

AIE111 :

# Artificial Intelligence

**Dr. Noha El-Sayad**





## Lecture 1:

# Introduction to AI

How Artificial Intelligence is  
Shaping Our World



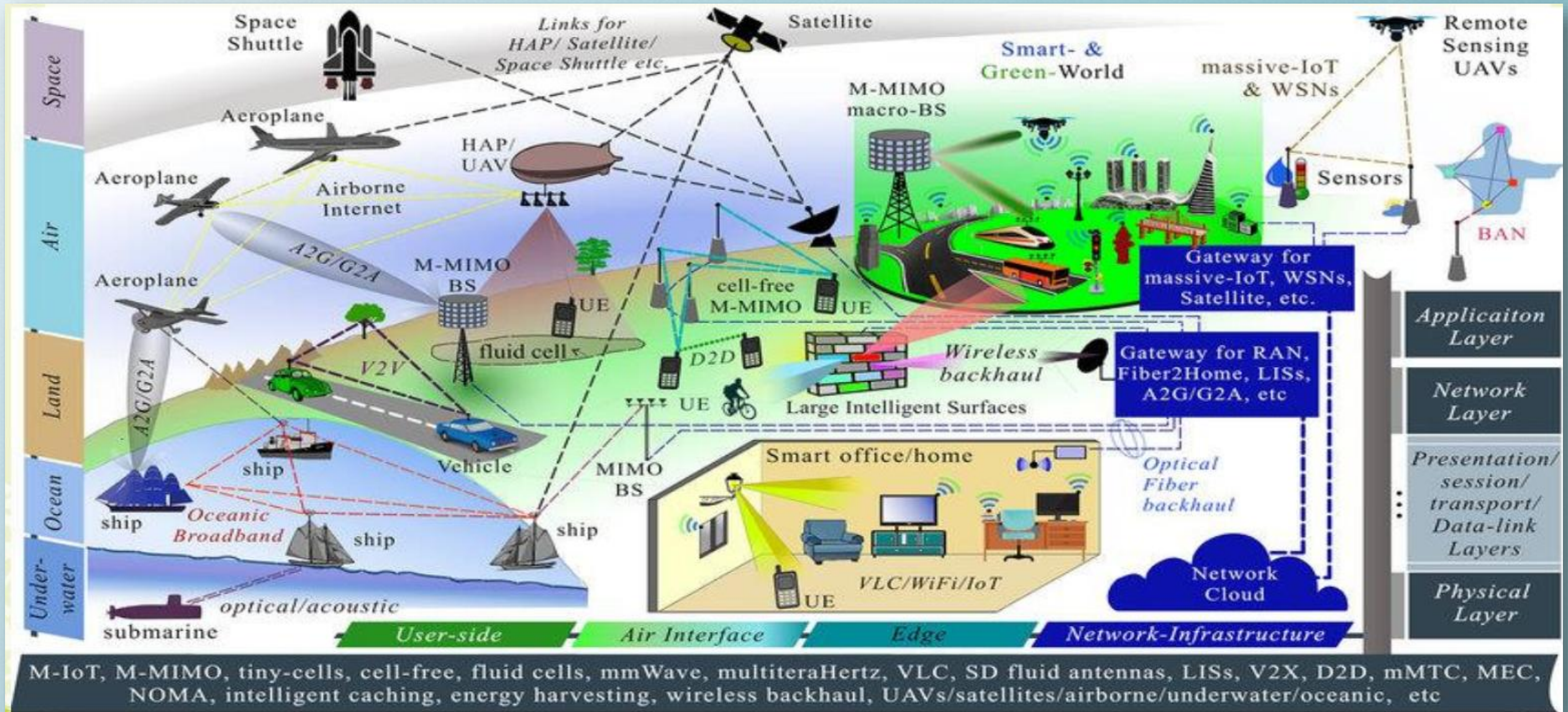
# 1. Why AI?

- AI makes computers more useful.
- It has a significant impact on human civilization.
- Many scientists consider AI one of the most exciting fields to work in.
- AI helps us understand intelligence by using computers as models for thinking.





