



# What is Artificial Intelligence, Agents

CS156

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# Outline

- Using Slidy
- What is AI
- Agents

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# Using Slidy

- The slides for this class are HTML files which both validate as XHTML 1.1 and pass the WAVE Accessibility Checker.
- They are made to look like slides using a Javascript called Slidy.
- The following keystrokes do useful things in Slidy:
  - *h - help (see all the commands)*
  - *f - fullscreen (gets rid of the links at the bottom of the window)*
  - *space - advance a slide*
  - *left/right arrows - forward or back a slide*
  - *up/down arrows - scroll within a slide*
  - *a - show all slides at once for printing*
  - *n - add a note to a slide in a given namespace (a student of mine Sriram Krishnan added this extension)*

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# Artificial Intelligence is ... ?

- **Acting like a human.** Turing (1950) proposed the **Turing Test**. A computer passes the test if a human interrogator after posing questions to the computer and seeing the responses cannot distinguish the responses from those of a human. Such a computer would need to be able to:
  - Do ***natural language processing*** to enable it to communicate successfully in English
  - Use some kind of ***knowledge representation*** to store what it hears
  - Be able to do ***automated reasoning*** to use the stored information to answer questions and draw conclusions.
  - Do ***machine learning*** to adapt to new circumstances and to detect and extrapolate patterns.

The **Total Turing Test** is a variant of the Turing in which the computer/robot must "pass" as a human. This would also involve being able to do **computer vision** and **robotics**.

- **Thinking like a human** - The field of **cognitive science** brings together computer models from

AI and experimental techniques from psychology to construct precise and testable theories of the human mind. This can further influence attempts to make a computer which can simulate such a mind. The point is having a good algorithm for something doesn't necessarily mean one is doing it the way a human mind does something.

- **Thinking rationally** - this might involve algorithms for reasoning about things expressed in formal logic.
- **Acting rationally** - algorithms that allow an agent to act to achieve the best outcome/best expected outcome possible for that agent. An agent that acts in this way is called a **rational agent**.

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# Agents

- As we said on the last slide rational agents are one approach to studying AI.
- In fact, it will be the first approach we will consider this semester...
- For us, an **agent** is anything that can be viewed as perceiving its **environment** through **sensors** and acting upon that environment through **actuators**
- For example:
  - *A human agent has eyes, ears, and other organs for sensors and hands, legs and vocal tracts, etc for actuators*
  - *A robotic agent might have cameras and infrared range finders for its sensors, and various motors for actuators*
  - *A software agent receives keystrokes, file contents, and network packets as sensory inputs and acts on its environment by displaying stuff on the screen.*
- A **percept** refers to the agent's perceptual inputs at any given instant.

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# Vacuum Cleaner World

- Consider a world consisting of just two locations A and B.
- The vacuum agent perceives what square it's in and whether there is dirt in the square.
- It can choose to move left, right, suck up dirt or do nothing.
- An **agent function** is a map from percept sequences to an action.
- We can often write out such a function using a table:

```
[A, clean] Right  
[A, dirty] Suck  
[B, clean] Left  
[B, dirty] Suck  
...
```

- What is the best way to create such a table?
- That is essentially what is involved in "programming the agent" and determines whether it is good, bad, intelligent or stupid.

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# Rational Agents

- What is rational at any given time depends on:
  - *The performance measure that defines the criterion for success*
  - *The agent's prior knowledge of the environment.*
  - *The actions that the agent can perform.*
  - *The agent's percept sequence to date.*
- A **rational agent** is one such that:  
For each possible percept sequence, the rational agent selects an action that is expected to maximize its performance measure, given the evidence provided by the percept sequence and whatever built-in knowledge it has.