What is Artificial Intelligence?

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Some Basic Ideas

- AI seeks to make computers do the kinds of things minds can do.

- What can minds do? Reason, See, Perceive, Motor Control, Associate, Plan, Predict, etc.

- Can we test intelligence? The Turing Test.

- Intelligence is Multi-Dimensional.

- The Pioneers insight came before computers. Decoupling intelligence from the substrate brain.

Two Main Motivations

- Technological

- Scientific

Two Main Purposes

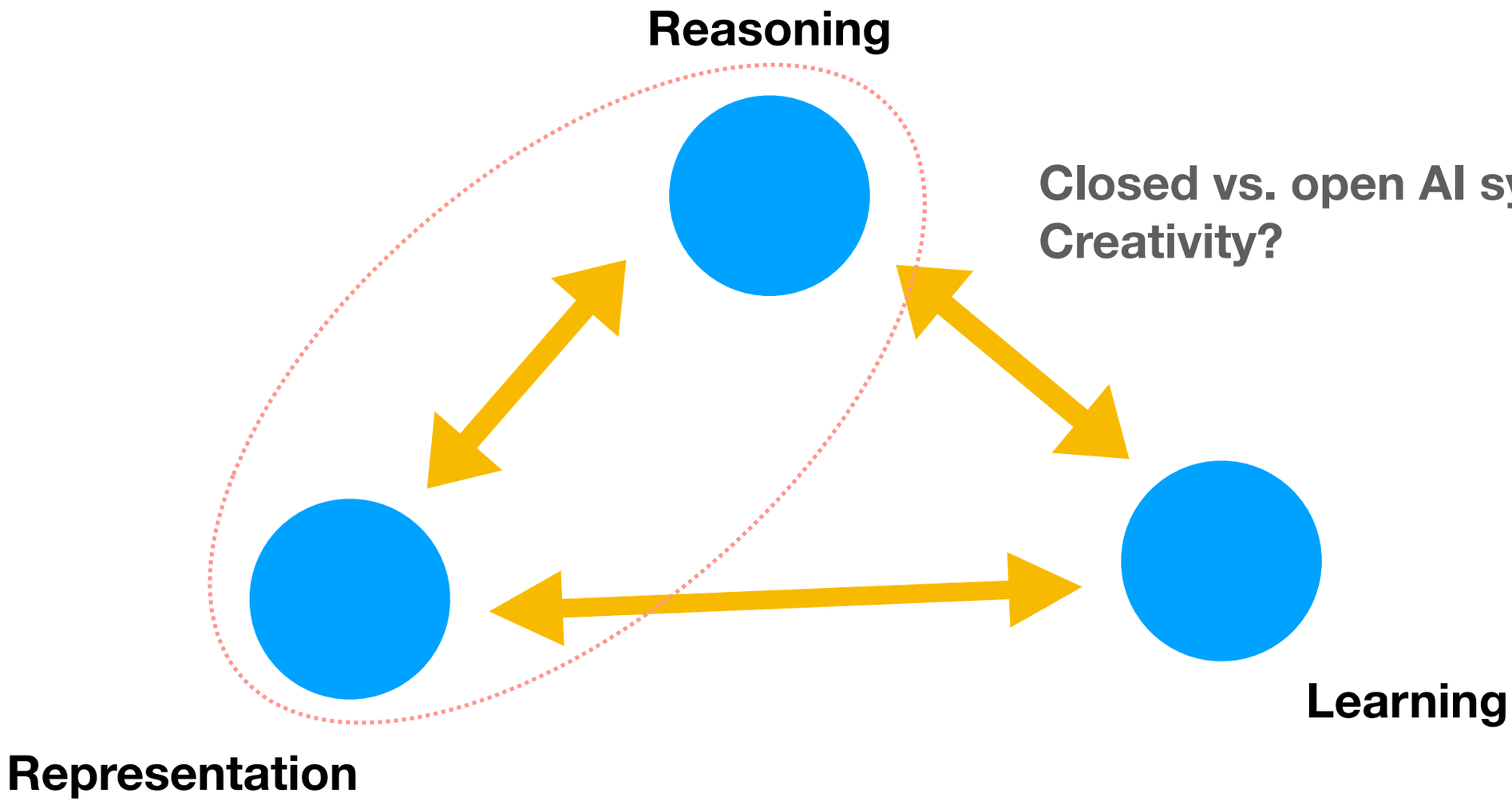
- Predictive

- Explanatory

Who Uses AI?

- Computer Scientists
- Biologists
- Neuro Scientists
- Governments
- Google, Facebook, Instagram, Twitter, etc.
- Your mobile device
- IoT
- The police
- Social Scientists
- Cognitive Scientists and Psychologists
- and the list goes on and on.

Three Pillars



Closed vs. open AI systems
Creativity?

The Two Roots

Symbolic Good Old Fashion AI

- Derives from Logic, and Language.
- Relies on the symbol's stand-in link to meaning
- Grew from the same root as Computer Science
- It was only possible because of Alan Turing
- Dominated AI from the 70s until 00s
- Very reliant on abstraction, inflexible, rule based

Connectionist AI

- Cyberneticians wanted to understand neural info proc
- How could a network of switches do math and language?
- The notions of control and feedback in bio systems
- Got stopped by lack of computer power until very recently
- Now this is what people call Deep Learning
- Very flexible, needs lots of training data

Mid Class Discussion

What about Humans.

Are we Symbolic?

Are we connectionist?

Something else?

The Pioneers

- Lady Ada Lovelace - the first programmer.
- Alan Turing - The Turing Machine, Computer Science.
- Warren McCulluloch and Walter Pitts - Neural Nets.
- Claude Shannon - Information Communication Theory.
- Norbert Wiener - Feedback / Memory.
- John McCarty - First AI language (LISP)
- Allen Newell and Herbert Simon - General Problem Solver.

The Turing Machine

$$\delta(s, q) : s \in \Sigma \wedge q \in Q$$

δ	**The machine is reading some symbol, and is in some state**
$s \in \Sigma$	**The machine can read a symbol from an alphabet**
$q \in Q$	**The machine can be in one and only one internal state**
$\Sigma \times Q$	**The machine's possible universe**

The Turing Machine

$$\delta(q_0, a) = (q_0, a, R) \tag{1}$$

$$\delta(q_0, b) = (q_0, b, R) \tag{2}$$

$$\delta(q_0, \square) = (q_0, \square, R) \tag{3}$$

$$\delta(q_1, a) = (q_f, a, L) \tag{4}$$

$$\delta(q_1, b) = (q_f, b, L) \tag{5}$$

$$\delta(q_1, \square) = (q_f, \square, L) \tag{6}$$

Homework

Read and take notes about the Macy Conferences.