertainty comes into play whenever it is not feasible to determine exact information

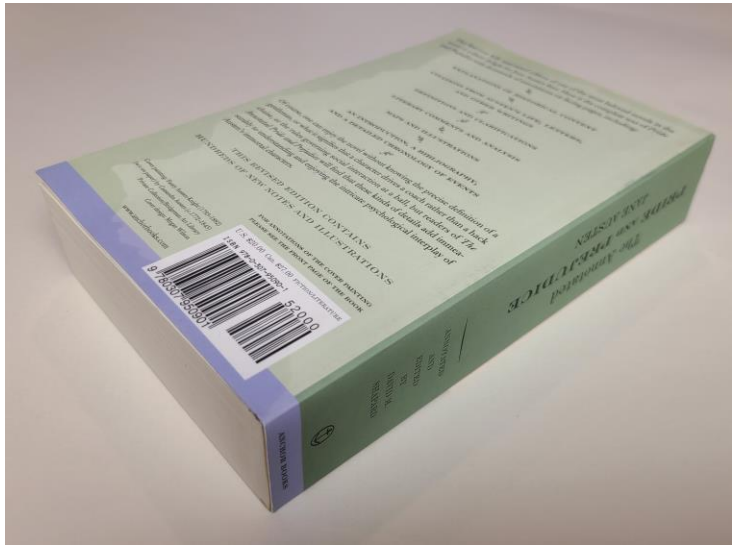
Uncertainty requires decisions to be made

Intelligence and Uncertainty

Consider the uncertainty present in the following

- Typing a product ID number into a website (book ISBN number into amazon.com)
- Barcode reader scanning a book in a well-lit library
- Barcode reader scanning a bag of carrots in a grocery store

ISBN 978-0-307-95090-1



Intelligence and Uncertainty

Uncertainty can have lots of sources, including anything we attribute to random chance

- Hidden information
  - Cards in another player's hand
- Noise
  - Sensor noise
- Way to complicated to model
  - Leaves blowing in the wind
- Infinite number of possible configurations
- More possibilities than any computer can compute in a reasonable time
  - Tic-tac-toe → Checkers → Chess

Sci-Fi AI?

