Introduction to Artificial Intelligence

1/18/17

A bit about me …

- Please call me Bryce
- My research is on algorithmic game theory
  - Related to the AI subfield of multi-agent systems

- I'm a Swattie (class of 2008)
  - Major: CS, (almost finished an ECON major)
  - Activities: orchestra, wind ensemble, ultimate, fencing, puckers, ICPC
- My favorite class at Swat was CS 63 with Lisa Meeden

Administrative Stuff

Course web page:
cs.swarthmore.edu/~bryce/cs63/s17

Be sure to check out:

- Readings
- Resources

Piazza forum:
piazza.com/swarthmore/spring2017/cs63

Grading

50%	Labs
20%	Exam 1
20%	Exam 2
5%	Class Participation
5%	Reading Quizzes

Office Hours

At some point this semester…

- you will need help on the labs, and
- something from lecture won't make sense.

When this happens, come ask questions.

- Office hours
  - M 12:30–4:00, WF 12:30–2:00
  - My door is usually open the rest of the time too.
- Piazza forum

I have set aside 6.5 hours every week for office hours.

If all you attend is 4 hours of lecture + lab, you will not get the most you can out of this class!

A lot has changed in 10 years…

- Watson beat Ken and Brad on Jeopardy:
  - https://www.youtube.com/watch?v=P18EdAKuC1U
- Self-Driving Cars are progressing fast:
  - https://www.youtube.com/watch?v=TsaES--OTzM
- AlphaGo beat Lee Sedol at go:
  - https://www.youtube.com/watch?v=SUbqykXVx0A

What is AI about?

- One goal of studying artificial intelligence is to better understand human intelligence.
- Another goal is to create machines that are as smart as or smarter than humans.

- In practice, AI is about making computers and other machines perform tasks that (for humans) seem to require intelligence.

Some history

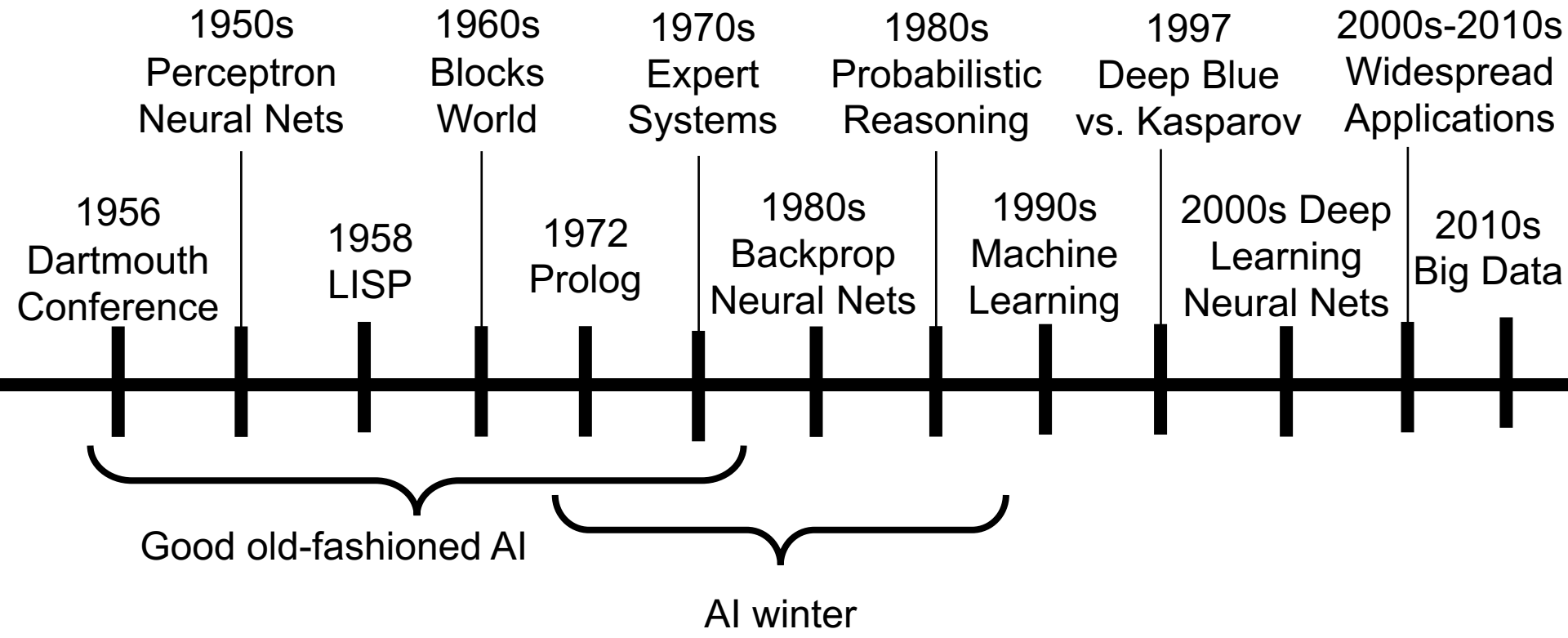
“We propose that a two-month, ten man study of artificial intelligence be carried out in the summer of 1956 at Dartmouth College...The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it.”

