Al-Mustaqbal University
College of Science

Introduction to Artificial Intelligence (AI)

LECTURE 4

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What is Artificial Intelligence?

Artificial Intelligence (AI) is the simulation of human intelligence in machines.

- Machines can think, learn, and make decisions.
- AI systems perform tasks that normally require human intelligence.

Why AI is Important Today

Used in many industries (healthcare, education, business).

- Helps automate tasks and save time.
- Improves decision-making using data.

Main Goals of AI

1) Create intelligent systems
Design and build computer systems that can think, learn, and make decisions like humans. These systems can understand data and improve over time.

2) Solve complex problems
Use smart algorithms to find solutions for difficult problems that are hard for humans to solve quickly, such as medical diagnosis or route planning.

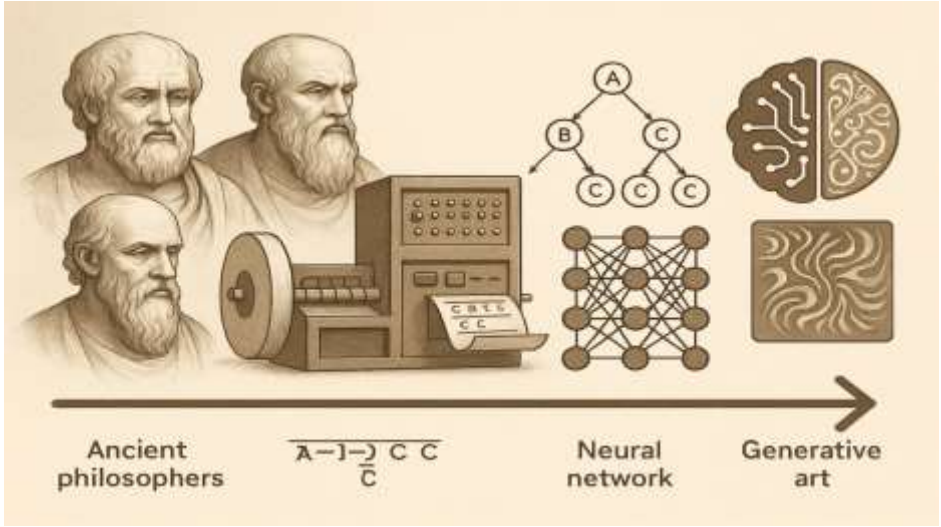
3) Improve efficiency and accuracy
Help complete tasks faster and with fewer mistakes by using automation and data analysis.

4) Assist humans in daily activities
Support people in their everyday life, such as voice assistants, recommendation systems, smart devices, and self-driving features.

History of AI – Early Ideas

Early ideas about intelligent machines appeared in ancient myths.

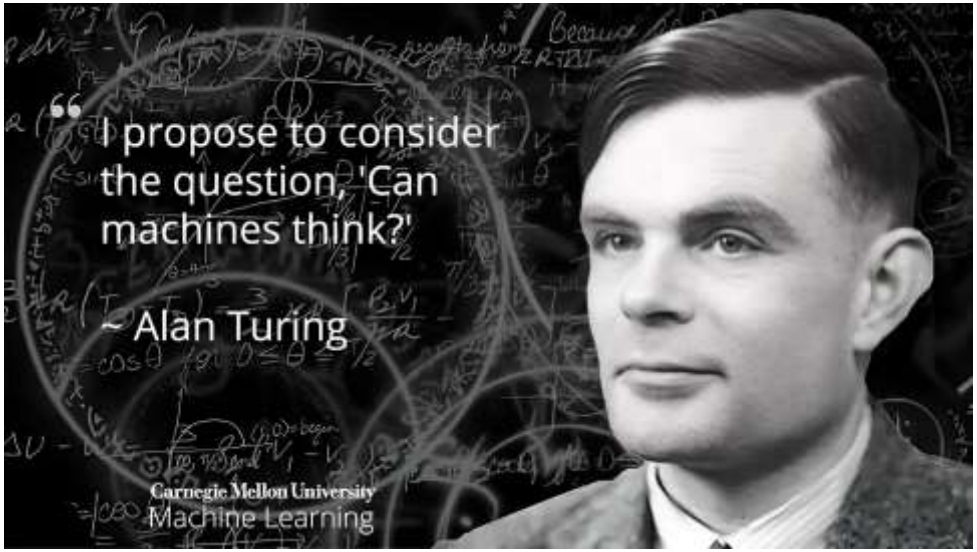
- Development of computers made AI possible.
- Scientists wanted machines to think like humans.



