



Introduction to Artificial Intelligence

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- Homo sapiens—man the wise—because our intelligence is so important to us.
- The field of artificial intelligence, or AI, goes further still: it attempts not just to understand but also to build intelligent entities
- The name "Artificial Intelligence" was coined in 1956.



What is Artificial Intelligence?

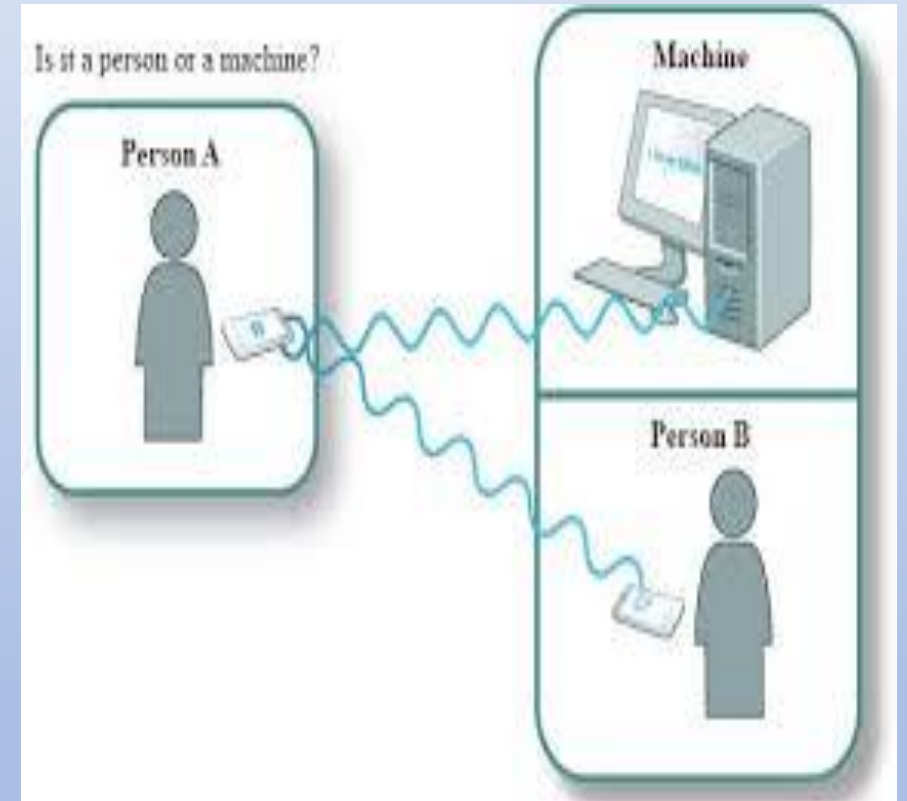


- The definitions on top are concerned with thought processes and reasoning, whereas the ones on the bottom address behavior.
- The left measure success in terms of fidelity to human performance
- the right measure against an ideal performance measure, called rationality.

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)

Acting Humanly: Turing Test Approach

- Turing Test approach
 - Proposed by Alan Turing (1950)
 - Provide a satisfactory operational definition of intelligence
 - Test is based on indistinguishability from true intelligent entities and human being.





Turing Test Cntd...

- Computer need to posses the following capabilities to pass Turing test:
 - Natural Language processing: to communicate successfully
 - Knowledge representation: to store what it knows
 - Automated reasoning: use the knowledge and derive conclusion
 - Machine learning: to adapt new circumstances
 - Computer vision: perceive objects
 - Robotics: to manipulate object and move about

Thinking humanly: The cognitive modeling approach

- need to get inside the actual workings of human minds.
- There are three ways to do this: through introspection—trying to catch our own thoughts as they go by; through psychological experiments—observing a person in action; and through brain imaging—observing the brain in action.
- The interdisciplinary field of cognitive science brings together computer models from AI and experimental techniques from psychology to construct precise and testable theories of the human mind.