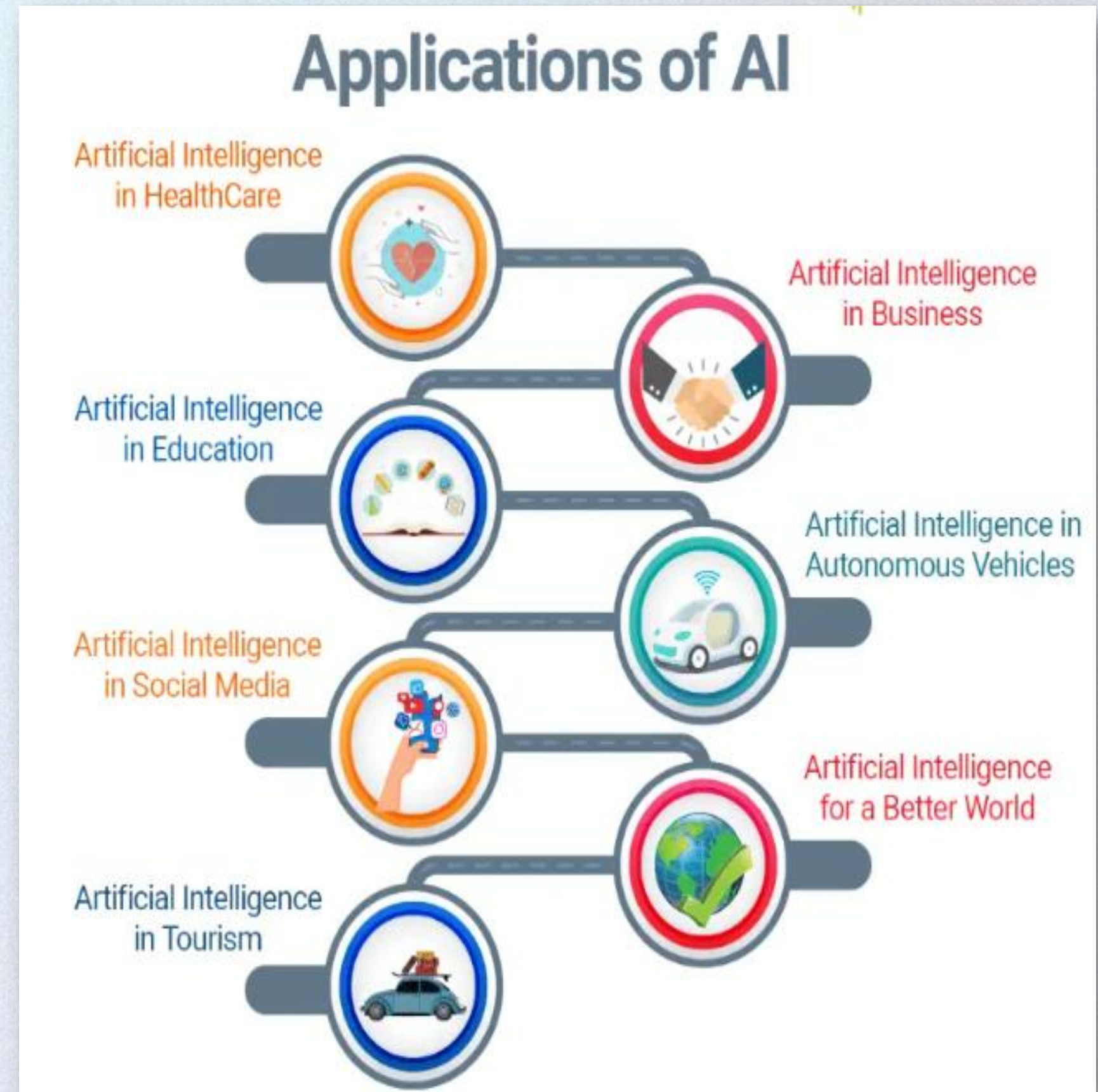
## 2. Applications of AI





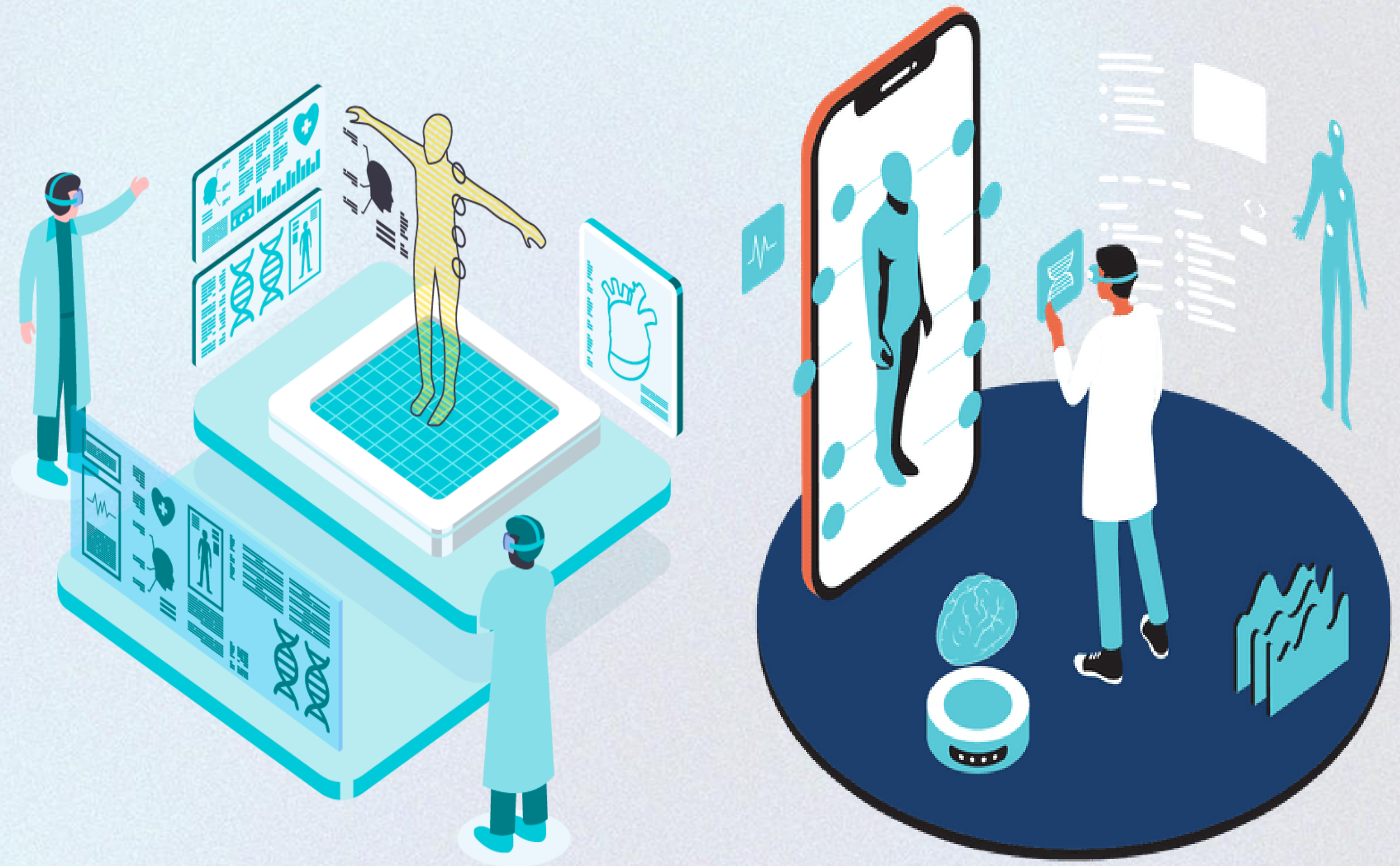
# 2. Applications of AI

- ❑ **Healthcare**: AI-assisted diagnostics (e.g., AI detecting tumors in MRI scans).
- ❑ **Autonomous Cars**: AI-powered self-driving technology (e.g., Tesla's Autopilot system analyzing road conditions and making driving decisions).
- ❑ **E-commerce**: Recommendation systems (e.g., Amazon suggesting products based on browsing history).
- ❑ **NLP**: Virtual assistants like Siri, Google Assistant, and ChatGPT understanding and responding to user queries.





❑ **Healthcare**: AI-assisted diagnostics (e.g., AI detecting tumors in MRI scans).





❑ **Autonomous Cars**: AI-powered self-driving technology (e.g., Tesla's Autopilot system analyzing road conditions and making driving decisions).



