Introduction to Artificial Intelligence

Unit # 1

Today's Agenda

- Get to Know Each Other
- Course Contents
- Grading Policy
- Projects Expectation
- Overview of the Main Topics
- Introduction to Artificial Intelligence

Course Outline

- Overview of Artificial Intelligence
- State Space Representation
- Search Techniques
- AI in Games
- Machine Learning
- Propositional and Predicate Logic
- Probabilistic Reasoning
- Robotics

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Useful Information

- Course Website
  - http://cse307ai.wikispaces.com/
  - Join the course wiki and actively participate in discussions.
- **Text Book**
  - Tim Jones, *Artificial Intelligence: A Systems Approach*, 2007.
- **Reference Books**
  - Ben Coppin, *Artificial Intelligence Illuminated*, 2004.
  - Kevin Korb and Ann Nicholson, *Bayesian Artificial Intelligence*, 2003
  - Steven Rabin, *AI Game Programming Wisdom 3*, 2005.
 - Steve Rabin, *AI Game Programming Wisdom 4*, 2008

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Software Tools

- SWI-Prolog (http://www.swi-prolog.org/)
- GeNIe (http://genie.sis.pitt.edu/)
- Weka (http://www.cs.waikato.ac.nz/ml/weka/)
- KNIME (http://www.knime.org/)

- For programming assignments, you can use any standard programming language (either Java, C#, C++, etc.).

Marks Distribution
(Tentative)

- Two Terms (30%)
- 4 Assignments (10%)
  - Implementation of different search techniques
  - Application of machine learning algorithms on a real data set and implementation of one of the algorithms
  - Real scenario modeling using logic and probabilistic reasoning tool
- Quizzes (3 out of 4) (7.5%)
- Project (12.5%)
  - Implementation of any of learned techniques in a problem domain of your choice
- Final Exam (40%)

AI in Movies
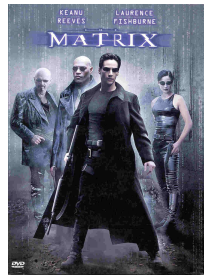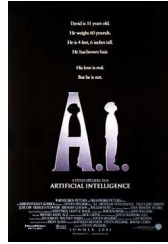
Basic Questions
(Taken from http://www-formal.stanford.edu)

- What is artificial intelligence?
- It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence.
- Yes, but what is intelligence?
- Intelligence is the computational part of the ability to achieve goals in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines.
- Isn't there a solid definition of intelligence that doesn't depend on relating it to human intelligence?
- Not yet. The problem is that we cannot yet characterize in general what kinds of computational procedures we want to call intelligent. We understand some of the mechanisms of intelligence and not others.

Basic Questions (Cont'd)

- Isn't AI about simulating human intelligence?
- Sometimes but not always or even usually. On the one hand, we can learn something about how to make machines solve problems by observing other people or just by observing our own methods. On the other hand, most work in AI involves studying the problems the world presents to intelligence rather than studying people or animals. AI researchers are free to use methods that are not observed in people or that involve much more computing than people can do.

- Does AI aim at human-level intelligence?
- Yes. The ultimate effort is to make computer programs that can solve problems and achieve goals in the world as well as humans. However, many people involved in particular research areas are much less ambitious.

Basic Questions (Cont'd)

- What about IQ? Do computer programs have IQs?
- No. IQ is based on the rates at which intelligence develops in children. It is the ratio of the age at which a child normally makes a certain score to the child's age. The scale is extended to adults in a suitable way. IQ correlates well with various measures of success or failure in life, but making computers that can score high on IQ tests would be weakly correlated with their usefulness. For example, the ability of a child to repeat back a long sequence of digits correlates well with other intellectual abilities, perhaps because it measures how much information the child can compute with at once. However, ``digit span'' is trivial for even extremely limited computers.

Strong vs. Weak AI

- Strong AI refers to the field of research that is interested in making computers think at a level equal to humans

- Weak AI represents the wider domain of AI technologies. Weak AI features can be added to systems to give them intelligent quanlities.

- The course focuses on weak AI.

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Philosophical vs. Practical AI

- Philosophical:
  - Can machines think, in principle?
  - Will machine thought be different from human thought?

- Practical
  - Collection of techniques to automatically solve particular problems that require "intelligence" (whatever that is)

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Turing Test

- One or more human judges interview computers and human foils using terminals (so that the judges won't be prejudiced against the computers for lacking a human appearance).
- The nature of the dialog between the human judges and the candidates (i.e., the computers and the human foils) is similar to an online chat using instant messaging.
- The computers as well as the human foils try to convince the human judges of their humanness. If the human judges are unable to reliably unmask the computers (as imposter humans) then the computer is considered to have demonstrated human-level intelligence

