CS 440: Introduction to AI

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Outline for Today

- Administrata
- Overview
- What is AI?
- History
- State of the Art

Some Salient Information

- Home page:
  - http://ai.vancouver.wsu.edu/~wallaces/courses/2005/ai
- Textbook:
  - S. Russell and P. Norvig
    AI: A Modern Approach
    Prentice Hall, 2003, Second Edition
- Grading:
  - Exams (50%), Homework (45%), Participation (5%)
- Three Exams (best counts most)

Course Focus

- Practical material useful outside of AI
- About 9 Homework Assignments
  - Many will involve programming
    -
  - ***May build on one another***
    - Do your homework!

A Recipe for Replicants?

- What you may see in this class
  - New methods for solving problems
  - Especially *hard* problems
- Most AI problems do not yield algorithms easily
  - Search
  - Learning
  - Induction

Key Topics We'll Cover

- Agents
- Search
- Logic
- Planning *
- Learning
- Probabilistic Models *

What is AI?

- A field in which the goal is to study and develop intelligent systems
- Underpinnings in both theory and engineering
- In the context of computer science, we often focus on design of intelligent software

AI's Multi-Disciplinary Nature

- AI draws from many areas:
  - Psychology
  - Philosophy
  - Linguistics
  - Statistics
  - Economics

Some Main Goals of AI

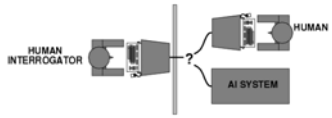
Four basic categories:

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

The textbook advocates "acting rationally"

Acting humanly: Turing Test

- 1950: "Can machines behave intelligently?"
- Operational test for intelligent behavior



- Related areas of AI:
  - knowledge reasoning
  - language understanding
  - learning

Thinking humanly: cognitive modeling

- 1960s: information-processing psychology
- Requires theories of the brain

- Validation requires
  1) Predicting behavior of human subjects (top-down)
  2) Direct identification from neurological data (bottom-up)
- Now these are (roughly)
  - Cognitive Science
  - Cognitive Neuroscience

Thinking rationally: "laws of thought"

- Aristotle: what are correct arguments/thought processes?
- Greek schools created first *logics*
- Math and philosophy developed modern logics (used in AI)
- Problems:
  1. Not all intelligent behavior is mediated by logical deliberation
  2. What is the purpose of thinking? What thoughts should I have?

Acting rationally: rational agent

- Rational behavior: doing the right thing
- Doesn't necessarily involve thinking; thinking should be in the service of rational action
- *The book concentrates on this approach*

Brief History of AI

- McCulloch & Pitts (1946) – described computational model of neuron
- 1st Chess playing programs (1950s)
- Newell & Simon's GPS

Brief History of AI

- Minsky & Papert's Perceptrons
- Knowledge Engineering and Heuristic Search (1970s)
- AI Industry is born (1980s)

AI & Software Engineering

- Today, there are two sides to AI that roughly correspond to the think and act goals of AI
  - Theory and research driven
  - Application driven
- Application driven side of AI has much in common with Software Engineering

AI & Software Engineering

- Goal of Software Engineering is to produce economical software that is efficient and reliable and operates on real machines.
- Goal of the applied side of AI is roughly the same, but focuses on software that exhibits some degree of *intelligence*

What is intelligence?

- Brings us back to our initial breakdown of AI
  - Thinking/acting like a human
  - Thinking/acting rationally
- AI R&D typically addresses problems that are not easy to solve using conventional software design techniques

Modern AI

- Renewed interest in Neural Networks
- Formalization of Planning systems
- Introduction/Refinement of probabilistic models such as belief nets and HMMs
- Coining the term “Agent”

State of the art

- Deep Blue defeated the reigning world chess champion Garry Kasparov in 1997
- Proved a mathematical conjecture (Robbins conjecture) unsolved for decades
- No hands across America (driving autonomously 98% of the time from Pittsburgh to San Diego)
- During the 1991 Gulf War, US forces deployed an AI logistics planning and scheduling program that involved up to 50,000 vehicles, cargo, and people
- NASA's on-board autonomous planning program controlled the scheduling of operations for a spacecraft
- `Proverb` solves crossword puzzles better than most humans