Thinking rationally: The “laws of thought” approach

- codify “right thinking,” that is, irrefutable reasoning processes.
- the laws of thought were supposed to govern the operation of the mind; their study initiated the field called logic.
- The so-called logicist tradition within artificial intelligence hopes to build on such programs to create intelligent systems

Acting rationally: The rational agent approach

- A rational agent is one that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome.
- Making correct inferences is sometimes part of being a rational agent, correct inference is not all of rationality
- All the skills needed for the Turing Test also allow an agent to act rationally.

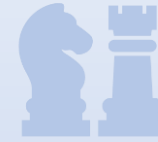


The application area of AI

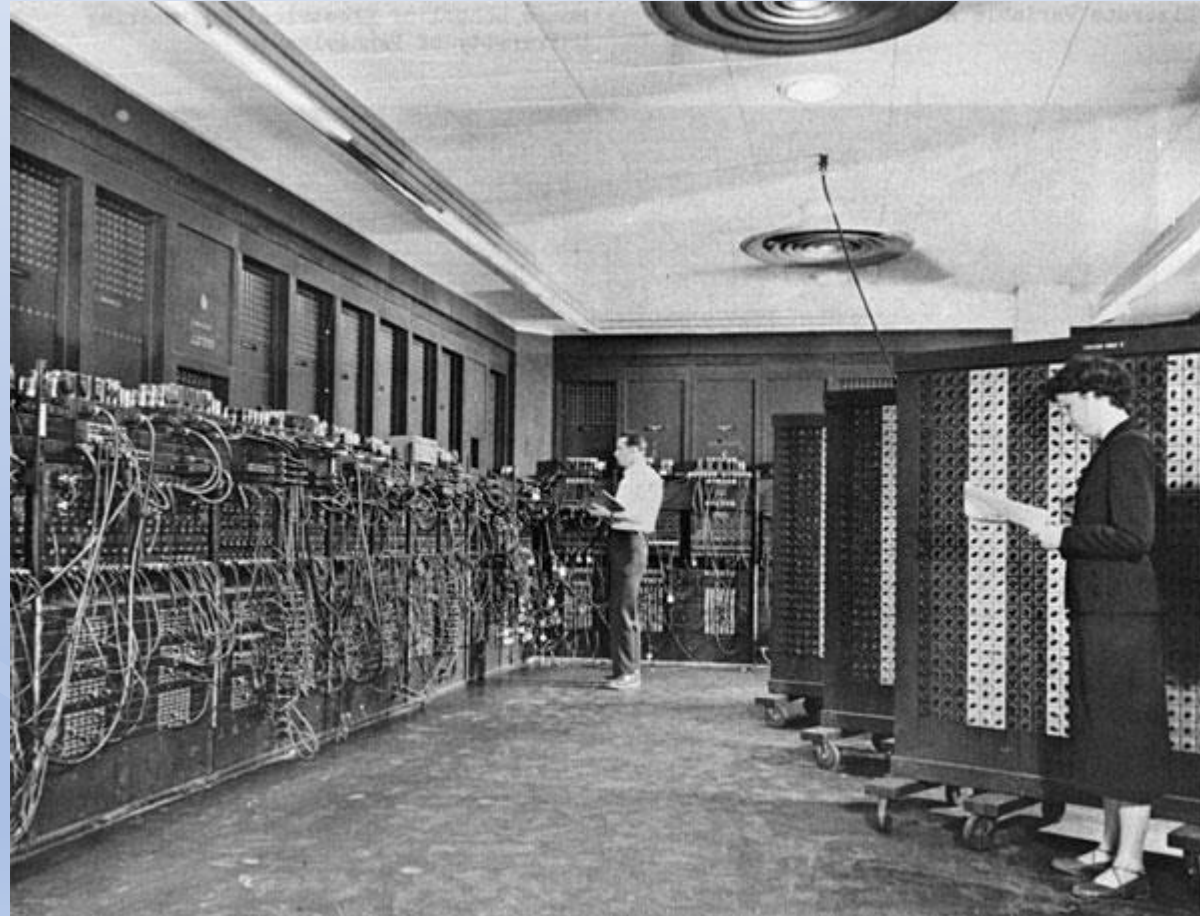
- Autonomous planning and schedule
- Game Playing
- Autonomous control
- Diagnosis
- Robotics
- Language understanding and problem solving



