What is Artificial Intelligence?
Agents acting in an environment

Learning objectives: at the end of the class, you should be able to

- describe what an intelligent agent is
- identify the goals of Artificial Intelligence
- classify the inputs and the outputs of various agents
Artificial Intelligence is the synthesis and analysis of computational agents that act intelligently.

- Its actions are appropriate for its goals and circumstances.
- It is flexible to changing environments and goals.
- It learns from experience.
- It makes appropriate choices given perceptual and computational limitations.
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.
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 if:
  - its actions are appropriate for its goals and circumstances
  - it is flexible to changing environments and goals
  - it learns from experience
  - it makes appropriate choices given perceptual and computational limitations
Examples of Agents

- **Organisations** Microsoft, Al Qaeda, Government of Canada, UBC, CS Dept,…
- **People** teacher, physician, stock trader, engineer, researcher, travel agent, farmer, waiter,…
- **Computers/devices** thermostat, user interface, airplane controller, network controller, game, advising system, tutoring system, diagnostic assistant, robot, Google car, Mars rover,…
- **Animals** dog, mouse, bird, insect, worm, bacterium, bacteria,…
- **book(?)**, **sentence(?)**, **word(?)**, **letter(?)**
Examples of Agents

- **Organisations** Microsoft, Al Qaeda, Government of Canada, UBC, CS Dept,...
- **People** teacher, physician, stock trader, engineer, researcher, travel agent, farmer, waiter...
- **Computers/devices** thermostat, user interface, airplane controller, network controller, game, advising system, tutoring system, diagnostic assistant, robot, Google car, Mars rover...
- **Animals** dog, mouse, bird, insect, worm, bacterium, bacteria...
- book(?), sentence(?), word(?), letter(?)
  Can a book or article do things?
Examples of Agents

- **Organisations** Microsoft, Al Qaeda, Government of Canada, UBC, CS Dept,...
- **People** teacher, physician, stock trader, engineer, researcher, travel agent, farmer, waiter...
- **Computers/devices** thermostat, user interface, airplane controller, network controller, game, advising system, tutoring system, diagnostic assistant, robot, Google car, Mars rover...
- **Animals** dog, mouse, bird, insect, worm, bacterium, bacteria...
- **book(?)**, sentence(?), word(?), letter(?)
  Can a book or article do things?
  Convince? Argue? Inspire? Cause people to act differently?
Goals of Artificial Intelligence

- **Scientific goal:** to understand the principles that make intelligent behavior possible in natural or artificial systems.
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
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.
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.

- Analogy between studying flying machines and thinking machines.
Agents acting in an environment

**Agent**

- Abilities
- Goals/Preferences
- Prior Knowledge
- Observations
- Past Experiences

**Environment**

- Actions

©D. Poole and A. Mackworth 2016  Artificial Intelligence, Lecture 1.1, Page 12
Inputs to an agent

- **Abilities** — the set of possible actions it can perform
- **Goals/Preferences** — what it wants, its desires, its values,...
- **Prior Knowledge** — what it comes into being knowing, what it doesn’t get from experience,...
- **History** of observations (percepts, stimuli) of the environment
  - (current) **observations** — what it observes now
  - **past experiences** — what it has observed in the past
Example agent: robot

- **abilities**: movement, grippers, speech, facial expressions, ...
- **goals**: deliver food, rescue people, score goals, explore, ...
- **prior knowledge**: what is important feature, categories of objects, what a sensor tell us, ...
- **observations**: vision, sonar, sound, speech recognition, gesture recognition, ...
- **past experiences**: effect of steering, slipperiness, how people move, ...
Example agent: teacher

- **abilities:** present new concept, drill, give test, explain concept, . . .
- **goals:** particular knowledge, skills, inquisitiveness, social skills, . . .
- **prior knowledge:** subject material, teaching strategies, . . .
- **observations:** test results, facial expressions, errors, focus, . . .
- **past experiences:** prior test results, effects of teaching strategies, . . .
Example agent: thermostat

- abilities:
- goals:
- prior knowledge:
- observations:
- past experiences:
Example agent: autonomous car

- abilities:
- goals:
- prior knowledge:
- observations:
- past experiences:
Example agent: medical doctor

- abilities:
- goals:
- prior knowledge:
- observations:
- past experiences:
Example agent: Apple Inc.

- abilities:
- goals:
- prior knowledge:
- observations:
- past experiences:
Other Agents

- user interface
- bee
- smart home
- ...

- abilities:
- goals:
- prior knowledge:
- observations:
- past experiences:
Example agent:

- abilities:
- goals:
- prior knowledge:
- observations:
- past experiences:
Agents acting in an environment

- Abilities
- Goals/Preferences
- Prior Knowledge
- Observations
- Past Experiences

Agent

Environment

Actions