Introduction to AI

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Who Am I?

- Instructor: Burr Settles
  - 3rd year grad student
  - Research Interests in machine learning, natural language processing, and bioinformatics
- Assistant: Ahmed Ayad
  - 3rd year graduate student
  - Databases research
- Assistant: Michael Schultz
  - 1st year graduate student
  - Interests in AI and bioinformatics

Who Are You?

- Homework #0: Next time, bring in a note card or sheet of paper with to following:
  - Your name
  - Year in school
  - Academic Major/Department
  - Why you're taking the course
  - What you hope to get out of the course
  - An image of you if possible (I'd like to get to know your faces, I'm terrible with names!)

Details

- Prerequisite
  - CS 367 (data structures & algorithms)
- Homeworks & Class Participation (~50%)
  - Probably 5 homeworks throughout the summer
  - A mix of written work and Java/Prolog
  - Due at the start of class
  - You need to know Java and Unix!!
    - CSL orientation session today & tomorrow @ 4pm
  - You have 3 "late days" for the summer… after that, 10 points off for each day

Details

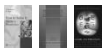
- Exams (~40%)
  - Midterm: Thursday, July 10
  - Final: Friday, August 8
- Class project (~10%)
  - Programming project *or* 5+ page research paper on a topic of *your* choice
  - Work in teams of 2-3 people
  - 15 minute presentations last week of class
  - More information as the summer unfolds…

Details

- Course webpage
  - http://www.cs.wisc.edu/~cs540-1
- Instructor/TA email
  - cs540-1@cs.wisc.edu
- Class mailing list
  - cs540-1list@cs.wisc.edu
  - About once a week there will be an online discussion topic (counts as part of the participation grade)

Textbooks

- Required text
  - *AI: A Modern Approach*
  - A classic by now, brand new edition!
  - All reading assignments will be from this book or from class handouts
- Recommended texts
  - *How to Solve It: Modern Heuristics*
  - *Machine Learning*
  - *Gödel, Escher, Bach: An Eternal Golden Braid*



7

Key Questions

What is intelligence?

What is *artificial* intelligence?

8

Goals of AI

- The engineering goal is to develop the concepts and practices of building intelligent machines. Emphasis is on *system building*
- The science goal is to develop concepts, theory, and mechanisms to model intelligence. Emphasis on understanding and automating *intelligent behavior*

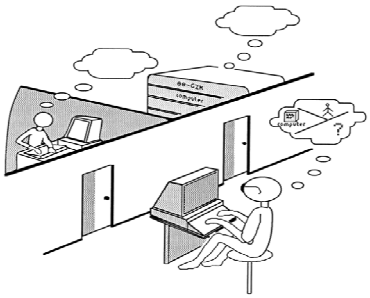
9

1st Tension: Human vs. Rational

- Should computers emulate human thought?
  - We don't even know how that works!!
  - Maybe we should just approximate thought by making computers arrive at conclusions in a rational way
- Should computers emulate human behavior?
  - You're sitting in class and someone asks, "Can you tell me the time?" How do you respond?
  - Behaviorist approach: exemplified by the Turing Test

10

The Turing Test



11

The Turing Test

- Famous attempts
  - **ELIZA** (J. Weizenbaum, MIT): Rogerian psycho-therapist program that asks questions based on keywords in the user's dialogue
  - **PARRY** (K. Colby, Stanford): emulates a paranoid by actively engaging the interrogator with "its" fears and anxieties
  - Others: RACTER, "Whimsical Conversation"
- Loebner Prize: Turing Test competition
  - **ALICE** is the most recent winner

12

2nd Tension: Thinking vs. Acting

- Does the machine need to actually *think*?
  - Playing a game of tic-tac-toe or chess
  - Speech recognition for airline reservations
  - Amazon.com's product suggestions
  - Medical diagnosis system
  - Automated steering of a vehicle
  - Any other ideas?

13

Four Faces of AI Research

Think like Humans (general problem solver, cognitive science)	**Think Rationally** (expert systems, logic programs)
Act like Humans (Turing Test, behaviorist approach)	**Act Rationally** (most of modern AI)

14

Symbolic vs. Connectionist AI

- How to represent knowledge?
- Symbolic approach
  - Facts are nodes or "tokens" with special meaning
  - Knowledge is contained logical relationships defined and manipulated between them
  - Prolog programs, decision trees, etc.
- Connectionist approach
  - Facts aren't represented explicitly
  - Knowledge emerges from arbitrarily learned, complex "connections" in between perceptions and actions
  - Neural networks are a prime example

15

Application: Game Playing

- IBM's Deep Blue
  - First AI to beat a human chess champion: Garry Kasparov, 1997
- Blondie24
  - Machine learning program that won a checker's tournament
- Commercial game AI
  - Increase in more sophisticated AI work for "non-academic" games

16

Application: Logistics Planning

- Trip itineraries
  - Engines such as MapQuest use AI to propose driving directions from one location to another
- Dynamic Analysis and Replanning Tool (DART)
  - Used during the 1991 Persian Gulf crisis to assist in managing military resources (over 50,000 people, vehicles, and cargo shipments)
- Airline flight scheduling
  - If flights are delayed or re-routed, AI planners are used to figure the best way to re-schedule departures and arrivals

17

Application: Speech Recognition

- Airline reservation systems
  - Often robust to many different voice pitches and accents
- Automatic transcription
  - Monitor language and content for live radio and television
  - Assist in the transcribing of closed-captioned television programs

18

Application: Text Processing

- Automated language translation
  - Altavista's *Babelfish* server
- Information retrieval
  - Google search engine
- Text classification and organization
  - Google news, SPAM filtering
- Document summarization
  - Columbia University's *Newsblaster*

19

Application: Biology & Medicine

- Diagnosis systems
  - Specialists often use statistical AI tools to diagnose a patient has a disease based on his/her symptoms
- Genome analysis software
  - Now that the human and other genomes are complete, AI is used to identify new genes, infer biochemical pathways, and compare genomes of multiple species

20

Application: Vision

- Handwriting recognition
  - US Postal Service automatically sorts mail
- Face recognition
  - Government / bank security systems
- Autonomous Land Vehicle In a Neural Network (ALVINN)
  - Uses camera data to automatically steer a car on a highway at speeds up to 65 mph (from Washington, DC to San Diego and back!)

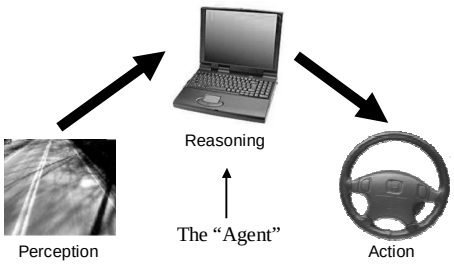
21

General AI Framework

- Perception
  - Data records, cameras, microphones, text documents, sensors: the real-world knowledge on which the machine has to base its decisions
- Reasoning
  - Search, inference, classification, decision-making: consider perceptions based on a "model" of the problem world
- Action
  - Output the results from decisions made during the reasoning process

22

General AI Framework



23

Next Time

Intelligent Agents!!

24