History of AI



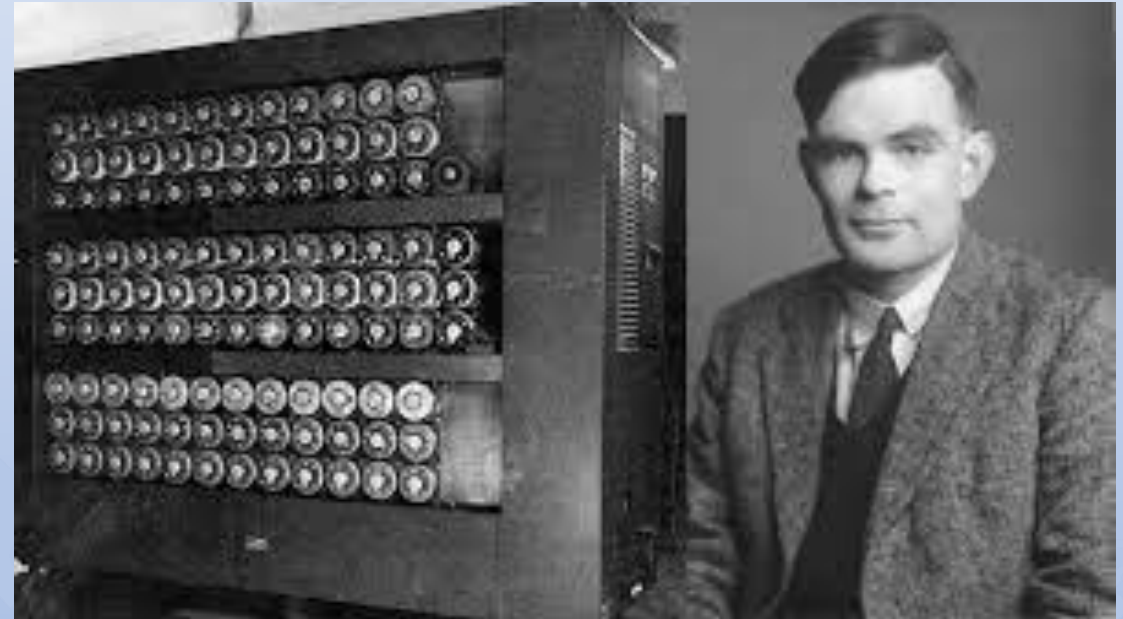
- ENIAC in 1946



History of AI



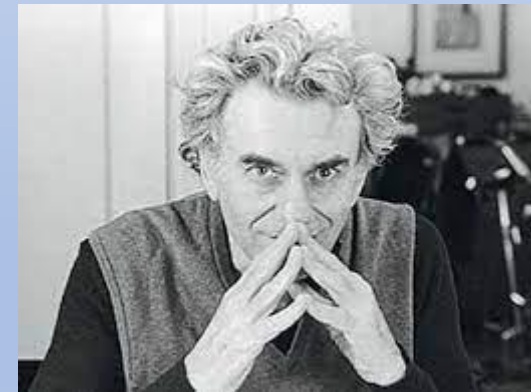
- In 1950, publishes "Computing Machinery and Intelligence" in which he proposed a test.
- The test can check the machine's ability to exhibit intelligent behavior equivalent to human intelligence, called a Turing test.



History of AI



- McCarthy, Minsky, Claude Shannon, and Nathaniel Rochester propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire.



History of AI



- Joseph Weizenbaum created the first chatbot in 1966, which was named as ELIZA.

