CS4804: Intro to AI
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Plan For Today

- Background: What is AI?
- Major topics we will cover
- Class policies

What is AI?

Thinking like a human	Thinking rationally
Acting like a human	Acting rationally

Acting Like a Human

- Turing (1950) proposed the imitation game
  - Thought that by 2000, there was a 30% chance of a computer fooling an interrogator for 5 minutes.
  - Paper identified many of the core areas of AI: knowledge, reasoning, language understanding, learning
  - Issues?

Thinking Like a Human

- How do we know how humans think?
- There are fields that try to understand the information processing that goes on in the brain:
  - Cognitive science: higher level of abstraction -- structures of knowledge
    - Predicts and tests human behavior
  - Cognitive neuroscience: lower level of abstraction -- what's going on in neural circuits
- Cognitive (neuro)science and AI often inform each other these days
- Issues?

Thinking Rationally

- What does it mean to think rationally? Ideas from mathematics and philosophy inform this question.
- What thoughts should I have?
- Does intelligent behavior have to be mediated by intelligent thought?

Acting Rationally

- Do the "right thing"
- What is the "right thing" anyhow?
  - Expected to maximize goal achievement, given available information
- Must it involve thinking?
  - Not necessarily: e.g. reflexes
  - But thinking should be in service of some goal
- Rationality does not mean clairvoyance or omniscience!

This Class: Agents That Act Rationally

- An agent perceives the world around it (perhaps in a limited way) and acts on that world (again, perhaps in a limited way)
- Theoretically: a function from histories of percepts to actions
  - $f : P^* \rightarrow A$
- For a given environment and a task, we should seek the agent that maximizes the performance measure we are interested in
- In addition to lacking omniscience, computational limitations typically make perfect rationality unattainable
  - Also, half the art is in setting the appropriate performance measure anyhow!

So, really, what is AI?

- Key elements of framing a problem the AI way:
  - Describe the environment
  - Agents interact with the environment through:
    - Sensors, that receive percepts from the environment, revealing (perhaps partially) the state of the world
    - Actuators, that enable the agent to act on the environment, thus changing (perhaps probabilistically) the state of the world
  - Define the performance measure, and determine how to give the agent its rewards
- Then there's the algorithmic challenge of solving the problem!

And what can it do?

http://www.youtube.com/watch?v=WFR3lOm_xhE

http://www.youtube.com/watch?v=7h4baBEi0iA

http://www.youtube.com/watch?annotation_id=annotation_383798&feature=iv&src_vid=7h4baBEi0iA&v=ll-M7O_bRNg#t=3m11s

http://www.youtube.com/watch?v=fJFtNp2FzdQ

http://www.youtube.com/watch?v=cdgQpa1pUUE

Course Structure

- There will be 6-8 homeworks: mix of programming, theory, and written analysis (yes, you need to write well!)
- There will be in-class exercises / quizzes that you will turn in and that will count toward your grade. Typically the emphasis in these will be on participation/effort rather than correctness.
- Two exams, a priori equal weight (I may give higher weight to the one on which you do better)
- Lectures: mix of blackboard / projector
- I care about interaction in class, so you have to answer questions!

Grading

- Homework assignments: 50%
- Class exercises and quizzes: 15%
- Exams: 35%

Prerequisites

- Mathematical maturity (logic, induction, probability, calculus, etc.)
- A solid grounding in data structures (trees, priority queues, etc) and graph algorithms (DFS, BFS, Dijkstra's algorithm)
- Competence in programming and design of algorithms and software
- Ability to write
- But, come speak with me if you have concerns

Topics (Subject to Change)

- Agents and environments (Chap 2)
- Searching for a solution (Chapters 2 and 3)
- Playing games (Chapter 5)
- Constraint Satisfaction Problems (Chapter 6)
- Logic and inference (Chapters 7-9)
- Uncertainty (Chapter 13)
- Decision-making under uncertainty (Chapters 16-17)
- Supervised learning (Chapter 18)
- Reinforcement learning (Chapter 21)