CS 188: Artificial Intelligence
Spring 2009

Lecture 1: Introduction
1/20/09

John DeNero -- UC Berkeley
Most slides over the course adapted from
either Dan Klein, Stuart Russell, or Andrew Moore

Course Info

• **Course Staff:**
  • Instructor: John DeNero
  • GSIs: Nimar Arora, Dan Gillick & Nick Hay

• **Course Website:**
  • http://inst.cs.berkeley.edu/~cs188/
  • Syllabus, assignments, course info, faq, etc.

• **Announcements & Forums:**
  • bspace.berkeley.edu (linked from course website)
  • Post your questions to the forum
More Course Info

• Book: Russell & Norvig, AI: A Modern Approach, 2\textsuperscript{nd} Ed.

• Prerequisites:
  • (CS 61A or B) and (Math 55 or CS 70)

• Work and Grading:
  • 5 projects & 4 written assignments (50%)
    • Programming: Python, groups of 1-2
    • Written: solve together, write-up alone
    • 5 late days for projects only
  • Midterm (20%) -- \textit{Evening of March 19}
  • Final (30%)
  • Fixed grading scale
  • Participation
  • Academic integrity policy

How Much of AI is Math?

• A lot, but not right away

• Understanding probabilities will help you a great deal

• Four weeks from now, there will be many more equations
Today

• What is artificial intelligence?
• What is this course?
• Our first AI program

Sci-Fi AI?
Sci-Fi AI Compared to Real AI

Cyberdyne Systems T-800 Series Model 101  VS  Ali Rahimi and Shen-Hui Lee’s web cam

[VIDEO]

Vision (Perception)

• Object and character recognition
• Scene segmentation
• Image classification

Image from Erik Sudderth
Robotics

- Robotics
  - Part mech. eng.
  - Part AI
  - Reality much harder than simulations!

- Technologies
  - Vehicles
  - Rescue
  - Soccer!
  - Lots of automation…

- In this class:
  - We ignore mechanical aspects
  - Methods for planning
  - Methods for control

Images from stanfordracing.org, CMU RoboCup, Honda ASIMO sites
Video from Pieter Abbeel (with J. Zico Kolter and Andrew Ng)

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Natural Language

- Speech technologies
  - Automatic speech recognition (ASR)
  - Dialog systems, speaker identification, meeting analysis, etc.

- Language processing technologies
  - Machine translation
  - Question answering
  - Linguistic analysis

Our research covers a range of topics in natural language processing.
Logic

- Logical systems
  - Theorem provers
  - NASA fault diagnosis
  - Question answering

- Methods:
  - Deduction systems
  - Constraint satisfaction
  - Satisfiability solvers (huge advances here!)

\[
\begin{align*}
&v_1 \lor v_2 \lor v_3 \\
&\bar{v}_1 \lor v_2 \lor \bar{v}_3 \\
&\bar{v}_1 \lor \bar{v}_2 \lor v_3 \\
&\bar{v}_1 \lor v_2 \lor v_3
\end{align*}
\]

Satisfying assignment:

\[
\begin{align*}
&v_1 \text{ is true} \\
&v_2 \text{ is false} \\
&v_3 \text{ is false}
\end{align*}
\]

Game Playing

- May, '97: Deep Blue vs. Kasparov
  - First match won against world-champion
  - "Intelligent, creative" play
  - 200 million board positions per second!
  - Humans understood 99.9% of Deep Blue's moves
  - Can do about the same now with a big PC cluster

- Open question:
  - How can humans compete with computers at all???

- 1996: Kasparov Beats Deep Blue
  - "I could feel --- I could smell --- a new kind of intelligence across the table."

- 1997: Deep Blue Beats Kasparov
  - "Deep Blue hasn't proven anything."

Text from Bart Selman, image from IBM's Deep Blue pages
Decision Making

• Scheduling, e.g. airline routing, military
• Route planning, e.g. mapquest
• Medical diagnosis
• Automated help desks
• Fraud detection
• Spam classifiers
• Web search engines
• etc.

Rational Decisions

We'll use the term *rational* in a particular way:
• Rational: maximally achieving pre-defined goals
• Rational only concerns what decisions are made (not the thought process behind them)
• Goals are expressed in terms of the *utility* of outcomes
• Being rational means *maximizing your expected utility*

A better title for this course would be:

**Computational Rationality**
What About the Brain?

- Brains (human minds) are very good at making rational decisions (but not perfect)
- Brains are to intelligence as wings are to flight
- Brains aren’t as modular as software
- Lessons learned: prediction and simulation are key to decision making

Designing Rational Agents

- An agent is an entity that perceives and acts.
- A rational agent selects actions that maximize its utility function.
- Characteristics of the percepts, environment, and action space dictate techniques for selecting rational actions.
- This course is about:
  - General AI techniques for a variety of problem types
  - Learning to recognize when and how a new problem can be solved with an existing technique
Pacman as an Agent

Reflex Agents

- Consider the past and present, but not future predictions, to select an action.
- Encode preferences as a function of the percepts and action.
Announcements

• Important this week:
  • **Python tutorial** is online now (due next Wednesday)
  • **Lab hours** this Thursday from 1pm-3pm in Soda 275
  • Get your **account forms** in front after class

• Also important:
  • **Sections** start on Monday; you may change sections. The 5-6 pm section is nice and small (just added).
  • The **Waiting list** is almost empty. I don’t control enrollment. Contact Michael-David Sasson (msasson@cs) with questions; he makes decisions.

See You Thursday

Comic courtesy of Dan Gillick