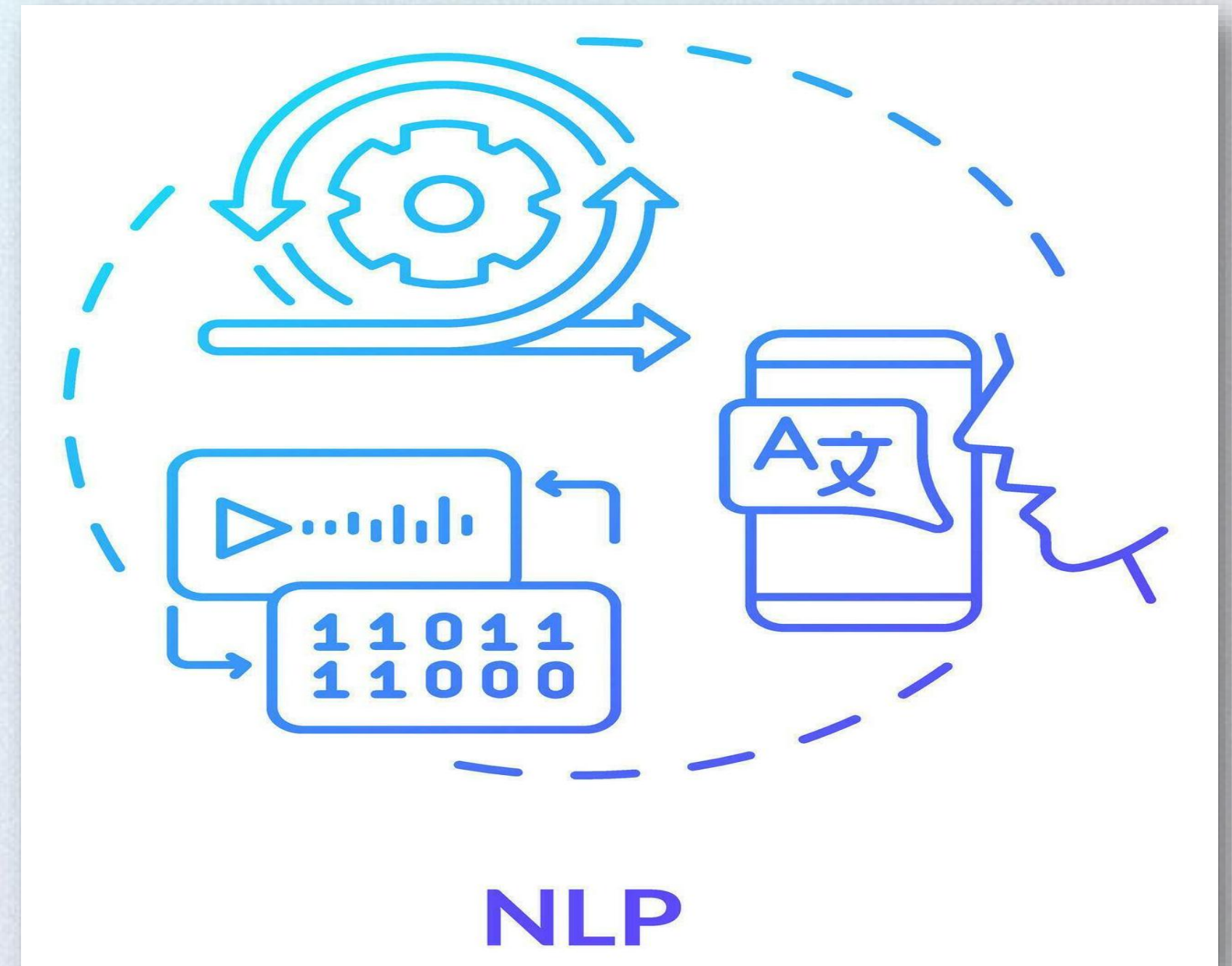
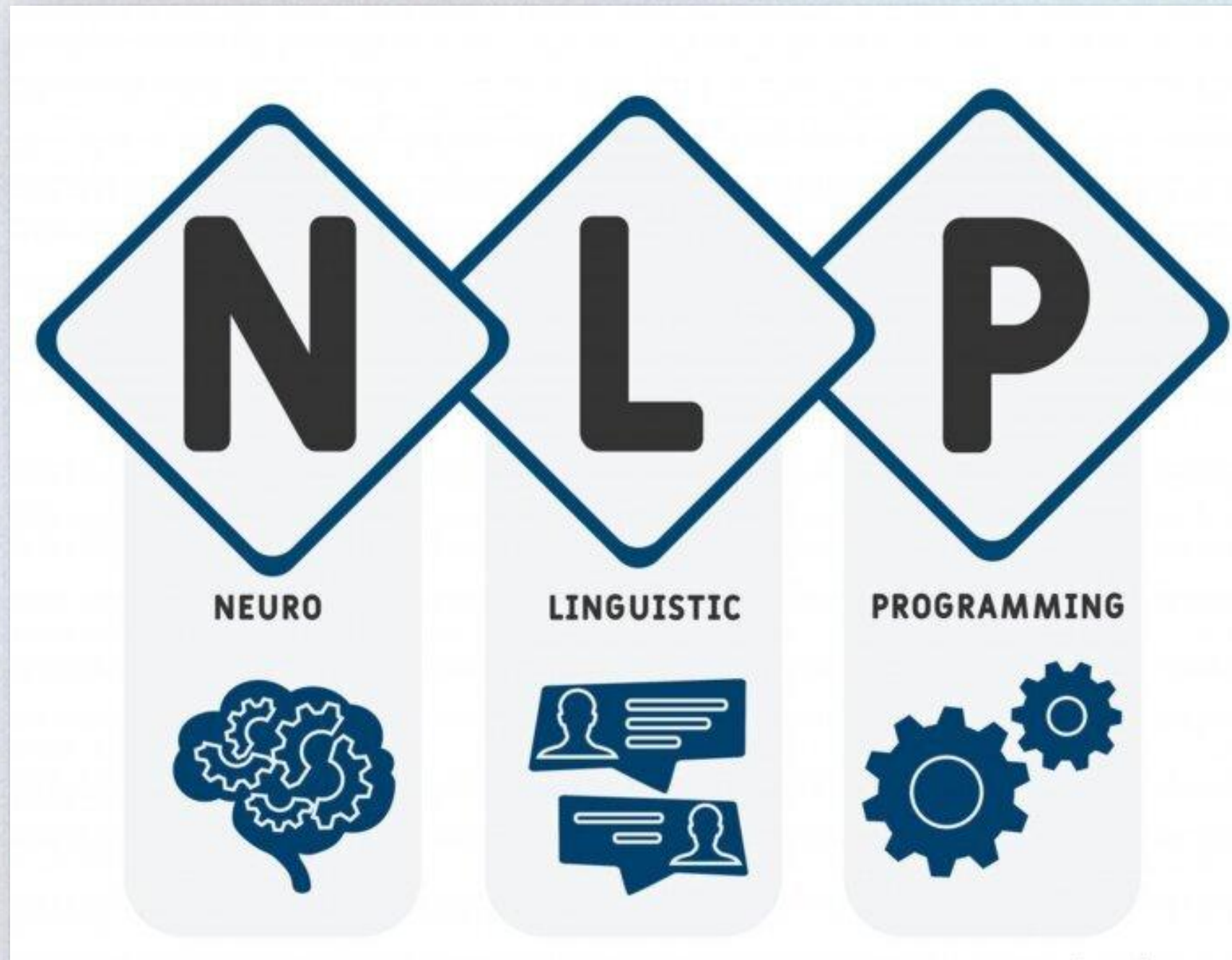


❑ **AI in Agriculture** refers to the use of artificial intelligence technologies to enhance farming practices and food production.





