

AI Summer School 2024

Medical Imaging Informatics

University of Pittsburgh

Introduction to Artificial Intelligence (AI)

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Learning Objectives

After completing this lecture, you should be able to:

- Understand and explain AI and its applications
- Understand the concept of “Turing Test”
- Understand and explain intelligent agents
- Explain AI history

Outline

- AI and its definitions
- AI; Big Picture
- Intelligent Agent
- Turing Test
- AI History

Artificial Intelligence (AI)

- Human Performance
- Rationality (reason and logic)

Systems that think like humans

Systems that think rationally

Systems that act like humans

Systems that act rationally

Artificial Intelligence (AI)

Systems that think like humans	Systems that think rationally
Systems that act like humans	Systems that act rationally

Bellman, 1978

“[The automation] of activities that we associate with human thinking, activities such as decision making, problem solving, learning.”

Dean et al., 1995

“The design and study of computer programs that behave intelligently. These programs are constructed to perform as would a human or an animal whose behavior we consider intelligent.”

Artificial Intelligence (AI)

Systems that think like humans	Systems that think rationally
Systems that act like humans	Systems that act rationally

Kurzweil, 1990

“The art of creating machines that perform functions that require intelligence when performed by people.”

Luger & Stubblefield, 1993

“The branch of computer science that is concerned with the automation of intelligent behavior.”

Artificial Intelligence (AI)

Systems that think like humans	Systems that think rationally
Systems that act like humans	Systems that act rationally

Nilsson, 1998

“Many human mental activities such as writing computer programs, doing mathematics, engaging in common sense reasoning, understanding language, and even driving an automobile, are said to demand intelligence. We might say that [these systems] exhibit artificial intelligence.”

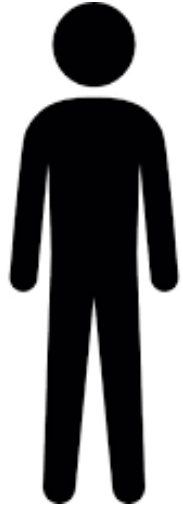
Artificial Intelligence (AI) !!!

- Defining “**intelligence**” has been a longstanding topics for many years now.

Artificial Intelligence (AI); Big Picture

Computer Science

Artificial Intelligence



Speech Recognition



Natural Language Processing (NLP)



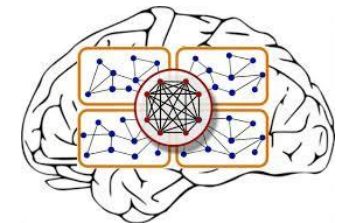
Computer Vision

Machine Learning

Pattern Recognition



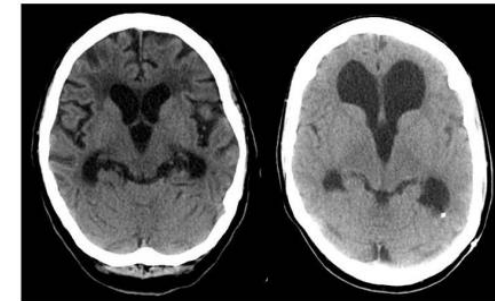
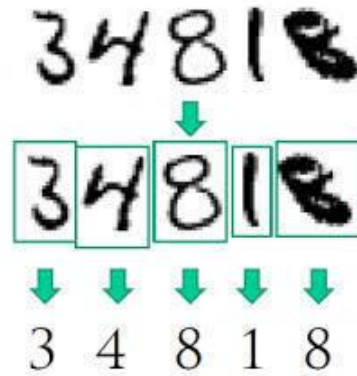
Robotics



