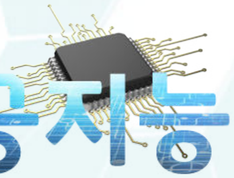


인공지능의 기초

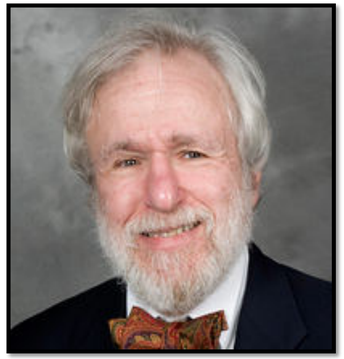
인공지능 소개

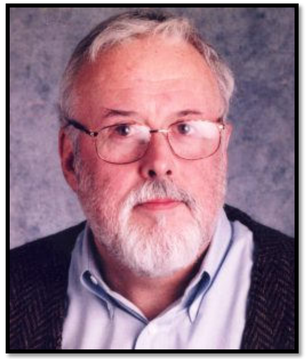
What is AI?

- **The exciting new effort to make computers think … machines with minds, in the full literal sense.**

Haugeland, 1985
(Philosopher)

- **The study of mental facilities through the use of computational models.**





Charniak and McDermott, 1985
(Computer scientists)

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What is AI?

- **A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes.**

Schalkoff, 1990
(Electrical Engineer)

- **The study of how to make computers do things at which, at the moment, people are better.**

Rich & Knight, 1991
(Computer scientists)

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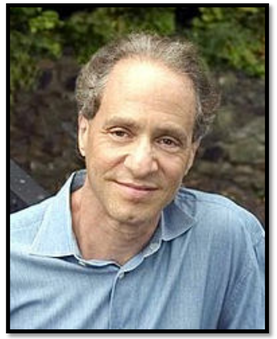
What is AI?

- **The art of creating machines that perform functions that require intelligence when performed by people.**



Kurzweil, 1992
(Futurist)

- **Defined as the branch of computer science that is concerned with the automation of intelligent behaviors.**

Luger & Stublefield, 1993
(Computer scientists)

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What is Intelligence?

Is there a “holistic” definition for intelligence?

- The definition of intelligence is controversial
- The ability to acquire and apply knowledge and skills

We might list elements of intelligence:

- Understanding, reasoning, problem solving, learning, common sense, generalizing, inference, analogy, recall, intuition, emotion, self-awareness
- Which of these are necessary for intelligence? Which are sufficient?

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What is AI?

Views of AI fall into four categories:

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

How does humanly differ from rationally?

- ▶ Humanly
  - Solve the problems the same way humans do
  - Require cognitive modeling
- ▶ Rationally
  - Achieve goals by maximizing performance measure
  - Use logic and deal with uncertainty and complexity

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What is AI?

Views of AI fall into four categories:

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

How does humanly differ from rationally?

- Humanly
  - Common-sense reasoning, social behavior
  - Expert knowledge: lawyers, medicine, diagnosis
  - Mathematical problems (puzzles, games, theorems)

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What is AI?

Views of AI fall into four categories:

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

How does intelligent thinking differ from intelligent behavior?

- Intelligence is hard to define, but intelligence behavior is not
- A machine has to display intelligent behavior that is indistinguishable from that of a human
- Turing test!

