



Defining Intelligence: Human Thought, Rational Action, and the Birth of AI

By Pouria Moradpour

AMCSUI Journal Club
October 20th, 2025



Wait...

Before We Get Started

Let's Talk About Journal Club

Our goal isn't just to read aimlessly.

- We organize our discussions into “**Arcs**”: focused themes that guide our reading and conversation.
- Each session is **logged on our website**,
- and we also maintain a **glossary** of key terms we discuss.
- Your **attendance and contributions** are recorded and can serve as valuable proof of engagement; something worth adding to your **resume**.

Oct 18, 2025, 1 min read

Search

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Glossary

✓ Artificial Intelligence Arc

AI Arc Session 1, Defining Intelligence

Session Reviews

glossary index

Leaderboard

Covered Resource

Date _____

Presenter

the first chapter of “Artificial Intelligence: A Modern Approach” by Russell & Norvig

Monday,
October 20th

Pouria
Moradpour

TIME Monday (Oct. 20th), 12:20-13:50 ARC All

ADDRESS *Faculty of Mathematics, University of Isfahan*

PRESENTER *Pouya Moradpour*



Our [Glossary](#) provides clear definitions of the technical terms and concepts that arise in our discussions, serving as both a reference and a record.

Each session is followed by a [Session Review](#), where we summarize the discussion, highlight key points, and note further directions for exploration.

Contribution is Appreciated But Not Mandatory

Leader board

Rank	Name	Total 💡 Insight Points 💡

- Attendance - 10 💡
- Presentation - 30 💡
- Contribution to the [Glossary](#) (per word) - 5 💡
- Session Review - 20 💡

- **Contributor names** will appear in the **Glossary** and **Session Reviews**.
- To make things more engaging, we also assign **“Insight Points”** for each contribution.
- Members with the highest scores will receive a **shout-out on our website’s main page!**

Session Structure

- Presentation, Questions at the End: 20-30 Minutes
- Break/Thinking About the Questions: 10 Minutes
- Discussion: 40-50 Minutes
- Task Assignment / Deciding on the Next Session: 10-20 Minutes

I Hope This Is the Start of Something Great!

Now, let's get back to **Artificial Intelligence.**



What is AI?

The Four Approaches & Eight Definitions

Thinking Humanly “The exciting new effort to make computers think . . . <i>machines with minds</i>, in the full and literal sense.” (Haugeland, 1985) “[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . .” (Bellman, 1978)	Thinking Rationally “The study of mental faculties through the use of computational models.” (Charniak and McDermott, 1985) “The study of the computations that make it possible to perceive, reason, and act.” (Winston, 1992)
Acting Humanly “The art of creating machines that perform functions that require intelligence when performed by people.” (Kurzweil, 1990) “The study of how to make computers do things at which, at the moment, people are better.” (Rich and Knight, 1991)	Acting Rationally “Computational Intelligence is the study of the design of intelligent agents.” (Poole <i>et al.</i>, 1998) “AI . . . is concerned with intelligent behavior in artifacts.” (Nilsson, 1998)

Figure 1.1 Some definitions of artificial intelligence, organized into four categories.

Thinking Humanly - The Turing Test

- natural language processing to enable it to communicate successfully in English;
 - knowledge representation to store what it knows or hears;
 - automated reasoning to use the stored information to answer questions and to draw new conclusions;
 - machine learning to adapt to new circumstances and to detect and extrapolate patterns.
 - The Total Turing Test
- 



“The quest for “artificial flight” succeeded when the Wright brothers and others stopped imitating birds and started using wind tunnels and learning about aerodynamics. Aeronautical engineering texts do not define the goal of their field as making “machines that fly so exactly like pigeons that they can fool even other pigeons.”



Thinking Humanly

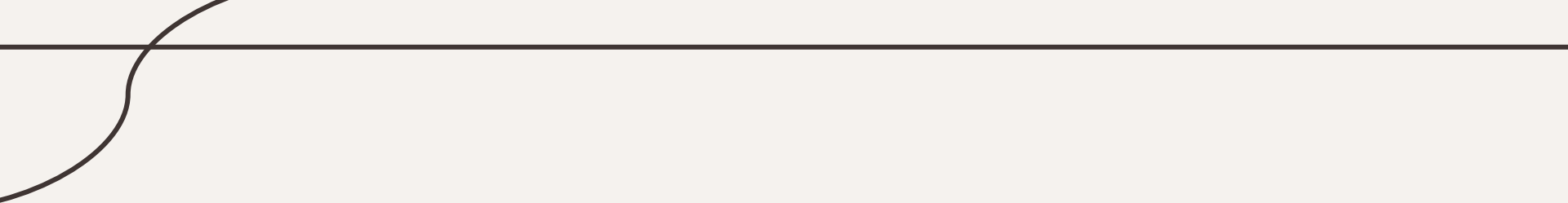
- Cognitive Science & Cognitive Modeling
- “an author would argue that an algorithm performs well on a task and that it is therefore a good model of human performance, or vice versa.”