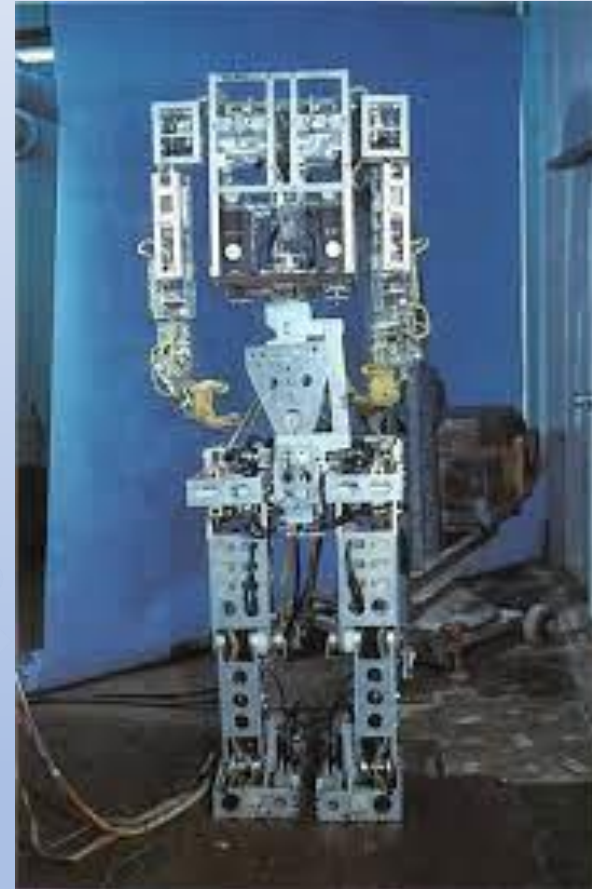
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Welcome to
EEEEEE LL      IIII ZZZZZZ  AAAAA
EE      LL      II      ZZ  AA  AA
EEEEEE LL      II      ZZZ  AAAAAA
EE      LL      II      ZZ  AA  AA
EEEEEE LLLLLL  IIII ZZZZZZ  AA  AA

Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.

ELIZA: Is something troubling you ?
YOU:  Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:  They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:  Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:  He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:  It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
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History of AI

In 1972, the first intelligent humanoid robot was built in Japan which was named as WABOT-1.

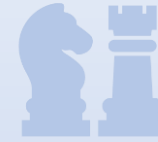


History of AI

- The first AI winter (1974-1980)
- A boom of AI (1980-1987)
 - AI came back with "Expert System"
- The second AI winter (1987-1993)



History of AI



- In the year 1997, IBM Deep Blue beats world chess champion, Gary Kasparov, and became the first computer to beat a world chess champion.
- AI came in the Business world till the year 2006. Companies like Facebook, Twitter, and Netflix also started using AI.