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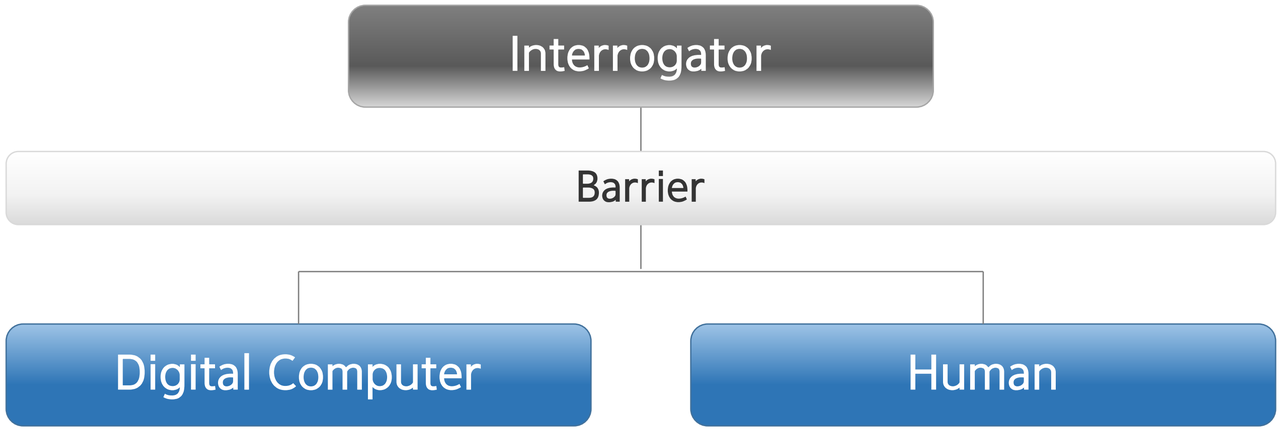
The Turing Test (1950)

Alan Turing devised a test for defining AI:

- An interrogator poses questions to a human and a computer
- If the interrogator cannot tell which is the human and which is the computer, then the computer passes the Turing Test and should be considered intelligent
- Turing first called this the Imitation game but has since been renamed the Turing Test



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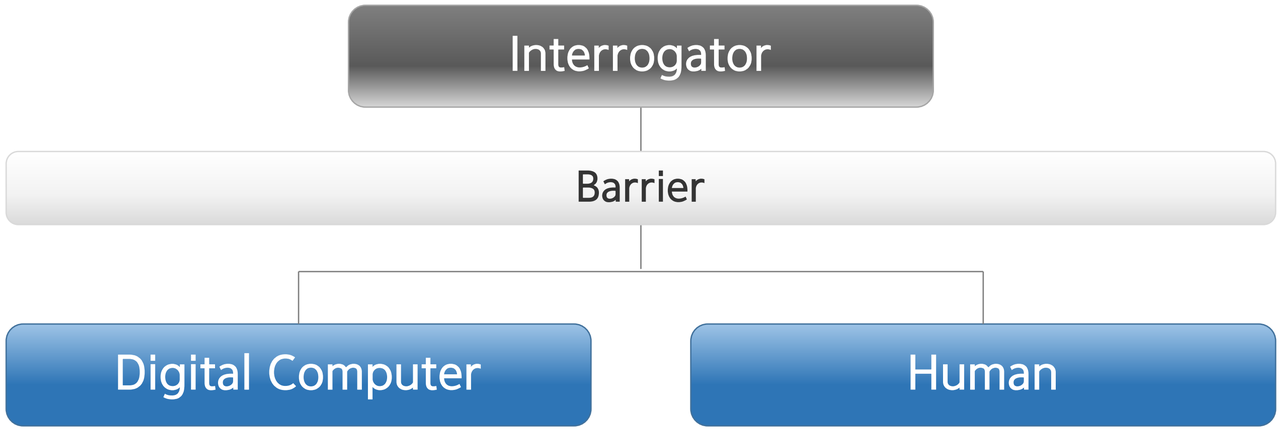
The Turing Test (1950)

Can machines think?

- Q: Please write me a sonnet on the subject of the Forth Bridge.
- A: Count me out on this one. I never could write poetry.
- Q: Add 34957 to 70764.
- A: (Pause about 30 seconds and then give as answer) 105621.



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The Turing Test (1950)

Acting humanly… NOT acting rationally

- Tests behavior: simple and objective
- Passing the Turing Test does not necessarily imply intelligence
- Suggested major components of AI:
  - Knowledge representation
  - Automated reasoning
  - Learning
  - Language/image understanding (+ Robotics)

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The Main Topics of AI

Sensing	Thinking	Acting
Translation of sensory inputs (percepts) into a conceptual representation • Computer vision • Speech recognition • Language understanding	Manipulation of the conceptual representation • Knowledge Representation • Problem Solving/ Planning • Learning (making improvements based on the results of past actions)	Translation of intent into (physical) actions (reflexive or deliberative) • Robotics • Speech and Language Synthesis