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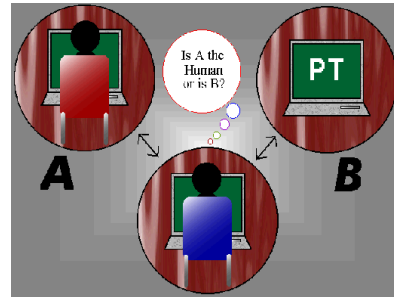
Loebner Prize

Home Page of The Loebner Prize in Artificial Intelligence

"The First Turing Test"

Loebner Prize Gold Medal
(Solid 18 carat, not *gold-plated* like the Olympic *"Gold"* medals)

- Read the following story on 2008 Loebner Prize:

http://technology.timesonline.co.uk/tol/news/tech_and_web/article4934858.ece

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Prophecies

- I believe that in about fifty years' time it will be possible to programme computers…to make them play the imitation game so well that an average interrogator will not have more than 70 percent chance of making the right identification after five minutes of questioning.

- *— Alan Turing, Computing machinery and intelligence, 1950.*

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Prophecies (Cont'd)

- In from three to eight years, we'll have a machine with the general intelligence of an average human being.

- *— Marvin Minsky to Life magazine, 1970*

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Prophecies (Cont'd)

- We can expect computers to pass the Turing test, indicating intelligence indistinguishable from biological humans, by the end of the 2020s.

- *— Ray Kurzweil, The Singularity is Near, 2005*

History of AI

- **1950s – The Birth of AI**
  - 1950: Alan Turing publishes "Computing Machinery and Intelligence."
  - 1956: John McCarthy coins the term, "Artificial Intelligence" at a Dartmouth computer conference.
  - 1958: John McCarthy invents the Lisp language, an AI programming language, at Massachusetts Institute of Technology (MIT).
- **1960s – The Rise of AI**
  - 1965: Joseph Weizenbaum builds ELIZA, an interactive program that carries on a dialogue in English on any topic (MIT).
  - Arthur's Clark book titled "2001: A Space Odyssey" – HAL, an intelligent computer onboard a Jupiter-bound spacecraft, murdered most of the crew out of paranoia over its own survival.
  - Knowledge representation was a strong theme during the 1960s, as strong AI continued to be a primary theme in AI research.

History of AI (Cont'd)

- 1970s – The Fall of AI
  - The 1970s represented the fall of AI after an inability to meet irrational expectations.

- 1990s to Today – AI Rises Again
  - Advancement in probabilistic reasoning, machine learning, intelligence agents, and computational intelligence systems.
  - 1997: IBM computer Deep Blue beats world champion Garry Kasparov in chess match.

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DARPA Urban Challenge

- The DARPA Grand Challenge is a prize competiton for driverless cars.
- The 2007 Challenge was held in California.
  - 96 KM course
  - 6 hours time duration
  - Rules included obeying all traffic regulations while negotiating with other traffic and obstacles and merging into traffic.
  - The $2 million winner was Tartan Racing, a collaborative effort by CMU and GM.

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Ms Pac-Man Competition

- The aim of this competition is to provide the best software controller for the game of Ms Pac-Man. This is a great challenge for computational intelligence, machine learning, and AI in general.

- The mode of interaction is as follows: about 15 times per second your program will be sent a pixel map of the Ms. Pac-Man window, and it then responds with an integer indicating the direction of the joystick.

- http://www.grappa.univ-lille3.fr/~loth/pacman.mpeg

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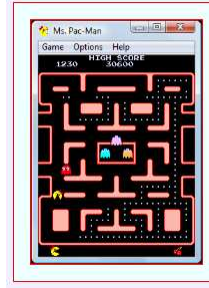
c/c++.geniuses.apply

Wanted: C/C++ Genius Software Engineers
Rs. 200,000 per month

x 6 permanent positions (with benefits) available
sign on bonus for immediate start

Work on our SATMAP Product Development initiatives / 3+ years of relevant experience required / Unix, Telephony (Avaya, Cisco, Nortel, Aspect & Spectrum etc.) or SNMP experience is an advantage, but not essential / International travel (USA, Europe etc.)

SATMAP: Intelligent call routing technology is the next revolution in routing standards, after skills-based routing. By mapping hundreds of variables and using neural network artificial intelligence, SATMAP dramatically improves customer satisfaction and revenues while optimising costs for businesses interacting with their customers.

Apply now for these and other opportunities (.Net / SQL Server) on our website at www.trgworld.com/trgtech, or send your cover letter and CV to trgtech.recruitment@trgworld.com.

trg tech: playing mind games
(of the intelligent kind)

- Dawn
  (Jan 05, 2009)

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Summary

- Intelligence is difficult to define, and as a result Artificial Intelligence is also hard to define.
- One definition of Artificial Intelligence is:

  Artificial intelligence is the study of systems that act in a way that to any observer would appear to be intelligent.

- Turing's test is a way to determine if a computer is truly intelligent, by seeing if it could fool a human in conversation into thinking that it too was human. It is widely believed today that even if a computer could pass the Turing test, it would still not truly be conscious or intelligent in the way that humans are.

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