-Dartmouth AI Project Proposal, 1955

“A physical symbol system has the necessary and sufficient means for general intelligent action.”

-Newell and Simon, 1976

Some history



What is this class about?

Search

- An agent's model of the world includes:
  - it's current state
  - goals it wants to achieve
- What actions should the agent take to make progress toward its goals?

route planning, game playing

Learning

- Given data, such as:
  - sensor readings
  - past action outcomes
- Construct a model of the world or of how to act.

neural networks, reinforcement learning

Agents

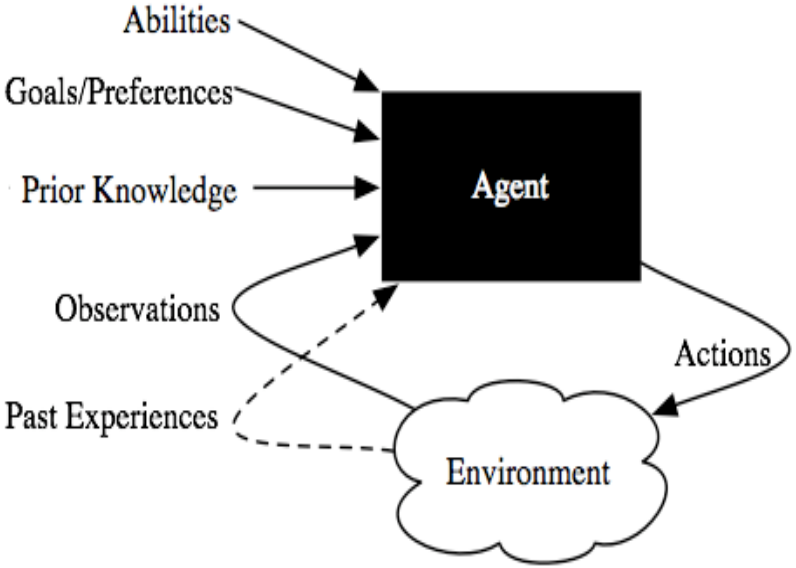
Entities that make decisions and act.

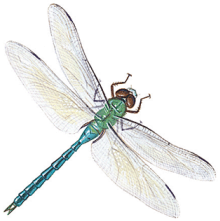
Input:

The world generates observations.

Output:

Actions affect the environment.





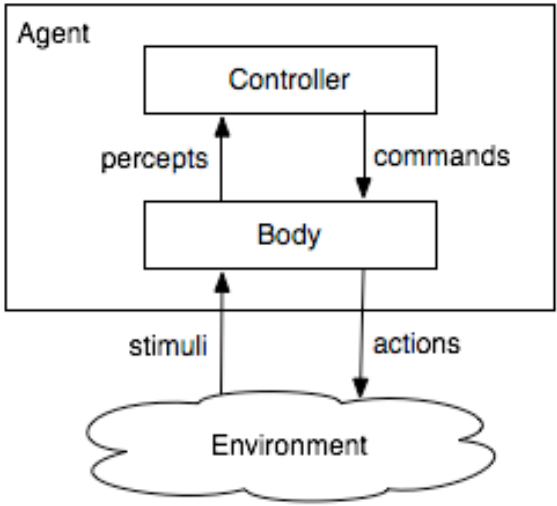
The Agent Function

We can think of the entire agent, or some portion of it as implementing a function.