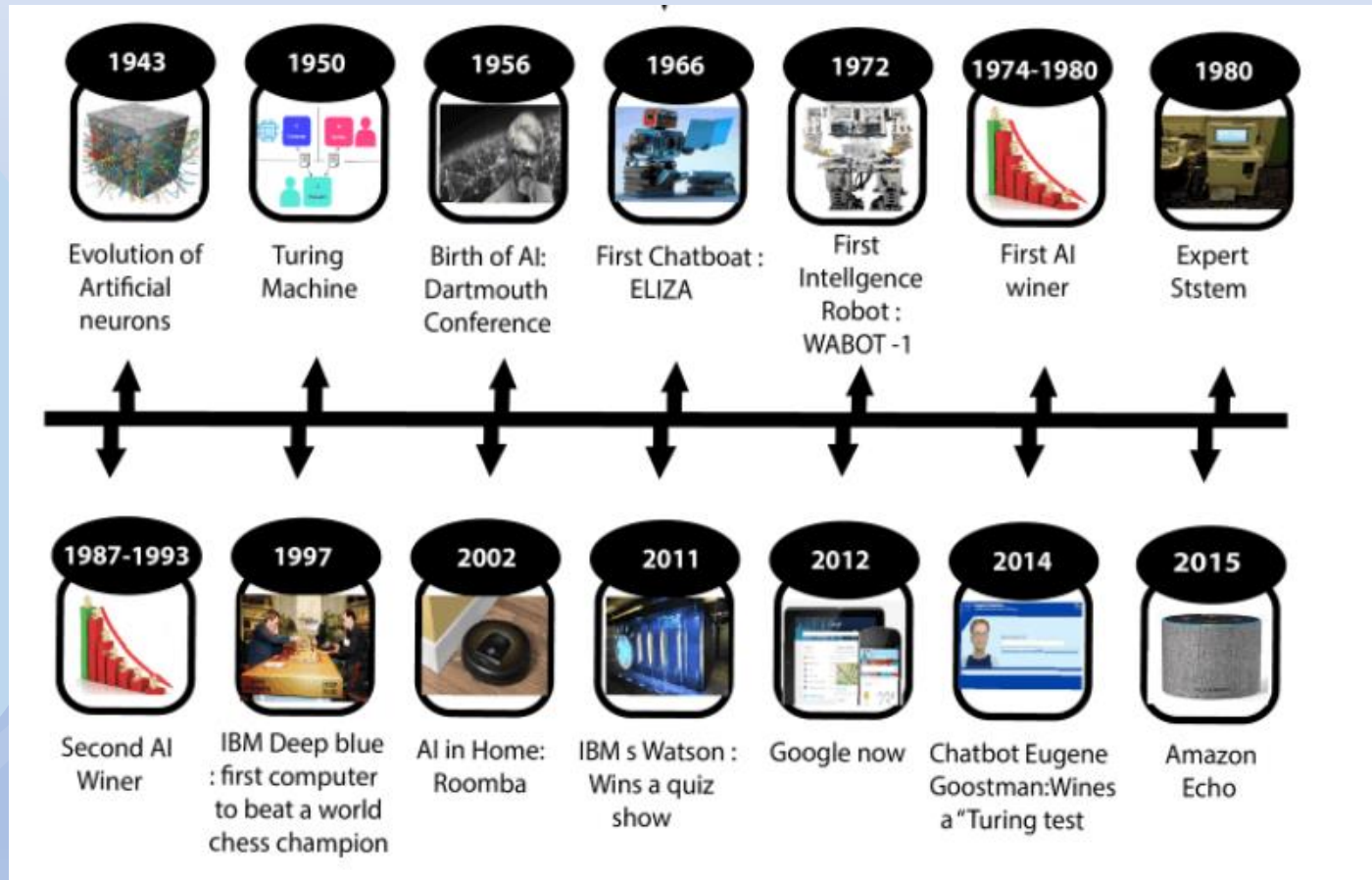
History of AI



- In the year 2011, IBM's Watson won jeopardy, a quiz show, where it had to solve the complex questions as well as riddles. Watson had proved that it could understand natural language and can solve tricky questions quickly.
- In 2012, Google has launched an Android app feature "Google now", which was able to provide information to the user as a prediction.