❑ **NLP**: Virtual assistants like Siri, Google Assistant, and ChatGPT understanding and responding to user queries.





# Here are some example applications

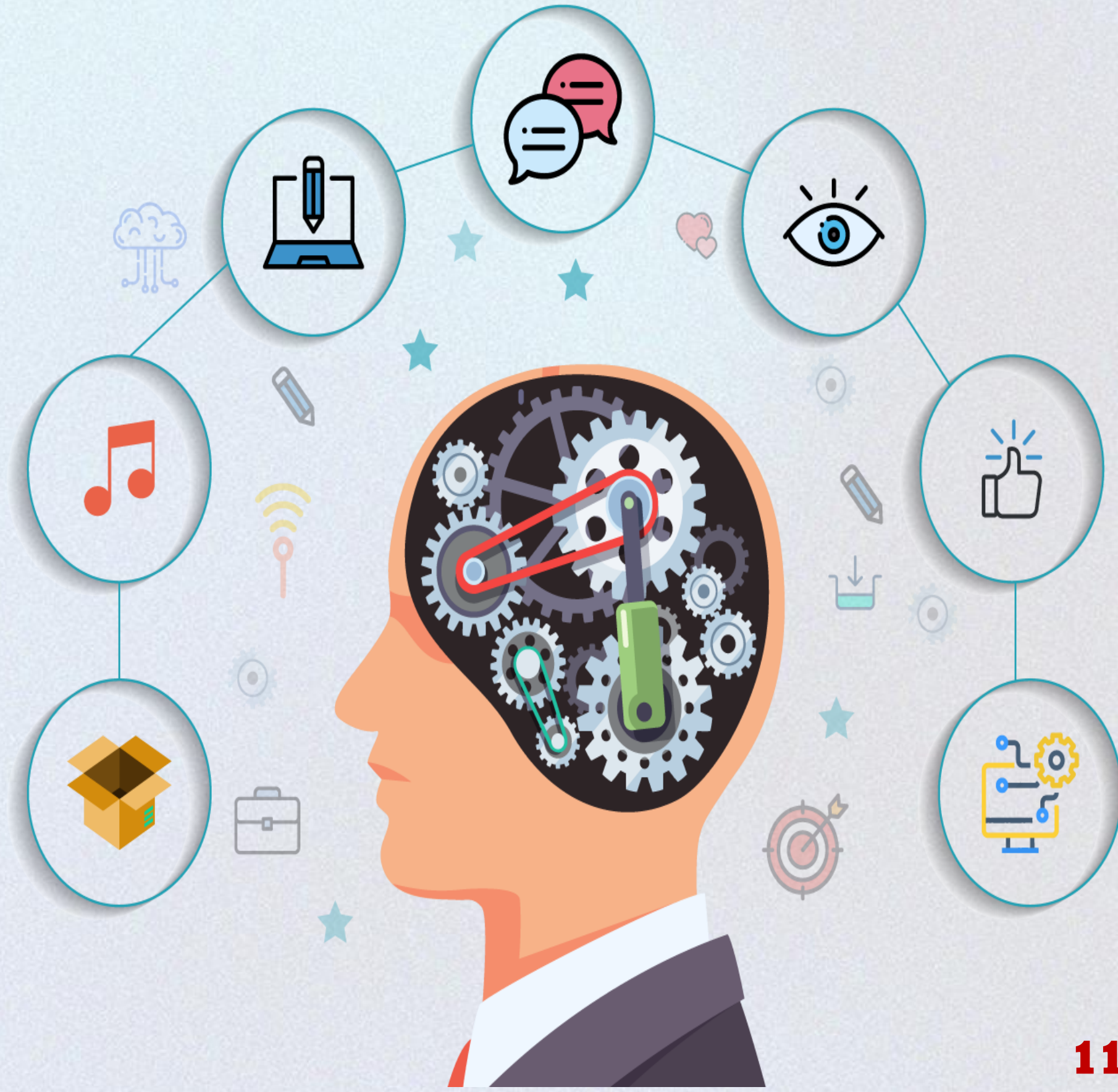
- ❑ **Computer vision:** face recognition from a large set
- ❑ **Robotics:** autonomous (mostly) automobile
- ❑ **Natural language processing:** simple machine translation
- ❑ **Expert systems:** medical diagnosis in a narrow domain
- ❑ **Spoken language systems:** ~1000 word continuous speech
- ❑ **Planning and scheduling:** Hubble Telescope experiments
- ❑ **Learning:** text categorization into ~1000 topics
- ❑ **User modeling:** Bayesian reasoning in Windows help (the infamous paper clip...)
- ❑ **Games:** Grand Master level in chess (world champion), checkers, etc.



# 3. Definition of AI

The ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.

Machines that mimic human intelligence by performing tasks typically requiring human cognition, such as learning, reasoning, and problem-solving.



