

CSC421 Intro to Artificial Intelligence



UNIT 00: Overview & Introduction

Overview



- Emphasis :
 - Agents as a way of thinking about AI and software in general
- Workload :
 - Balanced over the term
 - IMPORTANT: prepare for lectures
 - Suggested workplans
- Exams (midterm & final)
 - Open book
- Thoughts on cheating, copying, attendance

Extra interest group meeting



- Possibility of a 2-hour biweekly meeting to cover more history, advance topics, discussion, etc
- Student-driven
- ***NO EFFECT ON GRADE***
- Only if enough interest
- Expression of interest by email:
 - gtzan@cs.uvic.ca

What is AI ?



- Do you know of any examples of applications of AI ?
- Major challenges ahead ?
- Why study AI ?
- What do you expect to learn in this course ?
- Along with molecular biology, AI is regularly cited at the “field I would most like to be in” by scientists in other disciplines. Do you agree ? Why ?

My favorite definition



- “Artificial Intelligence (AI) is the science of how to get machines to do the things they do in movies” - Dr. Astro Teller

4 approaches



- Systems that:
 - Think like humans
 - Act like humans

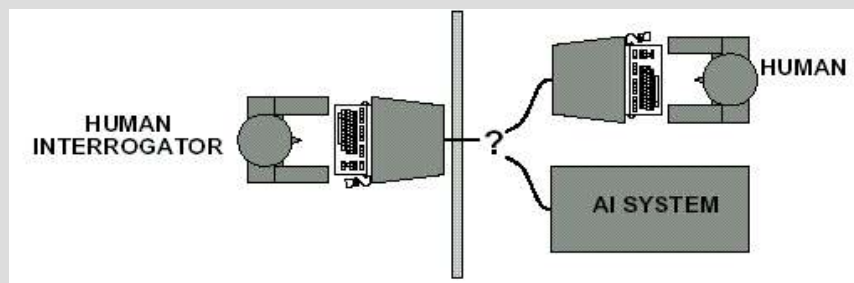
Think rationally
Act rationally



Acting Humanly: Turing Test



- Operational test for intelligent behavior:



- By 2000, a machine might have a 30% chance of fooling a human for 5 minutes
- Knowledge, reasoning, language understanding, learning
- Problems: Not reproducible, constructive, amendable to mathematical analysis

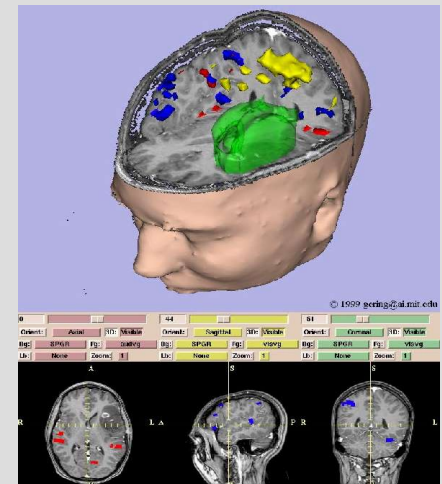


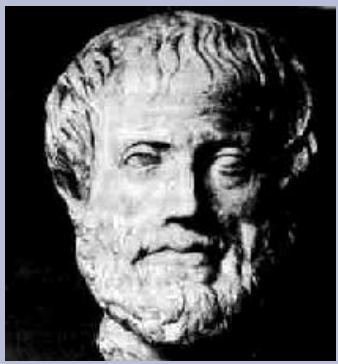


Thinking humanly: Cognitive modeling



- 1960s “**cognitive revolution**”: information processing psychology replaced prevailing orthodoxy of **behaviorism**
- Theories of how the brain works
 - Predicting and testing user subjects (top-down)
 - Direct analysis of neurological data (bottom-up)
- Cognitive science and cognitive neuroscience – today distinct from AI

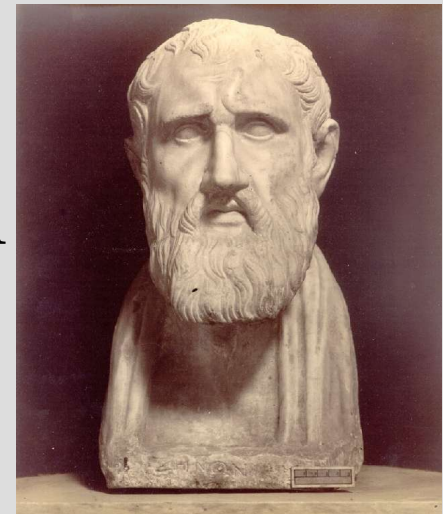




Thinking rationally: Laws of thought



- Greek schools various forms of logic
 - Notation and rules of derivation for thoughts
 - Mechanization of computation/proof
- Direct line through mathematics and philosophy to AI
- Problems:
 - Not all intelligent behavior is mediated logic deliberation
 - What is the purpose of thinking ?
 - What thoughts should I have ?





Acting rationally: The rational agent approach



- Rational behavior: doing the right thing
- That which is expected to maximize goal achievement given the available information
- Not necessarily just thinking: blinking reflex – but thinking should be in the service of rational action
- Advantages:
 - More general than laws of thought
 - More amendable to scientific development



Rational agents



- An **agent** is an entity that perceives and acts
- This course is about designing **rational** agents
- Abstractly, an agent is a function from precept histories to actions: $f: P^* \rightarrow A$
- For any given class of environments, we seek the agent (or class of agents) with the best performance
- Caveat: **computational resources**

AI Prehistory



- Philosophy** : logic, methods of reasoning
mind as a physical system
foundations of learning, language, rationality
- Mathematics**: formal representation and proof
algorithms, computation, (un)decidability,
(in)tractability, probability
- Psychology** : adaptation
phenomena of perception and motor control
experimental techniques (psychophysics etc)
- Economics** : formal theory of rational decisions
- Linguistics** : knowledge representation and grammar
- Neuroscience**: Plastic physical substrate for mental activity
- Control theory**: homeostatic systems, stability, simple optimal
agent designs

Brief history of AI



- 1943: McCulloch & Pitts: Boolean circuit model of the brain
- 1950: Turing's "Computing Machinery and Intelligence"
- 1952-69: Look, Ma, no hands !
- 1950s: Early AI programs, including Samuel's checkers program, Newell & Simon's Logic Theorist, Gelernter's Geometry Engine
- 1956 : Dartmouth meeting: "Artificial Intelligence" adopted
- 1965 : Robinson's complete algorithm for logical reasoning
- 1966-74: AI discovers computational complexity – Neural Network research almost disappears
- 1969-79: Early development of knowledge-based systems
- 1980-88: Expert systems industry booms
- 1988-93: Expert systems industry busts: "AI Winter"

Brief History of AI



1985-95: Neural networks return to popularity

1988- : Resurgence of probability; general increase in technical depth, “Nouvelle AI”: ALife, GAs, soft computing

1995- : Agents, agents, everywhere, ...

2003- : Human-level AI back on the agenda, games