Alan Turing

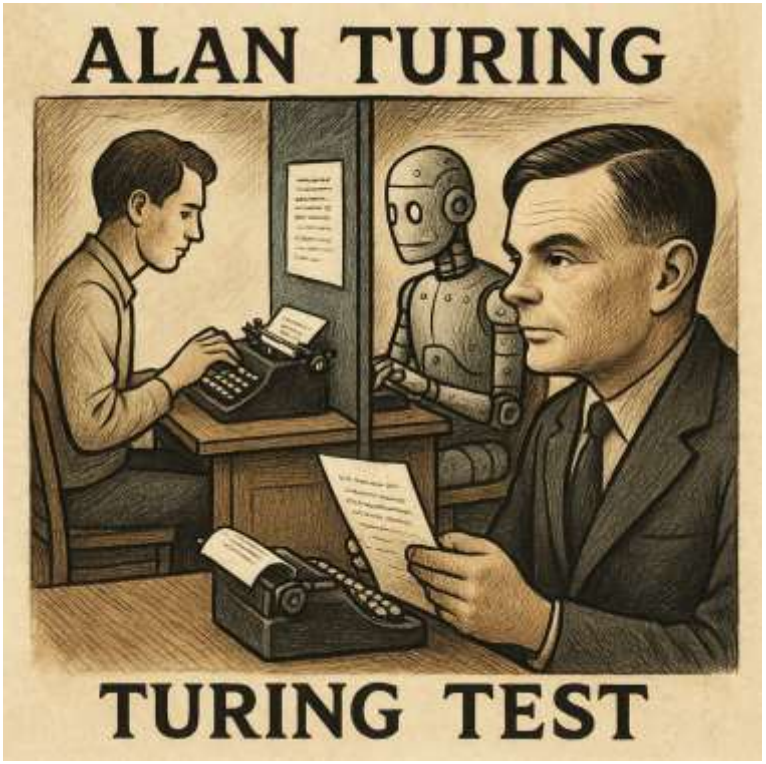
British mathematician and computer scientist.

- Proposed the Turing Test (1950).
- Test measures a machine's ability to imitate human behavior.



Turing Test

- The Turing Test is an experiment proposed by Alan Turing to evaluate whether a machine can imitate human intelligence through text conversation.
- If a human judge cannot distinguish between the machine's responses and a real person's responses, the machine passes the test.



Dartmouth Conference (1956)

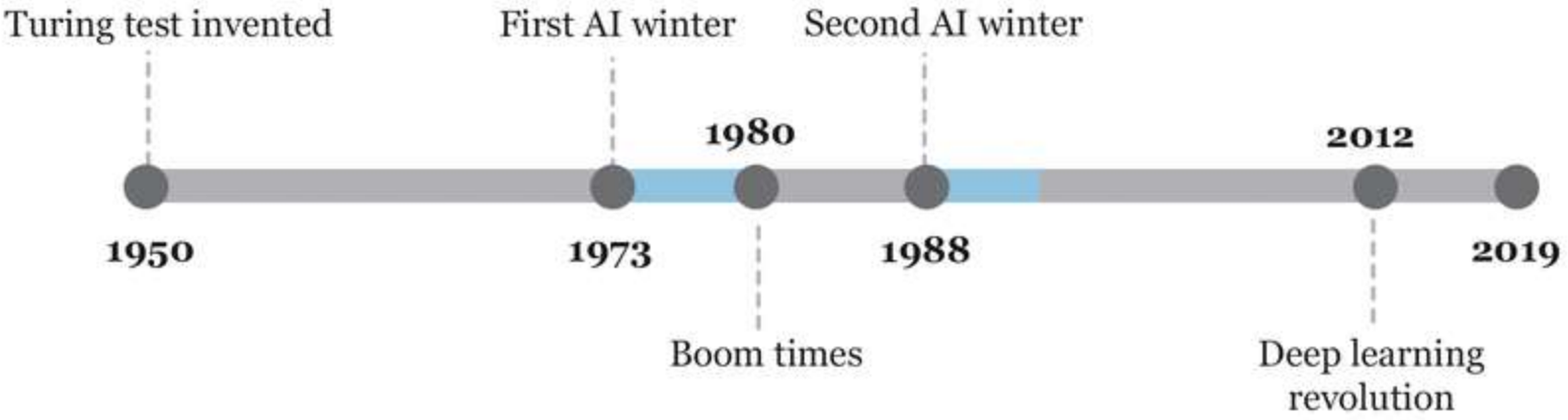
Considered the birth of AI as a field.