Slide credit: ai.berkeley.edu

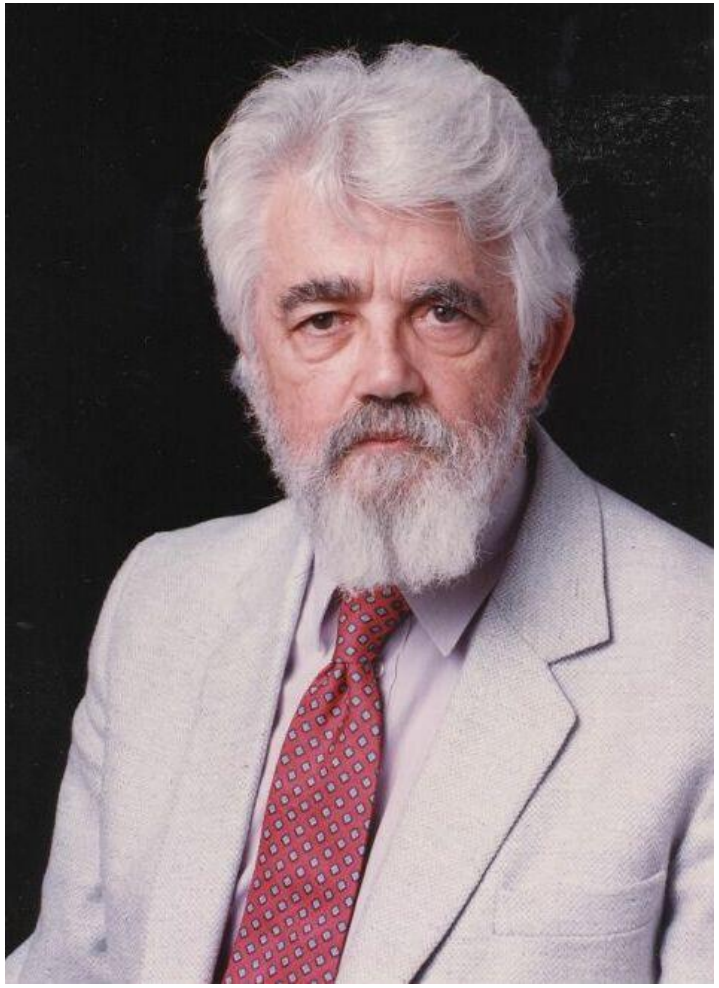
AI Definition by John McCarthy

What is artificial intelligence

- It is the science and engineering of making intelligent machines, especially intelligent computer programs

What is intelligence

- Intelligence is the computational part of the ability to achieve goals in the world



http://www-formal.stanford.edu/jmc/whatisai/whatisai.html

What is AI?

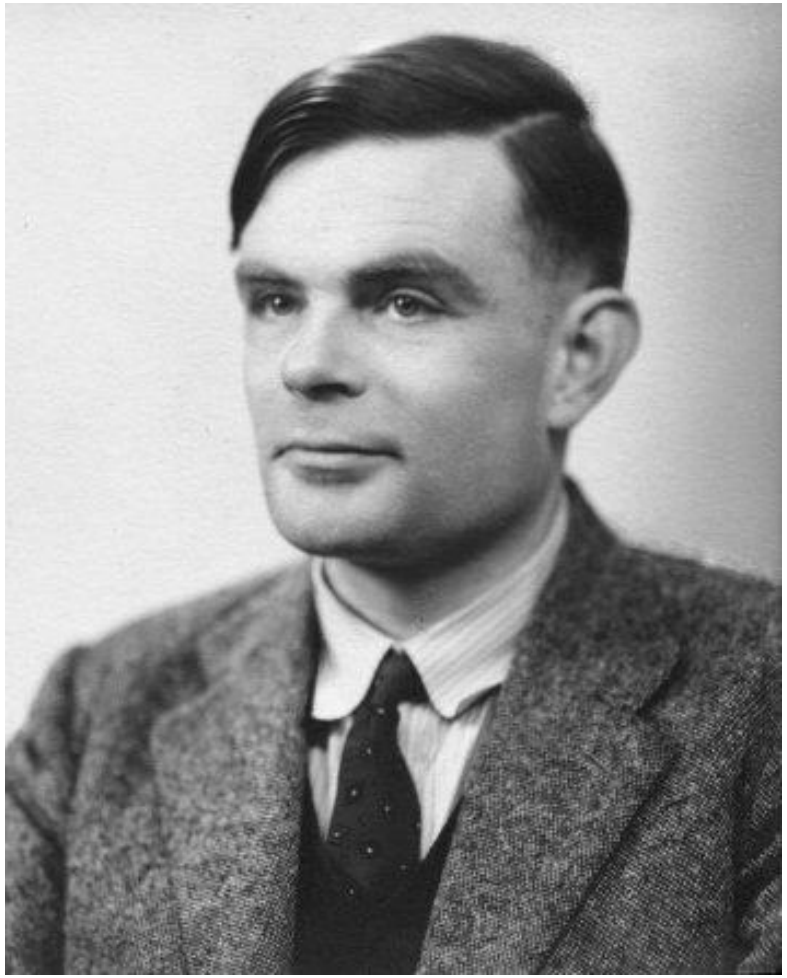
The science of making machines that:

Slide credit: ai.berkeley.edu

Turing Test

In 1950, Turing defined a test of whether a machine could “think”

“A human judge engages in a natural language conversation with one human and one machine, each of which tries to appear human. If judge can’t tell, machine passes the Turing test”



