



Introduction to AI

Sohrab Ardeshar Vakharia

ICAI- BI powered by AI ; - Sohrab V. & Asif R.

- The problem of defining artificial intelligence becomes one of defining intelligence itself.
- Is it a single faculty...? Or is it a collection of properties.....?
- Is it a learned faculty....? Or is it something already existed....?
- Can it be observed in behavior....? Or, do we have some scale to measure it...?
- These questions, though answers of which may be diverse nature, help in understanding and exploring the limits of AI.




What is Intelligence ?

Journey of Data-Information-Knowledge-Science- Intelligence.



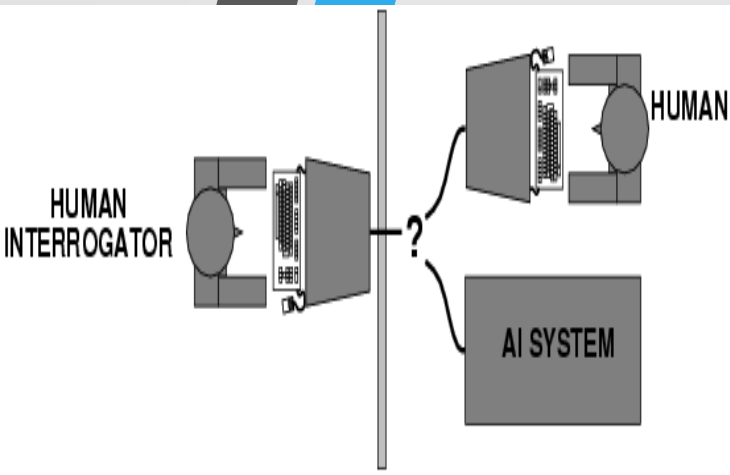
What is Artificial Intelligence ? And Cognitive Intelligence?

ICAI- BI powered by AI ; - Sohrab V. & Asif R.



Can machines think?
Are human's machines?
Can machines think like humans?
How would we know whether a computer is
thinking?

THINKING MACHINES

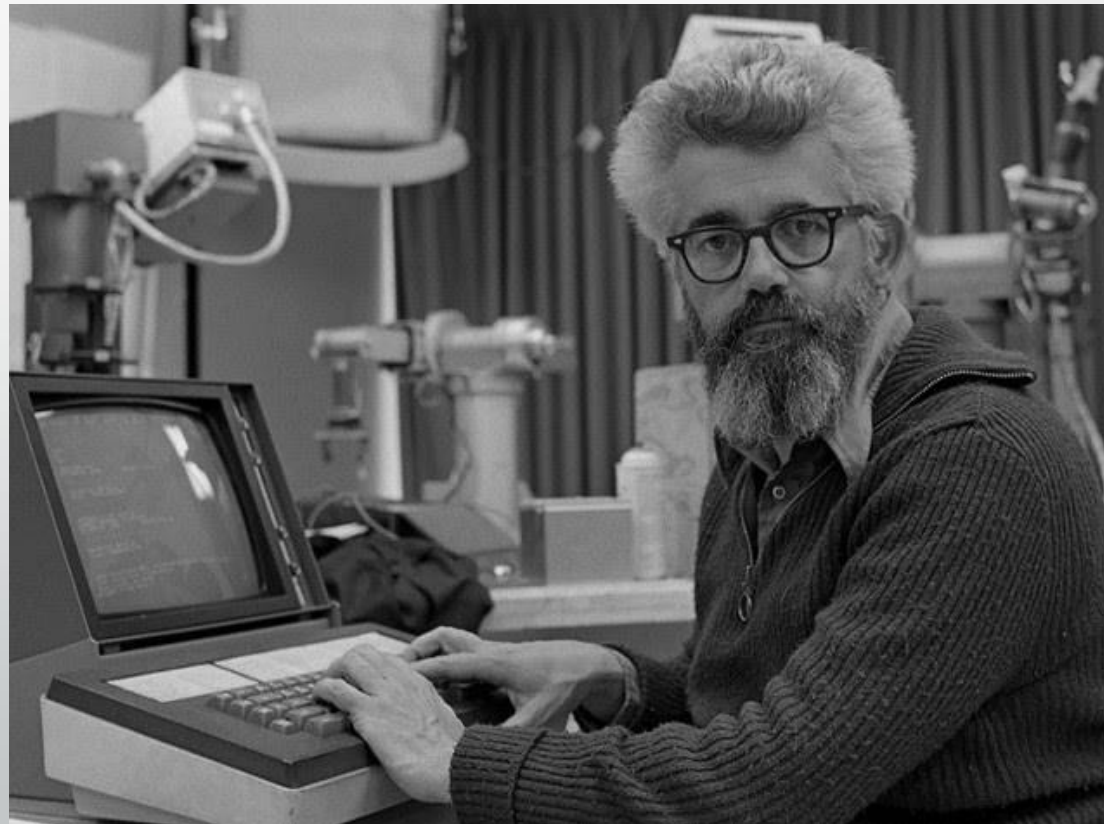


TURING TEST

Allan Turing, in 1950, considered the question of whether a machine could actually make to think.

Turing test measures the performance of an 'intelligent' machine.