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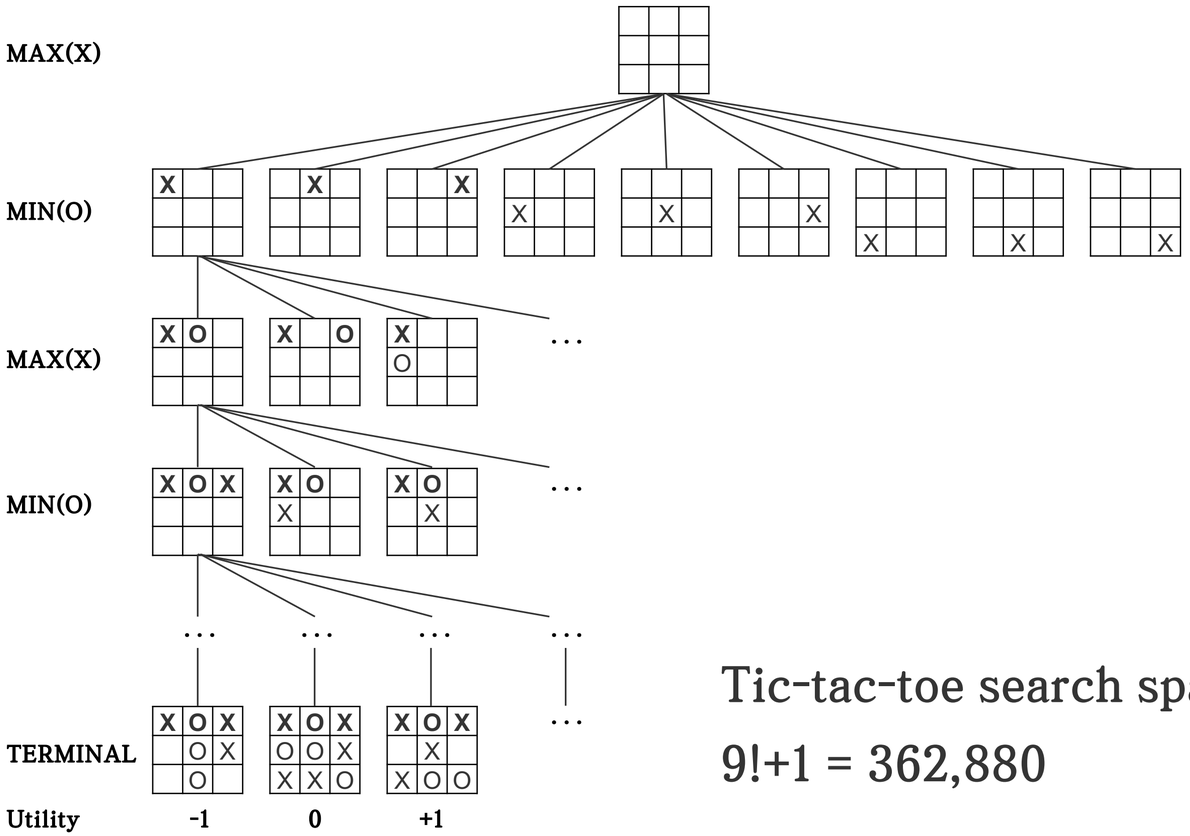
The Main Topics of AI

Search and constraints (includes game playing)

- Possible answers, decisions or courses of action are structured into an abstract space, which we then search



Tic-tac-toe search space:

9!+1 = 362,880

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The Main Topics of AI

Knowledge representation and reasoning

- How do we describe what we know about the world (concisely)?
- How do we generate new pieces of knowledge?
- How do we deal with uncertain knowledge ?

Planning

- Classical planning and motion/path planning
- Given a set of goals, construct a sequence of actions that achieves it
- What happens if the world changes?

Uncertainty in AI

- Bayesian networks, graphical models, Markov decision processes

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The Main Topics of AI

Learning

- Reinforcement learning, clustering, regression, computational learning theory
- How do we generate new facts/concepts from old?
- How do we learn to distinguish different situations in new environments?