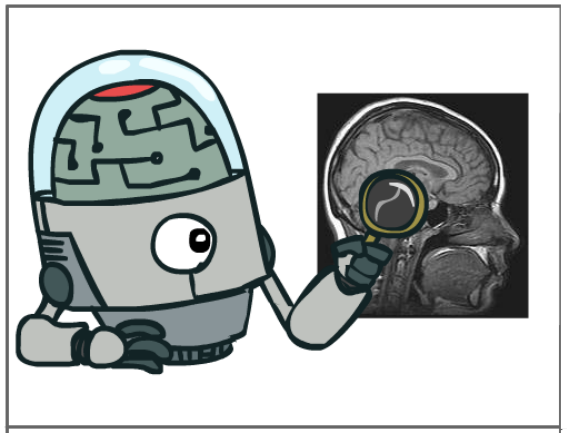
en.wikipedia.org/wiki/Turing_test

Slide credit: ai.berkeley.edu

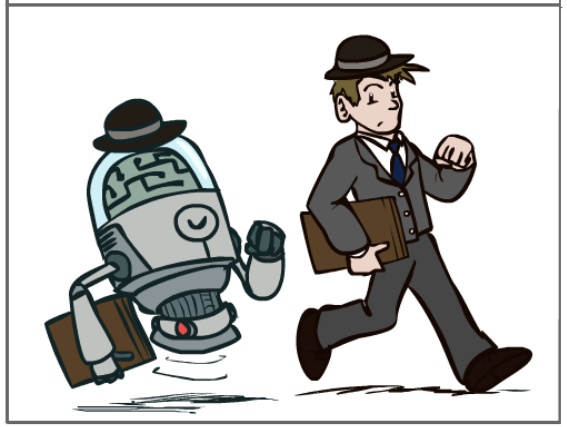
What is AI?

The science of making machines that:

Think like people



Act like people



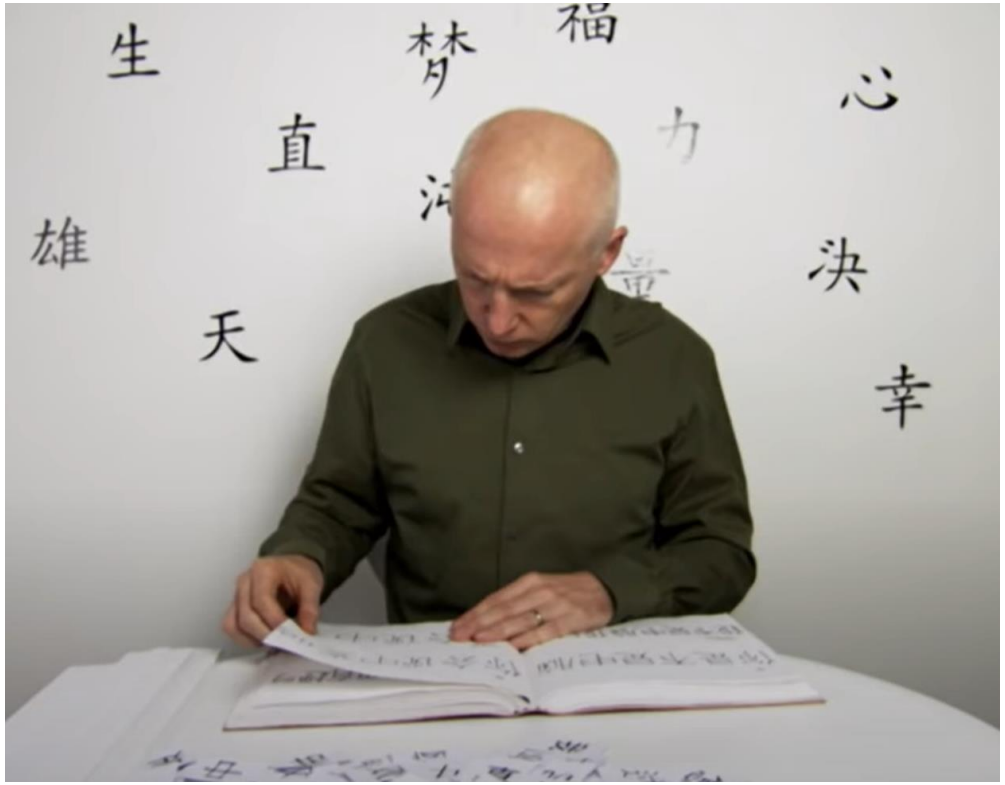
Slide credit: ai.berkeley.edu

What is Intelligence?