“The science and engineering of making intelligent machines, especially intelligent computer programs”.
-John McCarthy



Thinking Humanly

- "The exciting new effort to make computers think . . . machines with minds, 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)

DEFINITIONS

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 et al., 1998)
- "AI . . . is concerned with intelligent behaviour in artifacts." (Nilsson, 1998)

A BRIEF HISTORY

- What happened after WWII?
 - 1943: Warren Mc Culloch and Walter Pitts: a model of artificial Boolean neurons to perform computations.
 - First steps toward connectionist computation and learning (Hebbian learning).
 - Marvin Minsky and Dann Edmonds (1951) constructed the first neural network computer.
 - 1950: Alan Turing's "Computing Machinery and Intelligence"
 - First complete vision of AI.
- The birth of AI (1956)
 - Darmouth Workshop bringing together top minds on automata theory, neural nets and the study of intelligence.
 - Allen Newell and Herbert Simon: The logic theorist (first non numerical thinking program used for theorem proving).
 - For the next 20 years the field was dominated by these participants.
 - Great expectations (1952-1969)
 - Newell and Simon introduced the General Problem Solver.
 - Imitation of human problem-solving
 - Arthur Samuel (1952) investigated game playing (checkers) with great success.
 - John McCarthy(1958)
 - Inventor of Lisp (second-oldest high-level language)
 - Logic oriented, Advice Taker (separation between knowledge and reasoning).

Biological Neuron

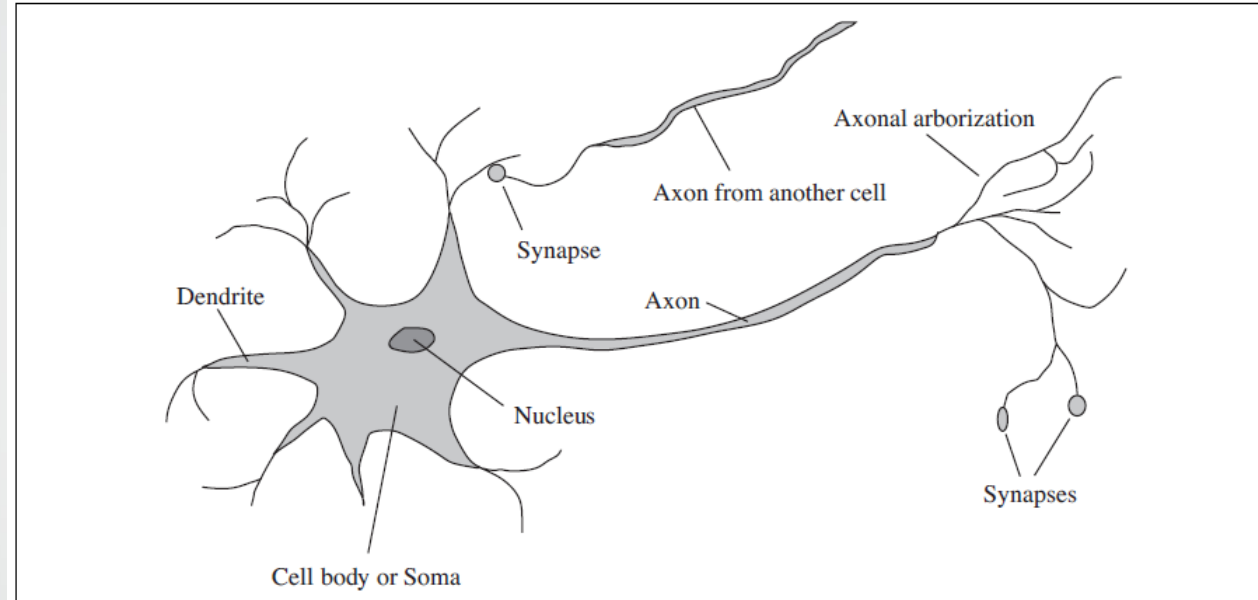


Figure 1.2 FILES: figures/neuron.eps (Tue Nov 3 16:23:13 2009). The parts of a nerve cell or neuron. Each neuron consists of a cell body, or soma, that contains a cell nucleus. Branching out from the cell body are a number of fibers called dendrites and a single long fiber called the axon. The axon stretches out for a long distance, much longer than the scale in this diagram indicates. Typically, an axon is 1 cm long (100 times the diameter of the cell body), but can reach up to 1 meter. A neuron makes connections with 10 to 100,000 other neurons at junctions called synapses. Signals are propagated from neuron to neuron by a complicated electrochemical reaction. The signals control brain activity in the short term and also enable long-term changes in the connectivity of neurons. These mechanisms are thought to form the basis for learning in the brain. Most information processing goes on in the cerebral cortex, the outer layer of the brain. The basic organizational unit appears to be a column of tissue about 0.5 mm in diameter, containing about 20,000 neurons and extending the full depth of the cortex about 4 mm in humans).

History contd..

- Great expectations continued
 - Marvin Minsky (1958)
 - Introduction of microworlds that appear to require intelligence to solve: e.g. blocks-world.
 - Anti-logic orientation, society of the mind.
 - Collapse in AI research (1966 - 1973)
 - Progress was slower than expected.
 - Unrealistic predictions.
 - Some systems lacked scalability.
 - Combinatorial explosion in search.
 - Fundamental limitations on techniques and representations.
 - Minsky and Papert (1969) Perceptrons.
- AI revival through knowledge-based systems (1969-1970).
 - General-purpose vs. domain specific
 - E.g. the DENDRAL project.
 - First successful knowledge intensive system.
 - Expert systems
 - MYCIN to diagnose blood infections
 - Introduction of uncertainty in reasoning.
 - Increase in knowledge representation research.
 - Logic, frames, semantic nets, ...

History Contd...

- AI becomes an industry (1980 - present)
- Connectionist revival (1986 - present)
 - Parallel distributed processing (Rumelhart and McClelland, 1986); back propagation.
- AI becomes a science (1987 - present)
 - In speech recognition: hidden markov models.
 - In neural networks.
 - In uncertain reasoning and expert systems: Bayesian network formalism.
- The emergence of intelligent agents (1995 - present)
 - The whole agent problem:
 - "How does an agent act/behave embedded in real environments with continuous sensory inputs".



Questions Please..

Thank You

-Sohrab Ardeshar Vakharia