Agent-based and multi-agent systems

- The vision: electronic commerce, supply chains, defense systems managed by autonomous software agents
- Cooperation and coordination
- Emergent behavior
- Computational game theory and computational social choice

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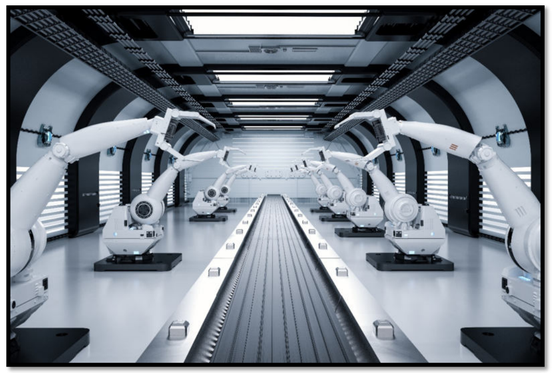
Strong AI vs Weak AI

- **Weak AI, as opposed to strong AI, is also known as applied AI or narrow AI**
  - Actions, decision, and ideas are programmed into it
  - All current forms of AI are weak AI
  - The weak AI hypothesis: the philosophical position that machines can demonstrate intelligence, but do not necessarily have a mind, mental states or consciousness



AlphaGo

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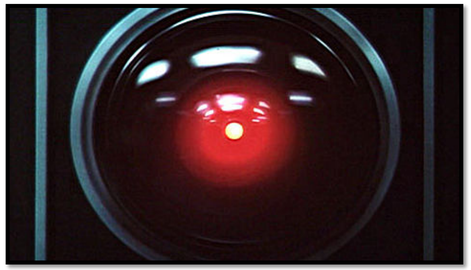
Strong AI vs Weak AI

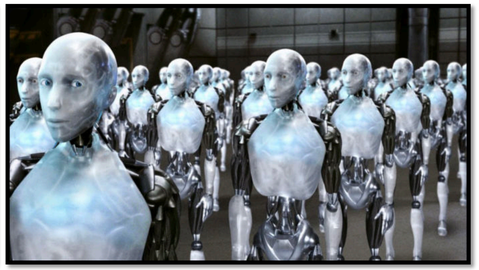
Strong AI matches or exceeds human intelligence

- Don't just simulate humans, they are intelligent on their own
- Also referred to as General AI
- Associates with such human traits as consciousness, sentience, sapience, free-will and self-awareness
- e.g. robots from the movies (HAL9000, Matrix, Terminator, I robot, etc)



Arthur C.Clarke's
Space Odyssey series

Terminator series



I, Robot

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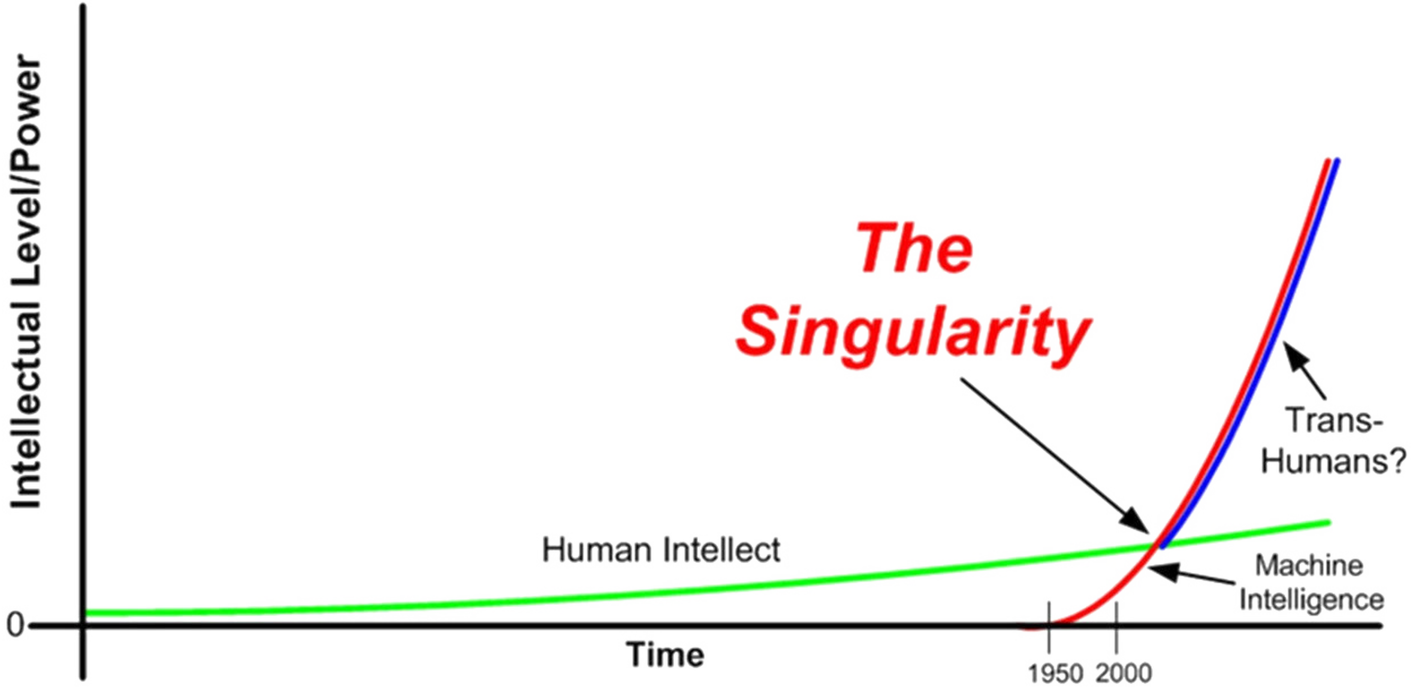
Technological Singularity