Thinking Rationally

- Logic
- Informality & Uncertainty
- *A subtle point for discussion*

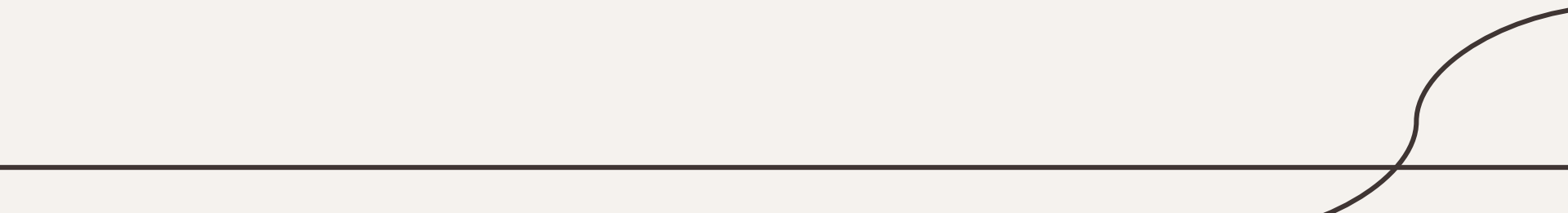
Acting Rationally

- More General than Laws-of-Thought
- Recoiling from a hot stove
- Perfect rationality is infeasible



Foundations of AI

Mostly for the discussion!



Contributions of Other Disciplines

- Philosophy
- Mathematics
- Economics
- Neuroscience
- Psychology
- Computer Engineering
- Control Theory & Cybernetics
- Linguistics

Mathematics

- Logic: Boole & Frege
- Algorithm: Khowarazmi
- Gödel's Incompleteness Theorem
- Computational Complexity Theory
- Probability

Neuroscience

	Supercomputer	Personal Computer	Human Brain
Computational units	10^4 CPUs, 10^{12} transistors	4 CPUs, 10^9 transistors	10^{11} neurons
Storage units	10^{14} bits RAM 10^{15} bits disk	10^{11} bits RAM 10^{13} bits disk	10^{11} neurons 10^{14} synapses
Cycle time	10^{-9} sec	10^{-9} sec	10^{-3} sec
Operations/sec	10^{15}	10^{10}	10^{17}
Memory updates/sec	10^{14}	10^{10}	10^{14}

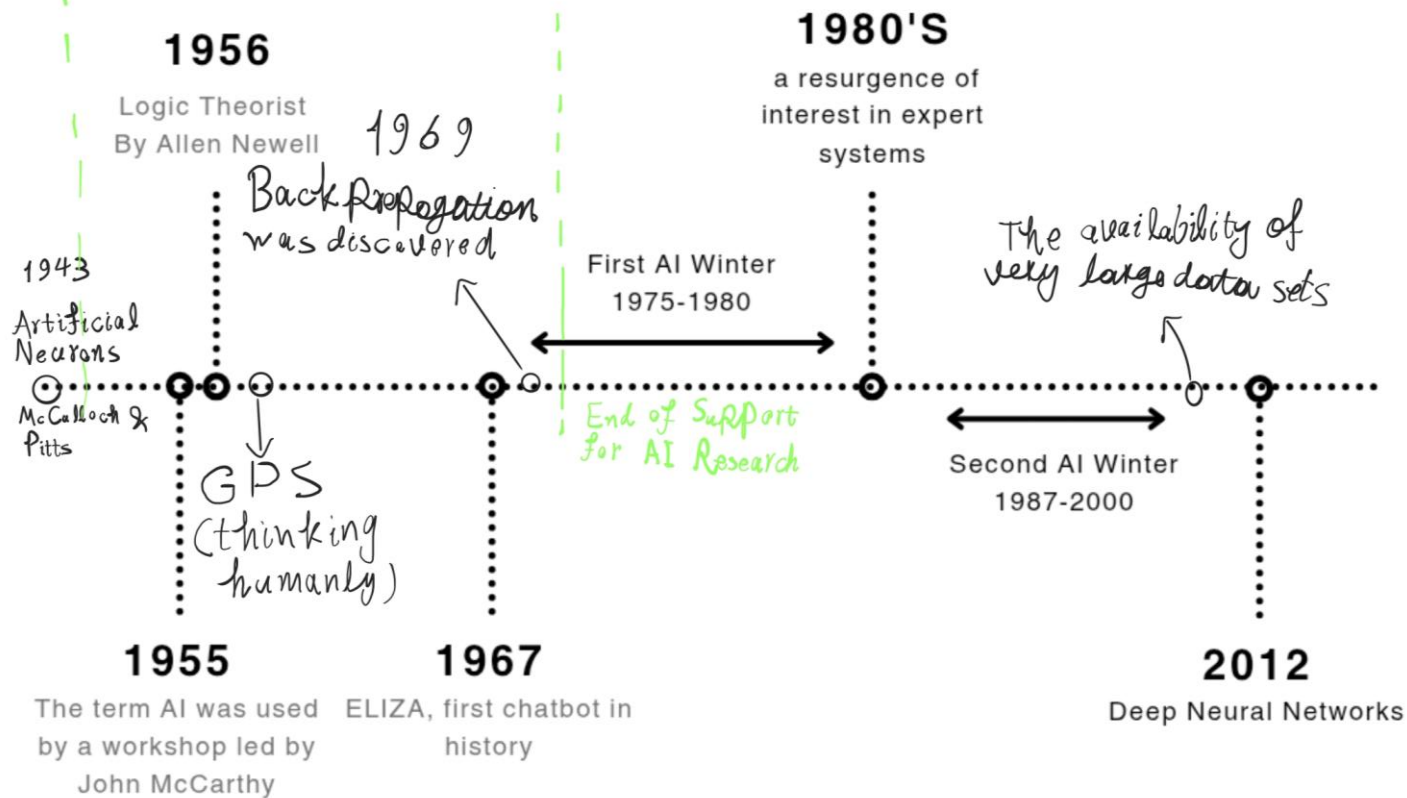
Figure 1.3 A crude comparison of the raw computational resources available to the IBM BLUE GENE supercomputer, a typical personal computer of 2008, and the human brain. The brain's numbers are essentially fixed, whereas the supercomputer's numbers have been increasing by a factor of 10 every 5 years or so, allowing it to achieve rough parity with the brain. The personal computer lags behind on all metrics except cycle time.

