Introduction to AI

Donglin Jia

May 13, 2020

1 Lecture 1 – Definition of AI

1.1 What is AI?

- Two ways to measure performance:

  - measure against human $\to$ how human think and act
  - measure against rationality $\to$ mathematics defined, developed analytic model

- Care about:

  - how they think
  - how they behave $\to$ can be observed internally

- Systems that think like humans

- Systems that act like humans

- Systems that think rationally

- Systems that act rationally

1.2 Human

1.2.1 Thinking Humanly

- The Cognitive Modeling Approach

  - Human as an intelligence – think like human
  - How human think?
    * Introspection
    * Psychological experiments
    * Brain imaging
  - Cognitive science – develop the theory of mind using AI modelling

1.2.2 Acting Humanly

- The Turing Test Approach

  - Assumption: the interrogator allows to ask any questions, if entity is intelligence, then it should handle all those including visual signal or/and object
  - Simple but powerful idea.
  - Need to be able to do NLP, knowledge representation, reason, learning, proceed to object and move and manipulate object
  - Drawback:
    * recognize but not realize intelligence

1.3 Rationality

- Rationality: an abstract "ideal" of intelligence, rather than "whatever humans do"

- Doing the right thing, given what it knows

1.3.1 Thinking Rationality

  - The Laws of Thought Approach
    * Greek philosopher Aristotle defined syllogisms
      · Given right premise get right conclusion
    * the logicist tradition – using logic to express the knowledge
    * Two obstacles for using this approach in practice
      · Too precise to express knowledge in logic $\rightarrow$ have difficulty to translate knowledge into logic
      · Hard to resolve the problem even if all the knowledge has been encode in logic, e.g. bruce force search takes long time and does not provide the which order to use first

1.3.2 Acting Rationality

  - The Rational Agent Approach:
    * Agent means todo
    * A rational agent acts to achieve the best outcome
    * Rational behavior:
      · Create and presume goal and agent should operate atomically that be able to proceed the environment and be able to adapt the changes and learn.

1.4 Caring about Behavior rather than Thoughts

- Acting rationally is more general idea than thinking rationally

    - no right/wrong answer, need to act quickly

1.5 Measure Success against Rationality rather than Human

- Human acting irrational more often

- Rationality is a well-defined concept mathematically $\rightarrow$ easy to develop theoretical model & perform experiments

- Understanding the principles behind certain object and using that to develop certain model