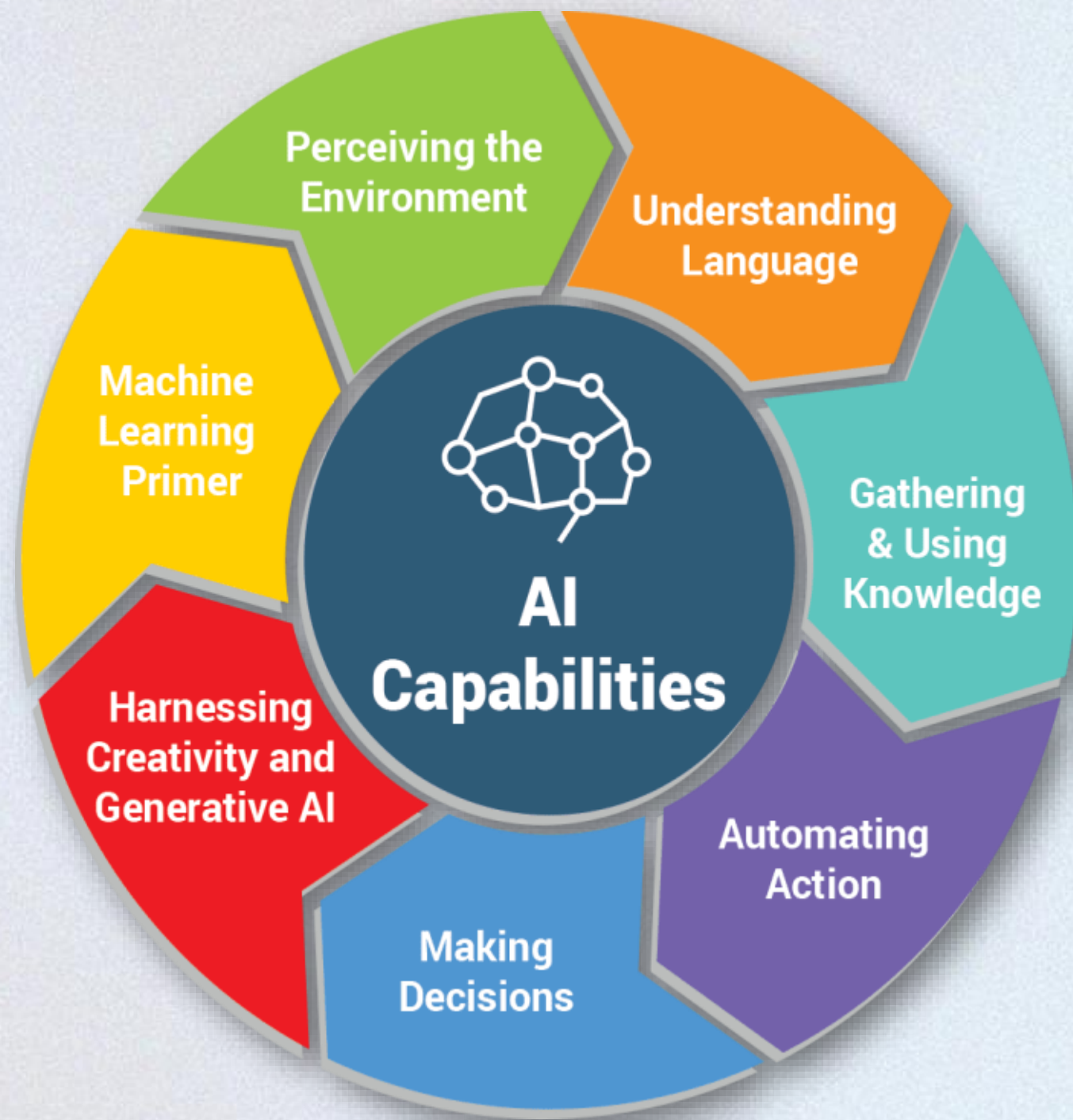


# Key Points Summary: Definition of AI

- **Intelligence** can be defined as the ability to learn, adapt to new situations, and make decisions based on specific criteria.
- **Humans naturally acquire knowledge** through experience and observation, which enables abstract thinking and decision-making.
- **AI aims to replicate human intelligence** by creating machines that can sense, act, and reason.
- **Many human tasks** (such as perception and control) are difficult to formalize into machine-executable programs.
- **AI is a branch of computer science** that studies human intelligence and attempts to recreate it in machines.
- **AI is relevant across industries**, as it extends into various human activities and problem-solving domains.



# AI Capabilities



- ❑ **Learning**: Ability to improve from experience (e.g., training neural networks to recognize images of cats and dogs).
- ❑ **Reasoning**: Making decisions based on rules and logic (e.g., chess engines analyzing possible moves and selecting the best one).
- ❑ **Perception**: Interpreting sensory inputs like images, sounds, or text (e.g., voice assistants recognizing spoken commands).



# 5. AI Categories

- ❑ **Narrow AI:** Designed for specific tasks (e.g., Google Translate, Chess AI like AlphaZero).
- ❑ **General AI:** Human-like reasoning and adaptability (hypothetical, no existing real-world example).
- ❑ **Super AI:** Beyond human intelligence (theoretical, often depicted in movies like "Ex Machina").

## Artificial Narrow Intelligence (ANI)

- Siri
- Alexa
- Cortana

## Artificial General Intelligence (AGI)

- IBM's Watson Super Computer
- Self-driving Cars

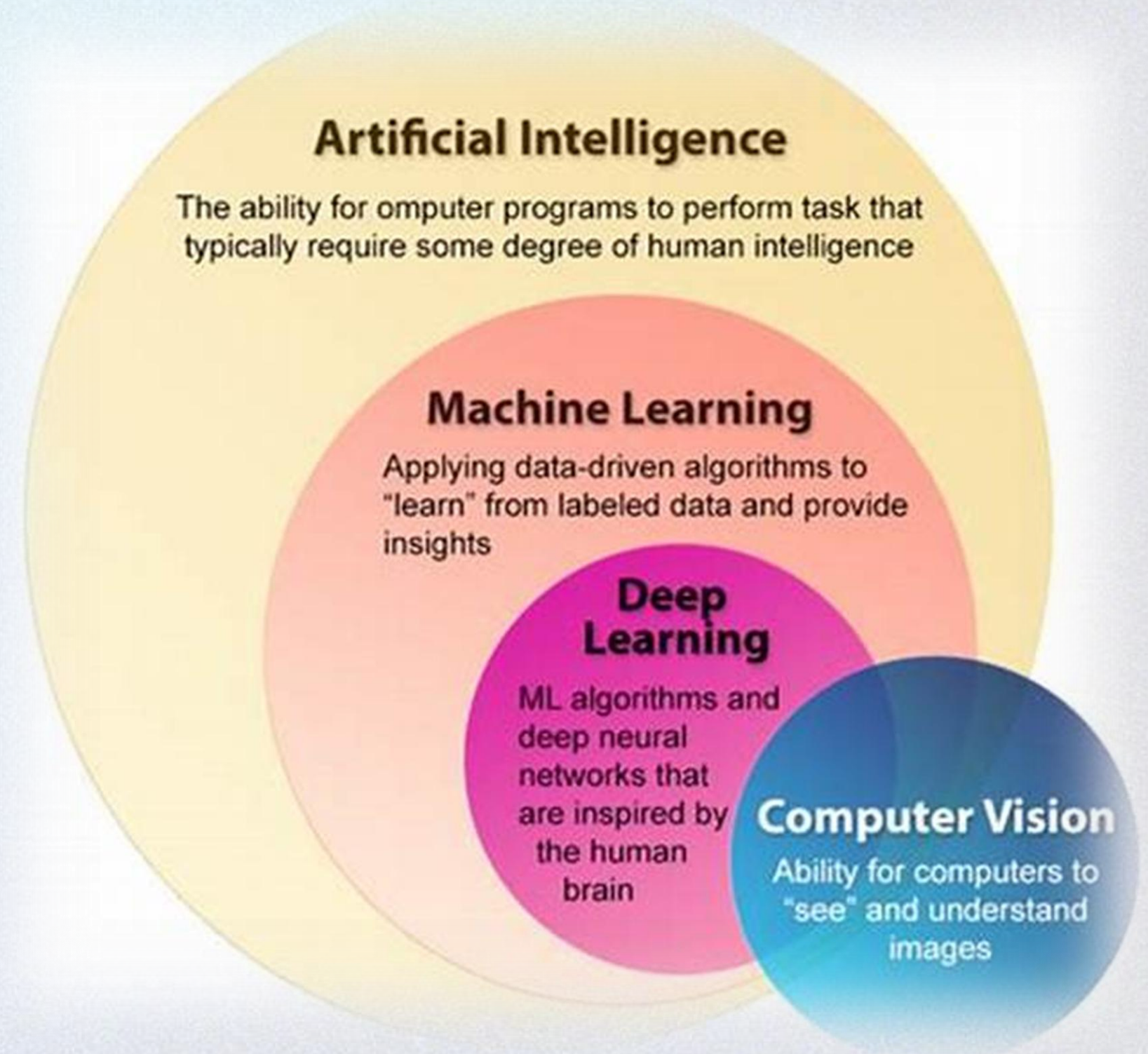
## Artificial Super Intelligence (ASI)