“raw comparisons are not especially informative. Even with a computer of virtually unlimited capacity, we still would not know how to achieve the brain's level of intelligence.”



History of AI

Early Enthusiasm





“It is not my aim to surprise or shock you—but the simplest way I can summarize is to say that there are now in the world machines that think, that learn and that create. Moreover their ability to do these things is going to increase rapidly until—in a visible future—the range of problems they can handle will be coextensive with the range to which the human mind has been applied”

- Herbert Simon, 1957





“We, as the producers of this technology, have a duty and an obligation to be honest about what is coming. It's a very strange set of dynamics, where we're saying: 'You should be worried about where the technology we're building is going.’”

- **Dario Amodei, 2025**



The Japanese announced the “Fifth Generation” project, a 10-year plan to build intelligent computers running Prolog. In response, the United States formed the Microelectronics and Computer Technology Corporation (MCC) as a research consortium designed to assure national competitiveness. In both cases, AI was part of a broad effort, including chip design and human-interface research. In Britain, the Alvey report reinstated the funding that was cut by the Lighthill report. In all three countries, however, the projects never met their ambitious goals.

The Stargate Project is a new company which intends to invest \$500 billion over the next four years building new AI infrastructure for OpenAI in the United States. We will begin deploying \$100 billion immediately. This infrastructure will secure American leadership in AI, create hundreds of thousands of American jobs, and generate massive economic benefit for the entire world. This project will not only support the re-industrialization of the United States but also provide a strategic capability to protect the national security of America and its allies. The initial equity funders in Stargate are SoftBank, OpenAI, Oracle, and MGX. SoftBank and OpenAI are the lead partners for Stargate, with SoftBank having financial responsibility and OpenAI having operational responsibility. Masayoshi Son will be the chairman.

Discussion

What do you think about these quotes?

- “we add and subtract in our silent thoughts.” –Thomas Hobbes
- One problem with a purely physical conception of the mind is that it seems to leave little room for free will: if the mind is governed entirely by physical laws, then it has no more free will than a rock “deciding” to fall toward the center of the earth
- “Nothing is in the understanding, which was not first in the senses.” – John Locke
- “actions are justified by a logical connection between goals and knowledge of the action’s outcome” - Aristotle
- How do the four core definitions of AI (thinking/acting, humanly/rationally) set fundamentally competing objectives for research, and in what ways does the concept of provide a mathematically well-defined standard for success that transcends mimicking human behavior?
- The chapter establishes that perfect is often computationally infeasible, leading to the concept of limited rationality. In what ways does the mathematical concept of -the distinction between polynomial and exponential growth in complexity- force AI systems to adopt principles of limited or bounded rationality in real-world environments?
- How did the fundamental mathematical limits demonstrated by Gödel's work, which showed the existence of statements in powerful formal theories, combine with the practical constraint of , forcing early AI researchers to abandon the dream of building complete, purely logical reasoning agents?

The image features two horizontal lines, one at the top and one at the bottom, both in a dark purple color. The ends of these lines are decorated with smooth, curved, S-shaped lines that extend outwards from the main horizontal lines.

Thanks!