Artificial Neural Networks

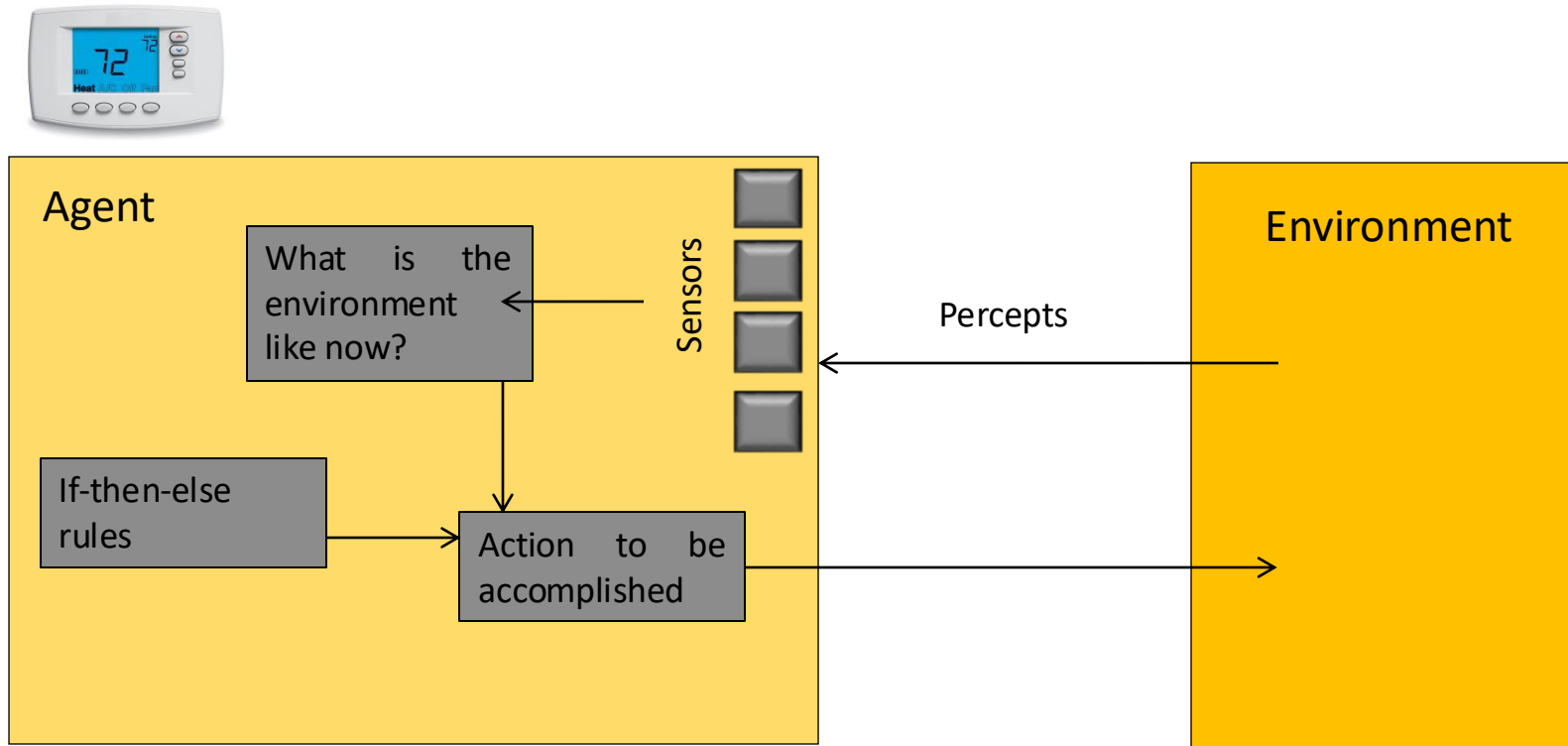
Artificial Intelligence (AI)

- The scientific discipline that helps to create/design computing systems (Hardware/Software) that are capable of intelligent behavior.
- An intelligence system understands its environment and takes actions that maximize its chances of success.



Intelligent Agent

- It solves a problem optimally.
- It figures out alone what is the best action to take.



Artificial Intelligence (AI): Turing Test

- Computer must be indistinguishable from a human based upon written exchanges. Computer and human both interrogated by a judge, then computer passes the test if the judge can't tell the difference.