- Hypothetical AI, we have not been able to achieve it yet

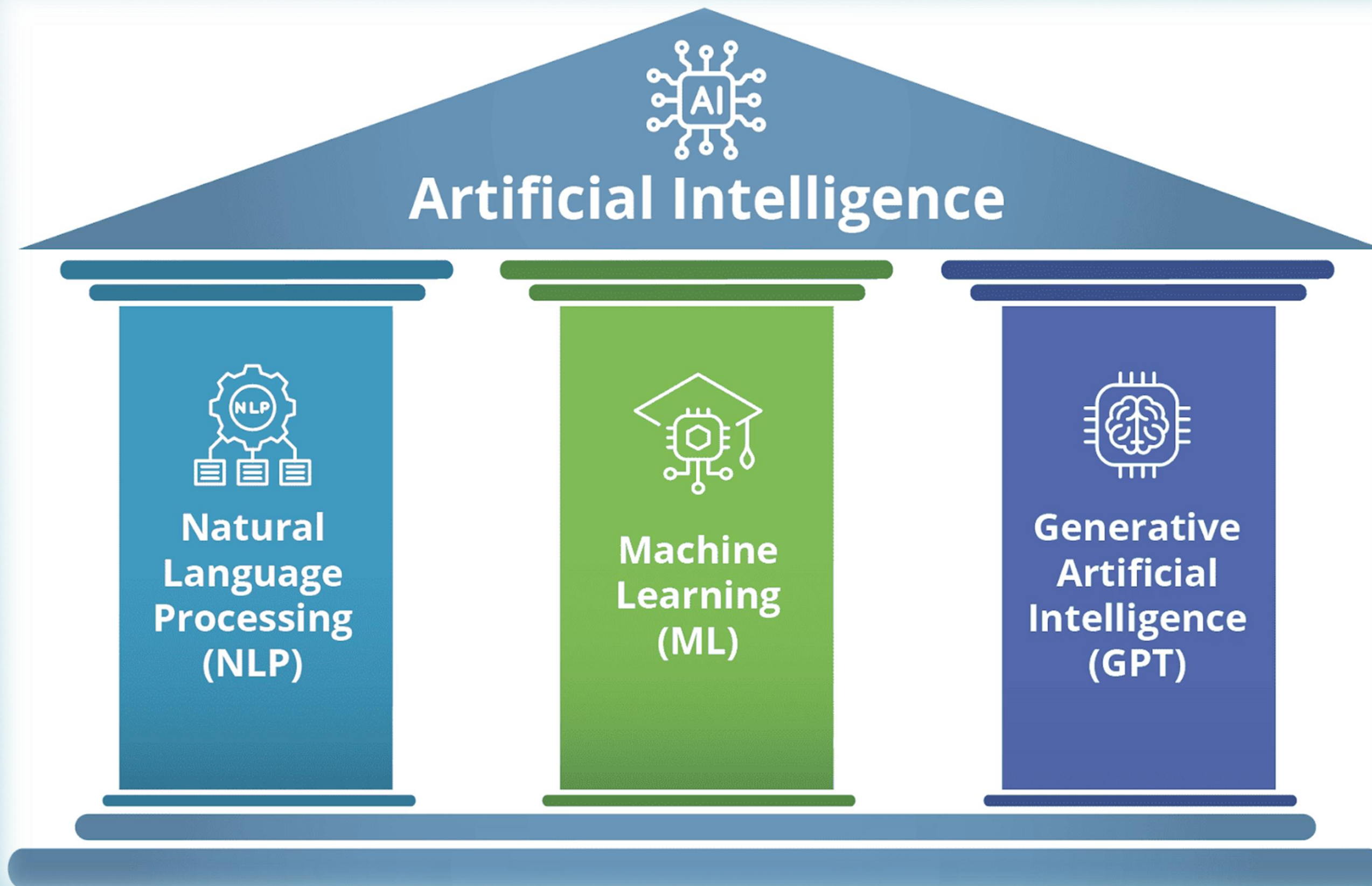


# Relationship Between AI, Machine Learning, and Deep Learning

- ❑ **Machine Learning (ML)**: AI models learn from data to make predictions  
(e.g., email spam filters learning from examples of spam and non-spam messages).
  - A major branch of AI that focuses on automating processes and discovering complex patterns.
- ❑ **Deep Learning (DL)**: Advanced ML using neural networks (e.g., AI recognizing faces on Facebook).
- ❑ **Expert Systems**: Rule-based AI for decision-making (e.g., medical diagnosis software suggesting treatments based on symptoms).