A function maps input to output, such as:

- Robot Input: sensor data
- Robot output: motor actions

Sometimes this function directly maps input to output, sometimes there is internal state that affects the mapping.



f (history) = action
f (percept, state) = command

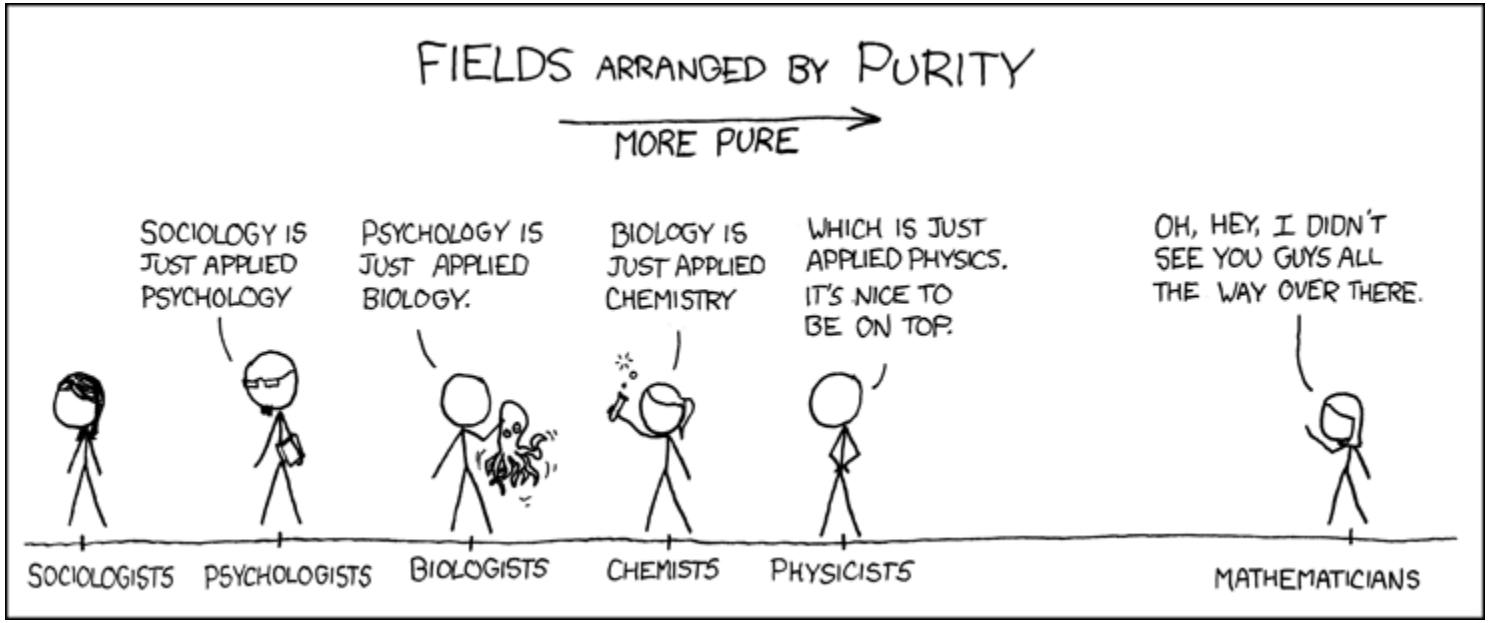
Modeling

Input to an agent isn’t a complete description of the world. The agent is limited by what it can perceive.

Nowhere near all of what can be perceived can realistically be processed. Some sort of abstraction must take place before agents can make decisions.

An agent needs to build a model from what it can perceive and act based on that model. These are hard problems!

Abstraction happens everywhere



Choosing the right level of abstraction at which to model the world is crucial.