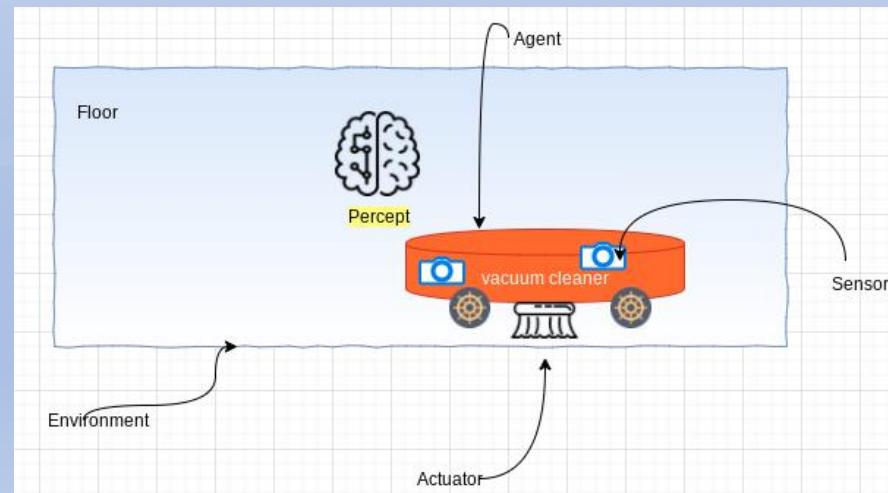
History of AI



Note: This image is taken from javapoint.com

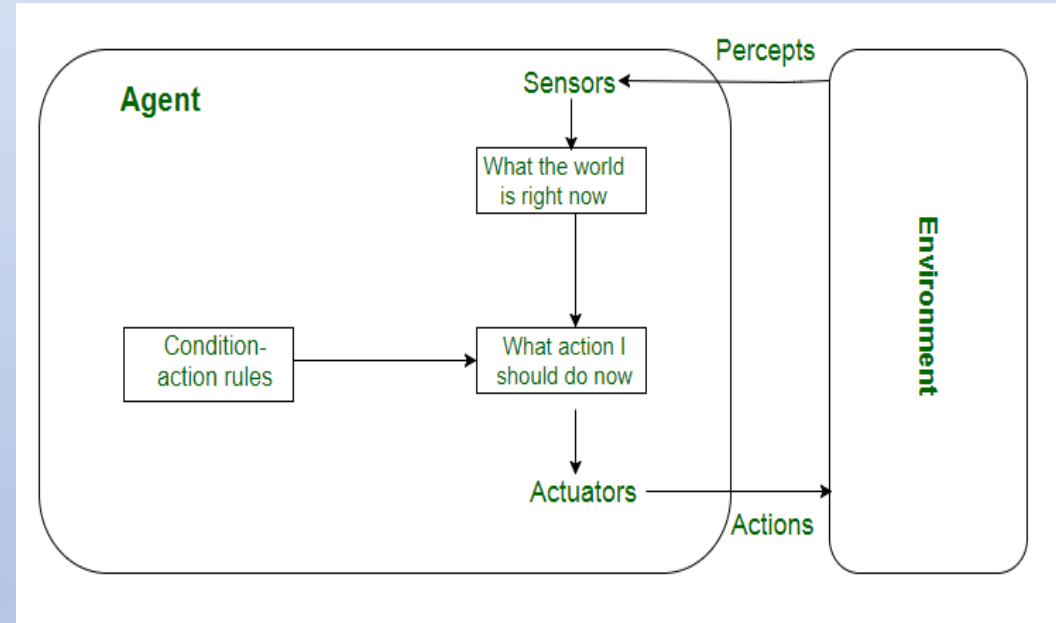
Agent

- An agent is something that acts.
- Agent perceive (view) its environment through sensors
- Agent acts upon the environment through actuators
- Percept refer to taking input from the environment.
- Agent function is the mapping of percept sequence to an action.



Rational Agent

- A rational agent is one that does the right thing.
- Achieve best outcome based on its knowledge.
- Performance measure is the criterion of an agent behavior.



PEAS Description

- Performance: success criterion
- Environment: agent act upon
- Actuators: output Device
- Sensors: input device



Example of agent type and PEAS



Agent Type	Performance Measure	Environment	Actuators	Sensors
Taxi Driver	Safe, Fast, legal, comfortable trip, maximum profit	Road, traffic, pedestrians, customers	Steering, accelerator, brake, signal, horn, display	Camera, GPS, sonar
Medical Diagnosis	Healthy Patient, minimize cost	Patient, hospital, staff	Display question, tests, diagnoses, treatment	Keyboard entry symptoms, findings
Interactive English tutor	Maximize student score	Set of students	Suggestions, corrections, display exercises	Keyboard entry