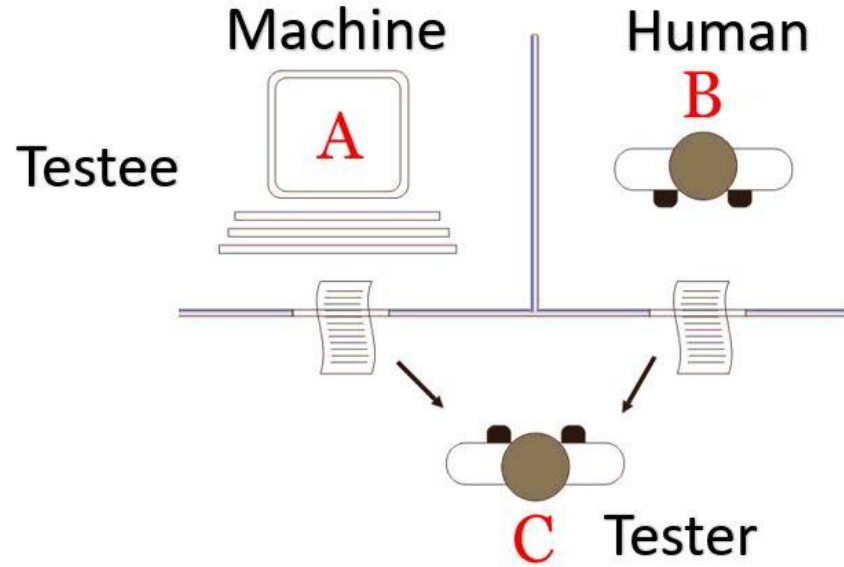
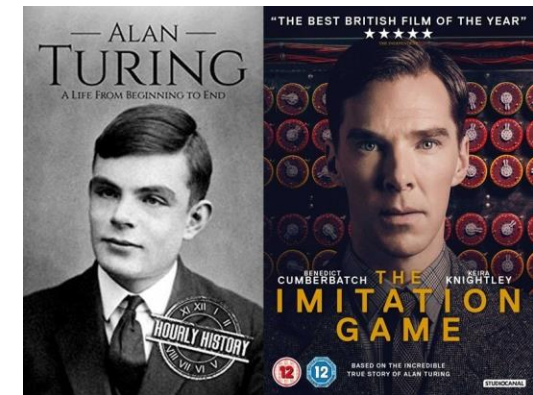


Image from: <https://www.how2shout.com/what-is/what-is-turing-test-and-it-used-for.html>



Activity: Student Participation

Please try this: <https://chatgpt.com>

Question: Do you think this is a human or a machine? How did you end up with your decision if you think it is a human or a machine?

Now, please try this question: When Alex was 10, her sister was half of his age. Now Alex is 40. How old is his sister now?

Artificial Intelligence (AI): Turing Test [Further Discussion]

- Does this imply intelligence?
- An intelligent machine still fail the test! (emotion, humor)
- The intelligent agent should have deep knowledge of a language
- Who is the judge?
- etc.

History of AI

The Artificial Intelligence “AI” term proposed in 1957, “Dartmouth Conference”.

Since then, it has been a subject of intense study, education, and research.

- **1960’s:** Logic, search, theorem proving
- **1970’s:** Robotic & perception
- **1980’s:** Expert systems, industrial interest, neural nets
- **1990’s:** intelligent agents, uncertainty, reduced funding and interest in AI
- **2000’s:** growth of ML, NLP, usable AI systems
- **2010’s:** Deep learning, fast industrial AI, robotics, data science, applied AI
- **2020’s:** Large Language Models (LLMs); Example: ChatGPT
- How will AI grow? This is up to us, ALL of US 😊

Activity: Student Participation

- Games: chess
- Voice recognition and conversational AI: Siri, Alexa, Google Assistant
- Recommender systems: Netflix, amazon prime
- Scene monitoring, face recognition: Face ID, Google image search, surveillance cameras
- Automated logistics: UPS, FedEx
- Autonomous cars, trains, etc.

Thank you!

Questions!

