Agents and Definitions of Artificial Intelligence

Intelligence is the art of good guesswork.
（H. B. Barlow）

Definitions of AI

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What is Artificial Intelligence?

- Artificial Intelligence is the synthesis and analysis of computational agents that act intelligently.
- An agent is something that acts in an environment.
- An agent acts intelligently to the extent that it uses its perceptions, knowledge and experience to maximize its expected performance.
  - Its actions are appropriate.
  - It is flexible to change.
  - It learns from experience.
  - It works within its limitations.

The Turing Test

- This idea of defining intelligence by external behavior was the motivation for the Turing test.
- The Turing test consists of an imitation game where an interrogator can ask a witness, via a text interface, any question.
- If the interrogator cannot distinguish the witness from a human, the witness must be intelligent.
- An agent could not fake intelligence for arbitrary topics.

Goals of Artificial Intelligence

- Scientific goal: to understand the principles that make intelligent behavior possible in natural or artificial systems.
  - analyze natural and artificial agents
  - formulate and test hypotheses about what it takes to construct intelligent agents
  - design, build, and experiment with computational systems that perform tasks that require intelligence
- Engineering goal: design useful, intelligent artifacts.
Agents

Illustration

Abilities
Goals/Preferences
Prior Knowledge
Observations
Past Experiences

Agent

Environment

Actions

Example 1

Example 2

Knowledge Representation

problem → solve → solution
represent → interpret → informal

representation → compute → output
formal

To solve a problem, the designer of a system must
- understand the problem and its solution
- represent the problem in a computer language
- use the computer to compute an output
- interpret the output as a solution

AI focuses on KRs that generalize for many problems.
Probability

- Agents need to act even if they are uncertain.
- Predictions are needed to decide what to do.
- Acting is gambling: agents who don’t use probabilities will do worse than those who do.
- Probabilities can be obtained from prior knowledge or learned from data.