Properties of Environment

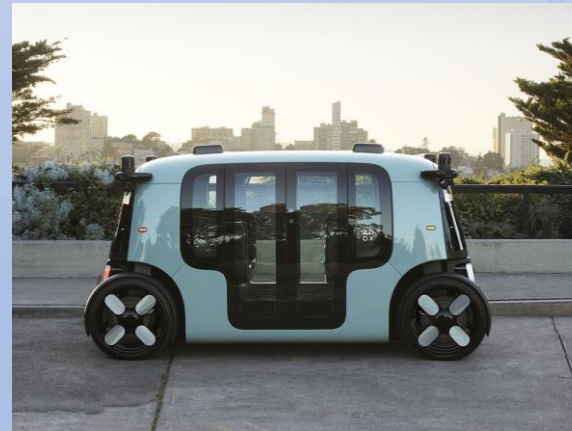
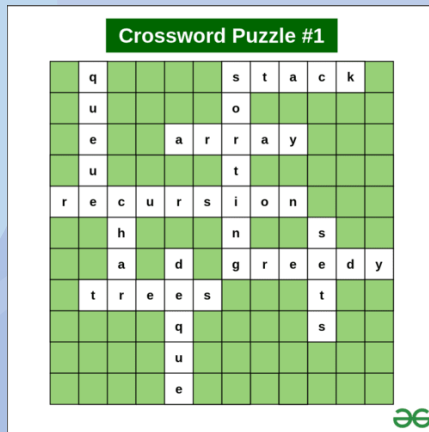


- Fully Observable vs partially observable
- Deterministic vs stochastic
- Episodic vs sequential
- Static vs Dynamic
- Discrete vs autonomous
- Single agent vs multiagent



Fully Observable vs Partially observable

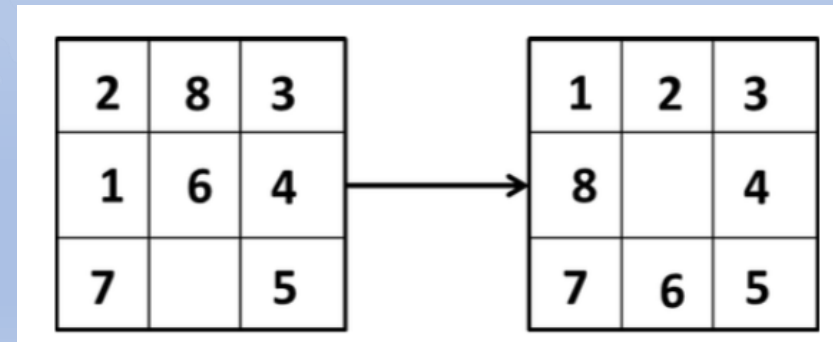
- Agent having access to the complete state of the environment at each point in time is called fully observable.
- Cross Word Puzzle
- Partially observable: Automated Taxi drivers



Deterministic vs Stochastic



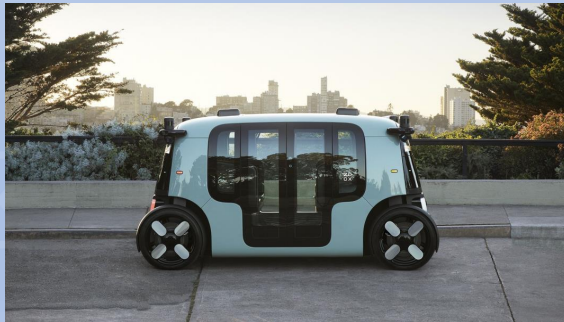
- Deterministic: The next state of the environment is completely determined by the current state and the action executed by the agent.
- Deterministic environment: Puzzle
- Stochastic: Medical diagnosis



Episodic vs Sequential



- Episodic Environment: the agent's experience is divided into atomic episodes. Each episode consists of the agent perceiving and then performing a single action.
- Episodic: Part picking robot
- Sequential: Chess, Taxi driving



