

- 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

# 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

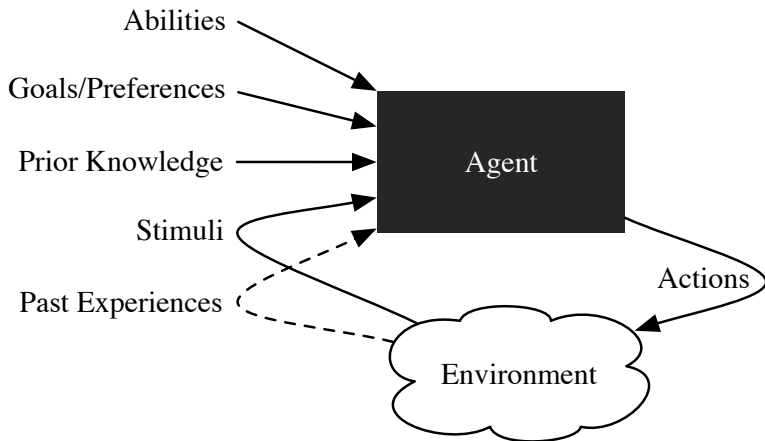
# Examples of agents

- **Organizations** Microsoft, European Union, Real Madrid FC, an ant colony,...
- **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.
  - ▶ 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: inputs and output



# 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 stimuli
  - ▶ (current) **stimuli** — what it receives from environment now (observations, percepts)
  - ▶ **past experiences** — what it has received in the past

# Example agent: autonomous car

- **abilities:** steer, accelerate, brake
- **goals/preferences** safety, get to destination, timeliness ...
- **prior knowledge:** street maps, what signs mean, what to stop for ...
- **stimuli:** vision, laser, GPS, voice commands ...
- **past experiences:** how braking and steering affects direction and speed...

# Example agent: robot

- **abilities:** movement, grippers, speech, facial expressions, . . .
- **goals/preferences** deliver food, rescue people, score goals, explore, . . .
- **prior knowledge:** what is important feature, categories of objects, what a sensor tell us, . . .
- **stimuli:** 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/preferences** particular knowledge, skills, inquisitiveness, social skills, . . .
- **prior knowledge:** subject material, teaching strategies, . . .
- **stimuli:** test results, facial expressions, errors, focus, . . .
- **past experiences:** prior test results, effects of teaching strategies, . . .

# Example agent: thermostat for heater

- **abilities:** turn heater on or off
- **goals/preferences** conformable temperature, save fuel, save money
- **prior knowledge:** 24 hour cycle, weekends
- **stimuli:** temperature, set temperature, who is home, outside temperature
- **past experiences:** when people come and go, who likes what temperature

# Example agent: medical doctor

- abilities:
- goals/preferences
- prior knowledge:
- stimuli:
- past experiences:

# Example agent: Apple Inc.

- abilities:
- goals/preferences
- prior knowledge:
- stimuli:
- past experiences:

# Other Agents

- user interface
  - bee
  - smart home
  - ...
- 
- abilities:
  - goals/preferences
  - prior knowledge:
  - stimuli:
  - past experiences:

# Example agent:

- abilities:
- goals/preferences
- prior knowledge:
- stimuli:
- past experiences:

# Agents acting in an environment