# What is Learning?

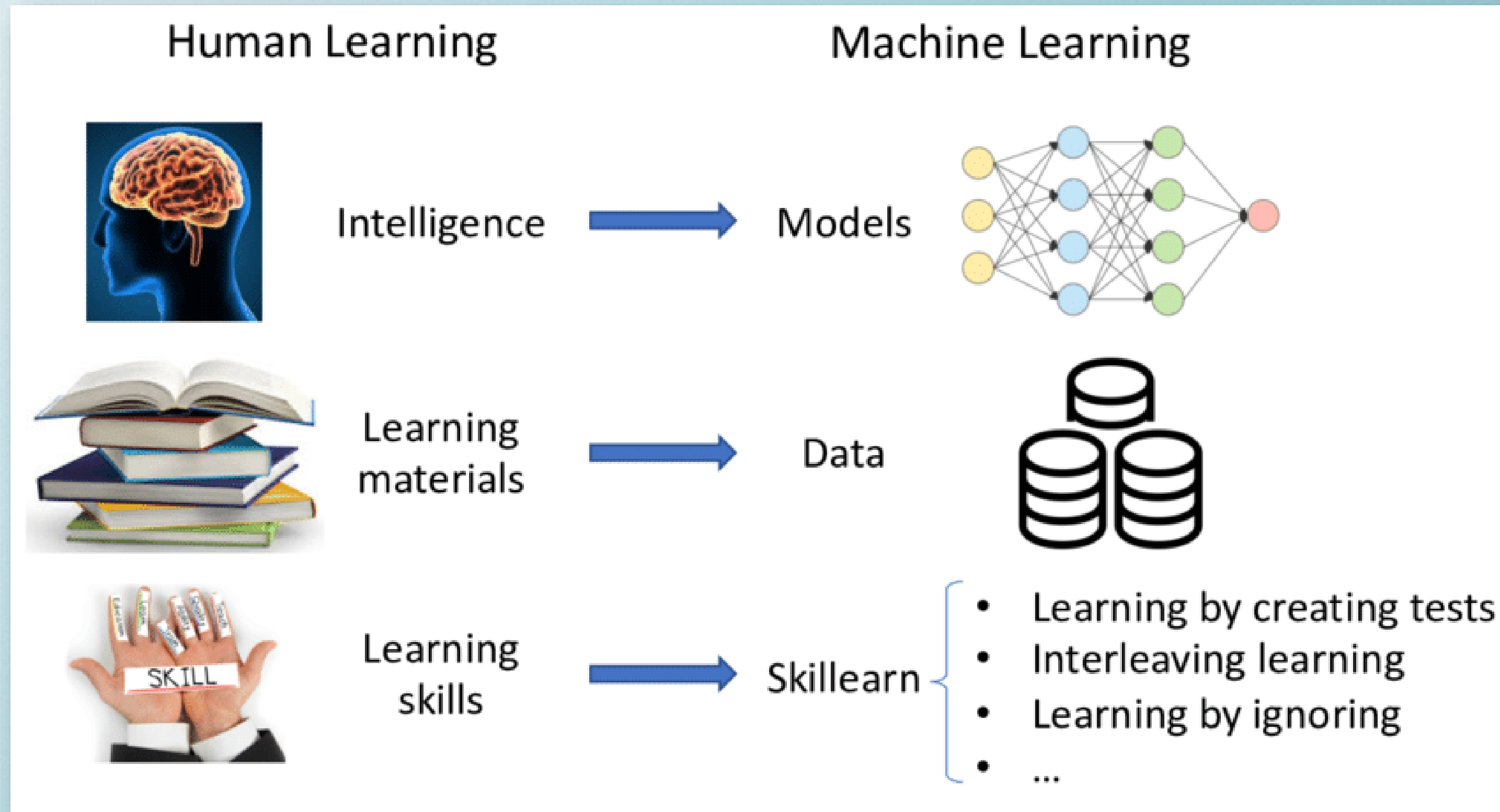
- **Learning** is essentially the process of **acquiring, processing, and applying new knowledge or skills.**
- It involves:
  1. **Receiving Information** – through sensory inputs like sight, sound, touch, taste, and smell.
  2. **Relating to Prior Knowledge** – connecting new information to what we already know.
  3. **Processing & Understanding** – making sense of the new information in context.
  4. **Applying or Acting on It** – using what we've learned to make decisions, solve problems, or create something new.

**Learning** can be

1. conscious (studying, practicing)
2. subconscious (picking up social cues, adapting to environments).
3. It can also happen through different methods like observation, experience, repetition, and teaching.



# Human Learning Versus Machine Learning





# Different Approaches to AI

- **Acting Humanly (Turing Test):**

AI is considered successful if it can imitate human behavior well enough that a judge cannot distinguish between a human and a machine.

This requires **language processing, knowledge representation, reasoning, learning, computer vision, and robotics.**

- **Thinking Humanly (Cognitive Modeling):**

This approach focuses on replicating **how the human brain works.**

a key role in understanding how humans think and applying it to AI.

- **Thinking Rationally (Logic-Based AI):**

AI should follow logical reasoning principles **to make correct decisions.**

The field of logic provides a foundation for many AI systems.

- **Acting Rationally (Rational Agents):**

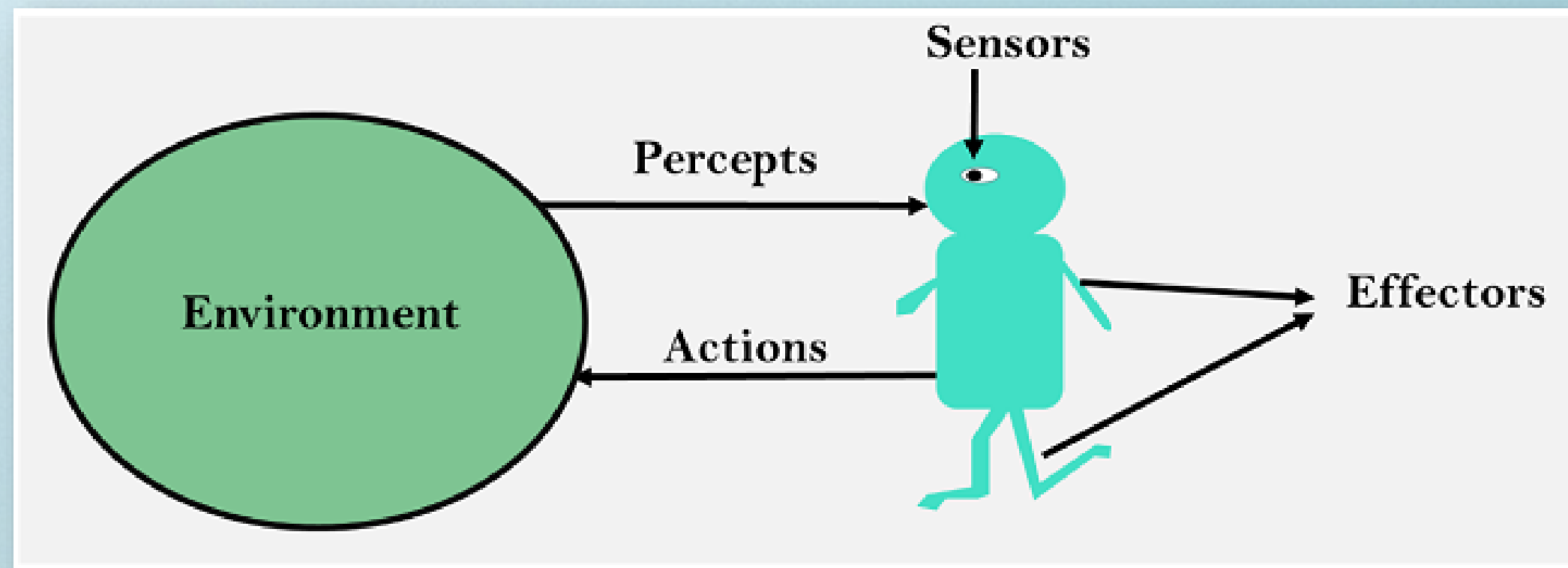
AI should act in a way that **maximizes the best possible outcome.**

Rational agents perceive their environment, adapt, and make decisions based on expected results.