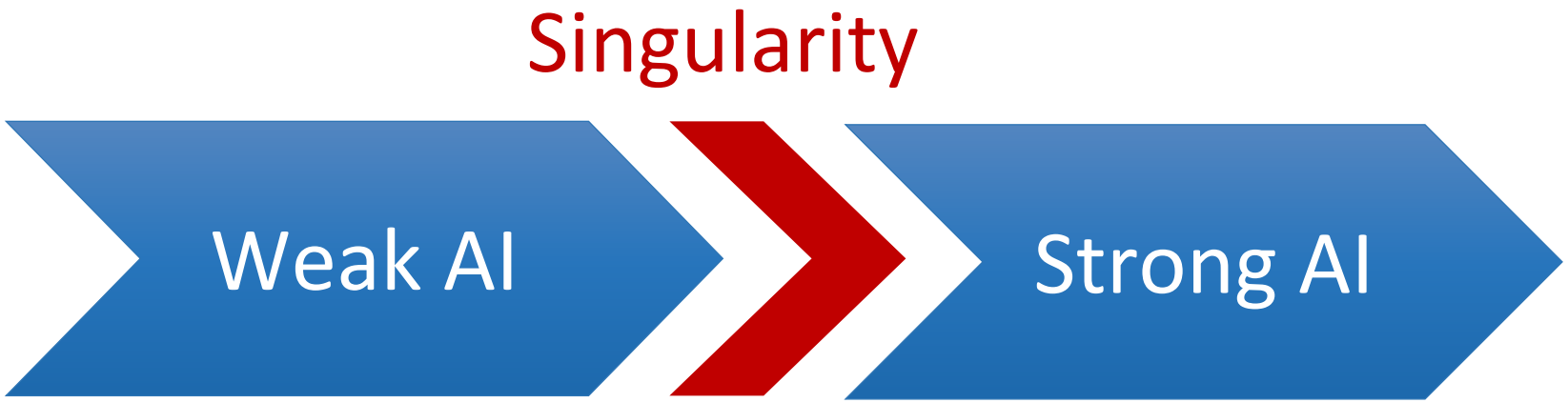
Chinese room experiment

John Searle

https://www.youtube.com/watch?v=D0MD4sRHj1M



Weak AI vs AGI



- Narrow AI
- Limited number of applications

- Artificial General Intelligence (AGI)
- Recursive self-improvement
- Beyond human control

AI in the News

electrek

Fred Lambert - Jan. 19th 2022 5:20 am

Elon Musk: Tesla could play a role in Artificial General Intelligence, decentralize Tesla Bot to avoid Terminator scenario

https://electrek.co/2022/01/19/elon-musk-tesla-artificial-general-intelligence-decentralize-tesla-bot-avoid-terminator-scenario/amp/
https://twitter.com/elonmusk/status/1483728729545363457

“Athletic” vs “Scholarly” AI

Boston Dynamics Founder and Chairman Marc Raibert

https://venturebeat.com/2019/11/12/boston-dynamics-ceo-on-the-companys-top-3-robots-ai-and-viral-videos/
https://www.youtube.com/watch?v=tF4DML7FIWk

“Athletic” vs “Scholarly” AI

Boston Dynamics Founder and Chairman Marc Raibert

“Athletic AI”

[Being] smart about controlling our bodies,
managing the energy use of our bodies,
receiving the world that’s right around us
and maneuvering in real time with respect to either obstacles or competitors

“Scholarly AI”

Make plans and then you execute on the plans. That’s the bulk of AI now — working at a high level where you’ve abstracted the world. You’re not interacting in real time with the physical world, you’ve abstracted the world

https://venturebeat.com/2019/11/12/boston-dynamics-ceo-on-the-companys-top-3-robots-ai-and-viral-videos/

Intelligence and Uncertainty

Uncertainty in “athletic AI”

- Robot that assemble cars in factory
- Robot that fold clothes

https://www.youtube.com/watch?v=pxLpsSkEtuY
https://www.youtube.com/watch?v=gy5g33S0Gzo