- Researchers discussed machine intelligence.
- The term 'Artificial Intelligence' was officially introduced.

AI Winters and Modern AI Era

AI Winters: Periods of low funding and interest.

- Modern AI: Growth due to big data and powerful computers.
- Rise of Machine Learning and Deep Learning.



Types of AI

- **Narrow AI:** Designed to perform a specific task, such as voice assistants, recommendation systems, or image recognition. It works well in one area but cannot perform tasks outside its programming.
- **General AI:** A type of AI that would have human-level intelligence and the ability to understand, learn, and perform any intellectual task like a human (not achieved yet).
- **Current AI systems:** Almost all AI systems today are Narrow AI.

Narrow AI system

- In 1997, Deep Blue (a Narrow AI system) defeated world chess champion Garry Kasparov in a famous match.
- Deep Blue could play chess at a superhuman level, but it could not do anything else outside chess, which shows it was Narrow AI, not General AI.

AI Techniques

- **Machine Learning (ML):** Learning from data to make predictions or decisions without being explicitly programmed for every step.
- **Deep Learning (DL):** A type of Machine Learning that uses neural networks with many layers to learn complex patterns from large amounts of data.
- **Natural Language Processing (NLP):** A field of AI that helps computers understand, process, and generate human language (text or speech).
- **Computer Vision:** A field of AI that enables computers to see and interpret images and videos.
- **Expert Systems and Robotics:** Expert Systems use stored knowledge and rules to solve specific problems like a human expert, while Robotics combines AI with machines to perform physical tasks in the real world.

AI Approaches

1- Symbolic Approach (Rule-based systems):
Uses clear rules and logical statements (IF–THEN rules) to make decisions. The knowledge is written by experts, and the system follows these rules step by step.

Example:
IF temperature > 38°C → The patient has a fever.
The system follows fixed rules written by experts.

AI Approaches

2- Data-driven Approach (Learning from data):
Learns patterns automatically from data instead of using fixed rules. It improves its performance by training on large datasets.

Example:
We give the system thousands of cat and dog images, and it learns by itself how to distinguish between them without writing specific rules.

AI Approaches

3- Hybrid Systems (Combination of both):
Combine rule-based logic with data-driven learning to get better accuracy and flexibility by using the strengths of both approaches.

Example:
A self-driving car uses:

- Traffic rules (Stop at a red light).
- Machine learning to detect pedestrians and obstacles from data

Applications of AI

- **Healthcare:** AI is used for disease diagnosis and analyzing medical images (like X-rays and MRIs) to help doctors detect problems faster and more accurately.
- **Education:** AI supports smart tutoring systems that personalize lessons based on each student's level and progress.
- **Business:** AI helps in data analysis, predicting trends, improving customer service, and automating routine tasks.
- **Smart Devices:** AI powers voice assistants and smart home systems that can respond to commands, control devices, and make daily life easier.

Challenges of AI

1) Need for large amounts of data: AI systems usually require massive, well-organized datasets to learn patterns and make accurate decisions, otherwise they may perform poorly or be biased.

2) High cost and complexity: Building, training, and maintaining AI systems can be very expensive and technically complex due to specialized hardware, energy use, and expert knowledge needed.

3) Possible errors and limitations: AI can still make mistakes, produce biased results, be hard to understand (“black box”), and struggle with tasks requiring common sense or full accuracy.

Ethical Considerations in AI

- **Privacy concerns:** AI systems may collect and use personal data, which can threaten people's privacy if not protected properly.
- **Bias and fairness issues:** AI can make unfair decisions if it learns from biased or unbalanced data.
- **Impact on jobs:** AI and automation may replace some jobs, but they can also create new types of jobs.
- **Responsible and safe AI:** AI should be developed and used carefully to ensure it is safe, ethical, and beneficial for society.

Future of AI

- **More intelligent systems:** Future AI systems will become smarter, more accurate, and able to handle more complex tasks.
- **Better human–AI collaboration:** AI will work more closely with humans, helping them make better decisions and improving productivity.
- **Stronger regulations and ethical standards:** Governments and organizations will create clearer rules and ethical guidelines to ensure AI is used safely and responsibly.

Thank You

Questions?
Discussion Time