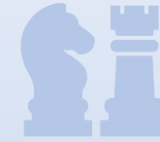


Static vs Dynamic

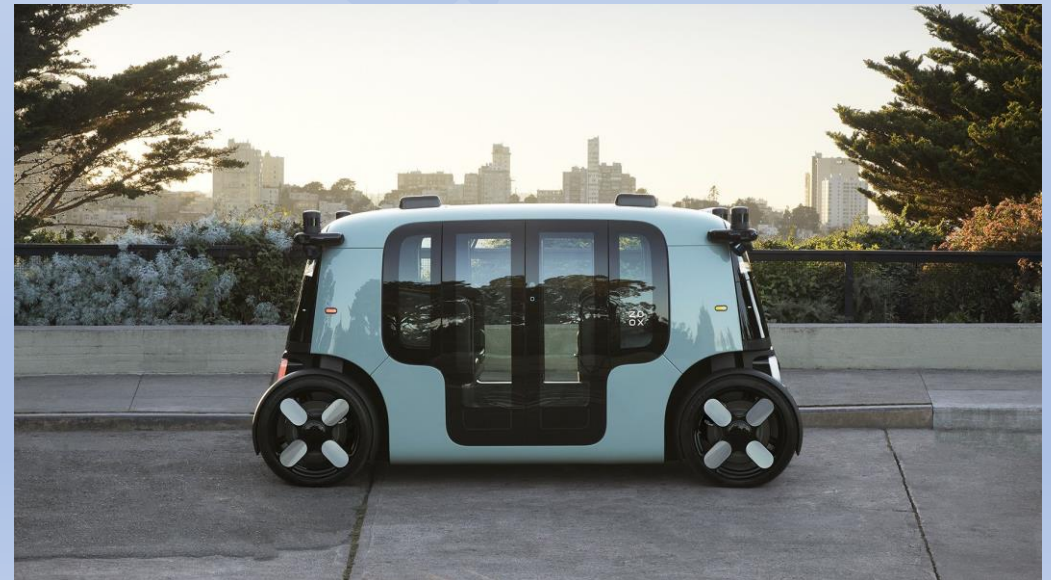
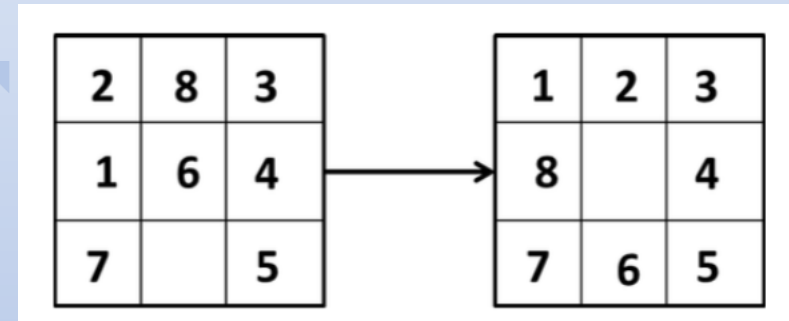
- Dynamic: Environment change while an agent deliberating.
- Dynamic: Medical Diagnosis
- Static: 8-puzzle problem



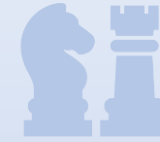
Discrete vs Continuous



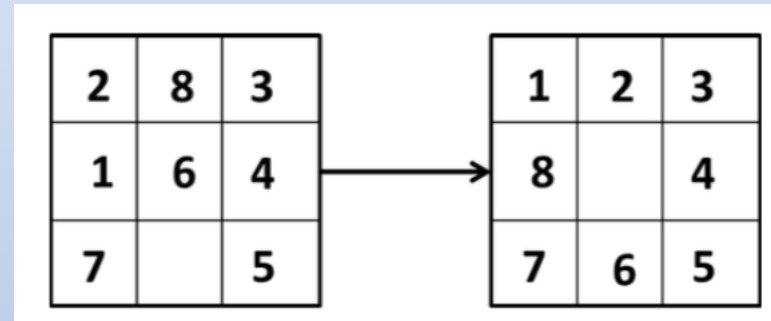
- Finite number of distinct states.
- Discrete: 8 puzzle problem
- Continuous: Taxi driving



Single Agent vs Multi Agent



- 8- Puzzle: Single Agent
- Chess: Multi agent





Thank You