CMU Spotlight

CMU Biorobotics Laboratory

http://biorobotics.ri.cmu.edu/

Matthew Travers

Howie Choset

Intelligence

In this course we'll focus on

Rational agents

- Agents that choose actions that maximize their expected performance measure

Weak AI (rather than AGI)

"Scholarly" AI (rather than "athletic" AI)

Plan

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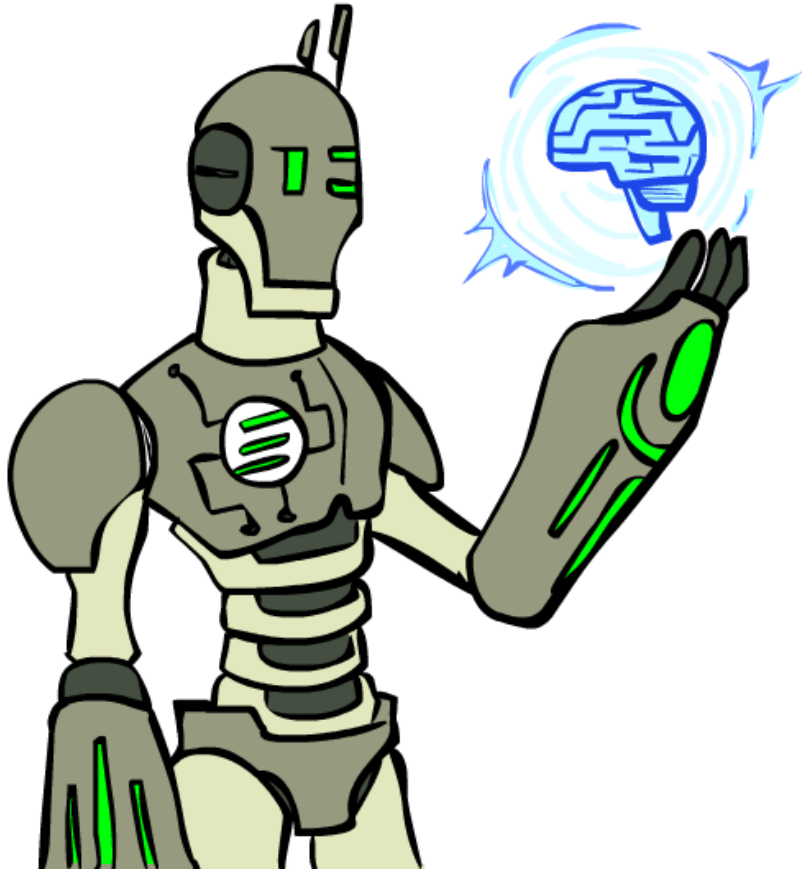

Images: ai.berkeley.edu

Course Information

Website: https://www.cs.cmu.edu/~15181

Canvas: canvas.cmu.edu

Gradescope: gradescope.com

Communication:

piazza.com

E-mail (only if piazza doesn't work):

pvirtue@andrew.cmu.edu

Course Information

Lectures

- Lectures are recorded
  - Shared with our course and CMU teaching staff only
- Slides will be posted

Participation

- Participation points earned by answering Piazza polls in lecture
  - One point for each “take” so make sure to answer all of them
- Credit for participating in lecture activities
- Participating $\geq$ 80% will earn full participation score

Course Information

Assignments

- Online homeworks
  - Quick exercises to help practice topics
  - Online in Gradescope
- Projects
  - Hand-on experience with AI
  - Python
  - Data
  - Report

Course Information

Quizzes

- Quizzes will in lecture, announced two days ahead of time

Final exam

- Schedule TBD

Course Information

Office Hours

- OH calendar on course website
- OH-by-appointment requests are certainly welcome

Mental Health

Don’t struggle alone

Find at least one person and let them know how you’re feeling

- Friend, family, roommate, advisor
- https://www.cmu.edu/student-affairs/resources/index.html#liaisons
- CMU CaPS https://www.cmu.edu/counseling/
- And, of course, you can always talk to me