# Intelligent Agents

- An agent interacts with its environment through sensors (to perceive) and actuators (to take action).
- Examples:
  - 1. Human Agent:** Sensors = eyes, ears; Actuators = hands, legs.
  - 2. Robot Agent:** Sensors = cameras, sonar; Actuators = motors.





# Intelligent Agents

**Example:** A vacuum-cleaner



A		B	

Percept sequence	Action
[A, Clean]	Right
[A, Dirty]	Suck
[B, Clean]	Left
[B, Dirty]	Suck
[A, Clean], [A, Clean]	Right
[A, Clean], [A, Dirty]	Suck
⋮	⋮
[A, Clean], [A, Clean], [A, Clean]	Right
[A, Clean], [A, Clean], [A, Dirty]	Suck
⋮	⋮



# PEAS Framework for AI Systems

**P**erformance measure – Defines success criteria.

**E**nvironment – The surroundings in which the AI operates.

**A**ctuators – The components that allow AI to take action.

**S**ensors – The components that allow AI to perceive the world.

**Example:** AI Taxi Driver

Performance Measure: Safe, fast, comfortable driving while maximizing profits.

Environment: Roads, traffic, passengers.

Actuators: Steering, accelerator, brake, signals, horn.

Sensors: Cameras, GPS, speedometer, accelerometer



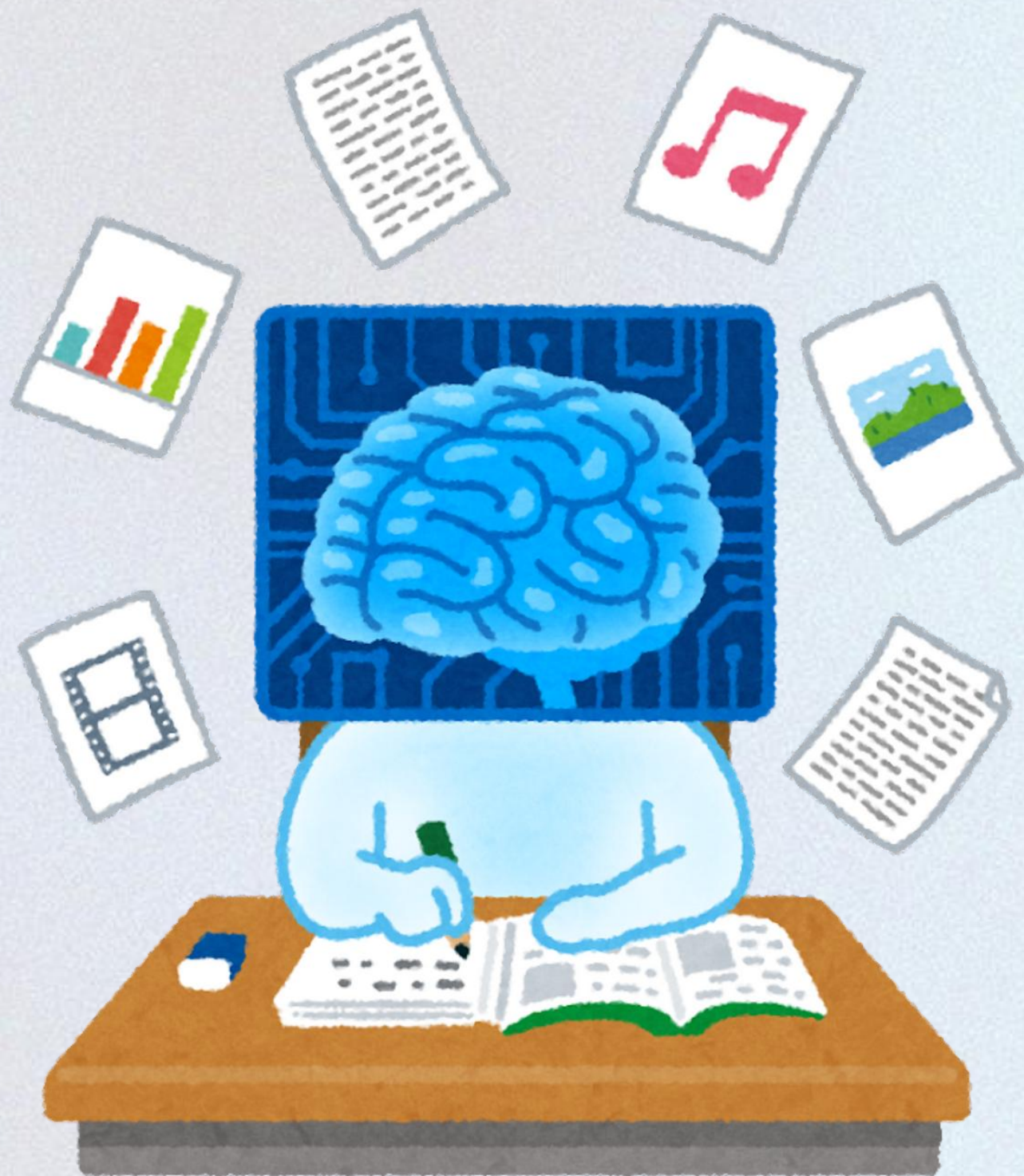
# Advantage



- **Automates repetitive tasks**: Increases efficiency (e.g., AI-powered chatbots handling customer support inquiries).
- **Recognizes patterns efficiently**: Helps in fraud detection (e.g., AI flagging unusual credit card transactions).
- **Enhances productivity**: AI-driven decision-making (e.g., supply chain optimization in logistics companies).



# Limitations:



- Requires massive data: Needs large datasets for training (e.g., AI translation services improving with more language data).
- Cannot think creatively: Lacks human intuition and emotional intelligence (e.g., AI writing articles but struggling with humor and abstract reasoning).
- Ethical concerns: Bias in AI, privacy risks, potential job displacement (e.g., facial recognition misidentifying individuals from minority groups).



# THANK YOU!

[nelsayad@horus.edu.eg](mailto:nelsayad@horus.edu.eg)