- Emergence of superhuman intelligence
- Key idea: self-improvement
- Some predict: this century, but others argue: never



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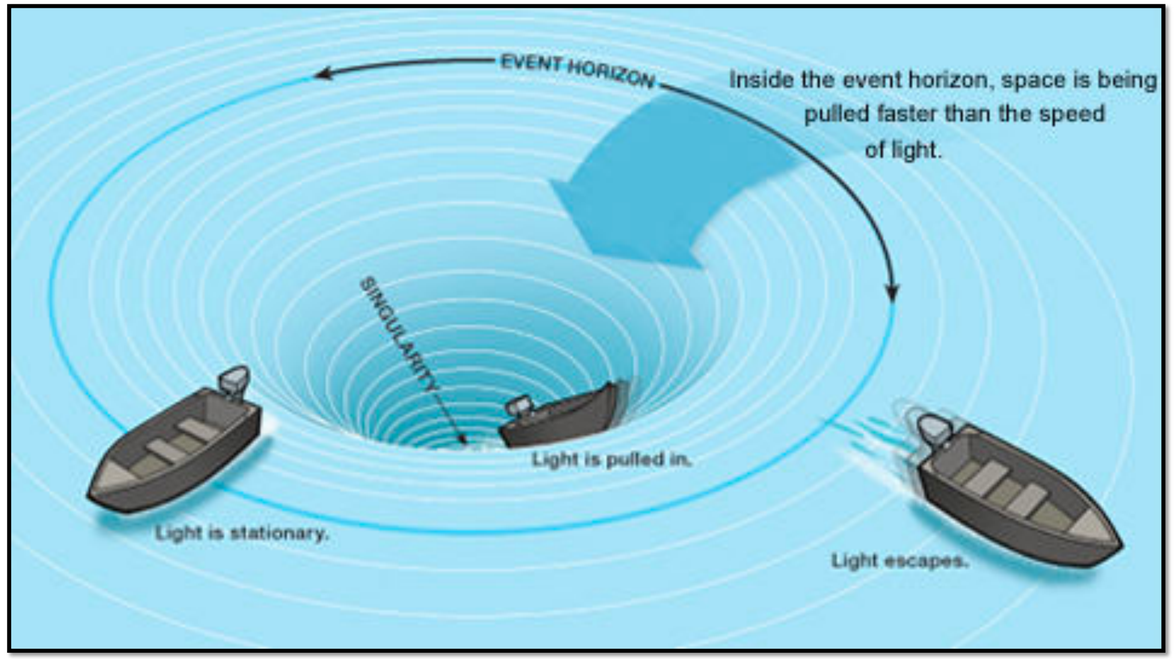
Technological Singularity

Source of name

- Analogy between inability to predict events after the development of a superintelligence, and the space-time singularity beyond the event horizon of a black hole



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