

Artificial Intelligence

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Lecture 1- AI overview

1. Introduction
2. Intelligence Types
3. What is Artificial Intelligence
4. Relationship Between AI, Machine Learning, and Deep Learning
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"I propose to consider the question, 'Can machines think?'"

— Alan Turing, 1950

"...making a machine behave in ways that would be called intelligent if a human were so behaving."

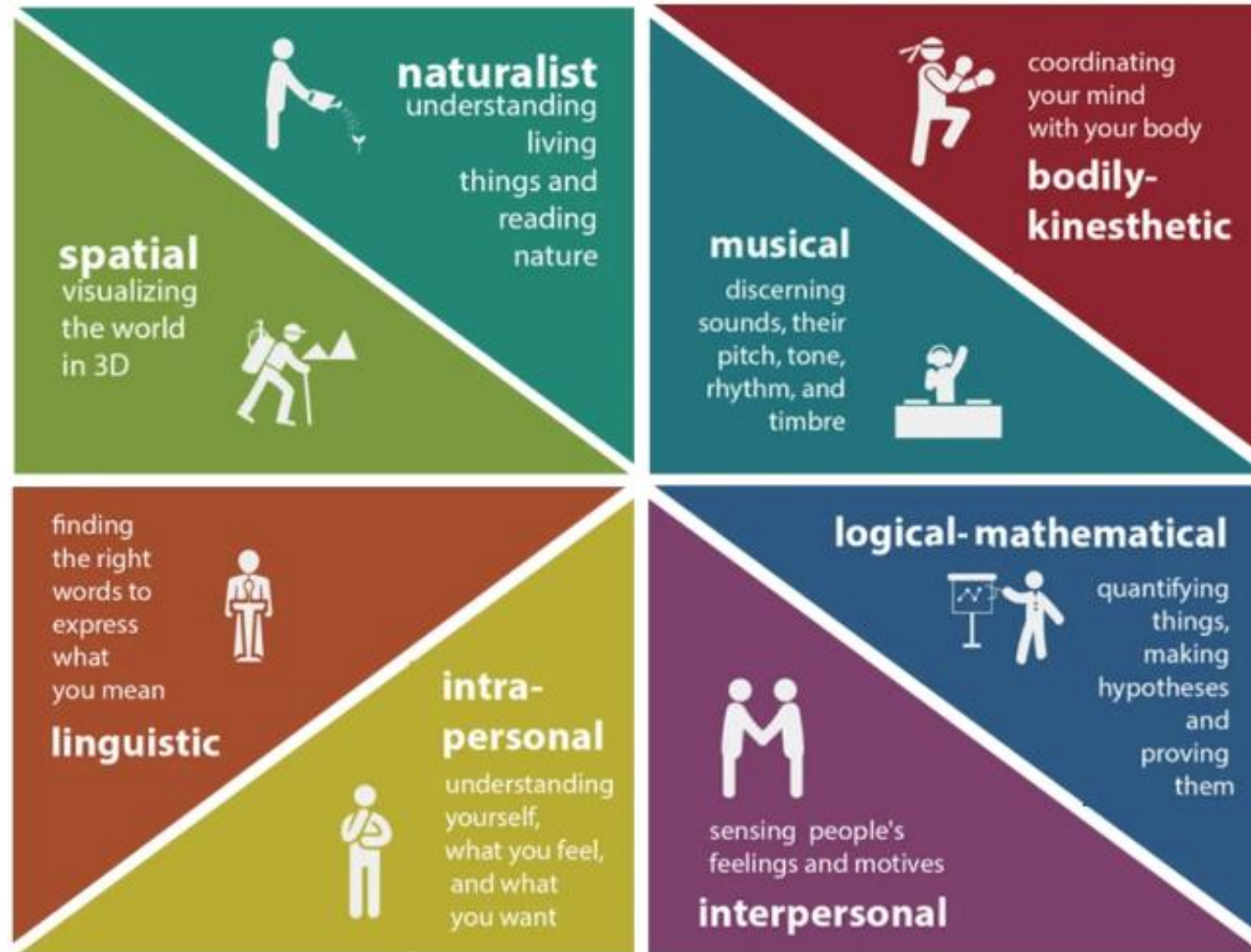
— John McCarthy et al., 1956

"Artificial intelligence is the science of making machines do things that would require intelligence if done by men."

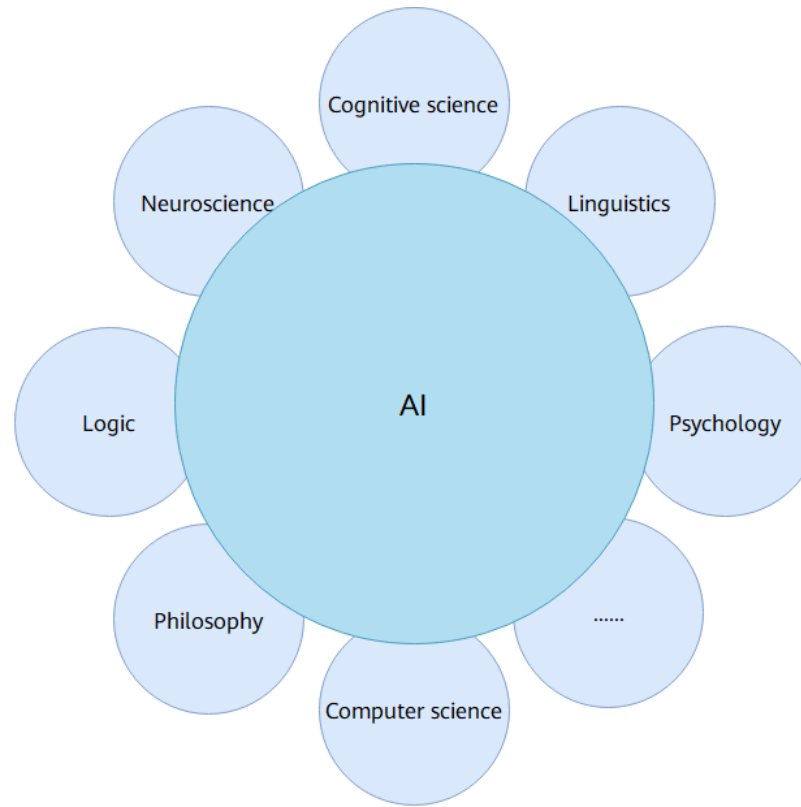
— Marvin Minsky

What Is Intelligence?

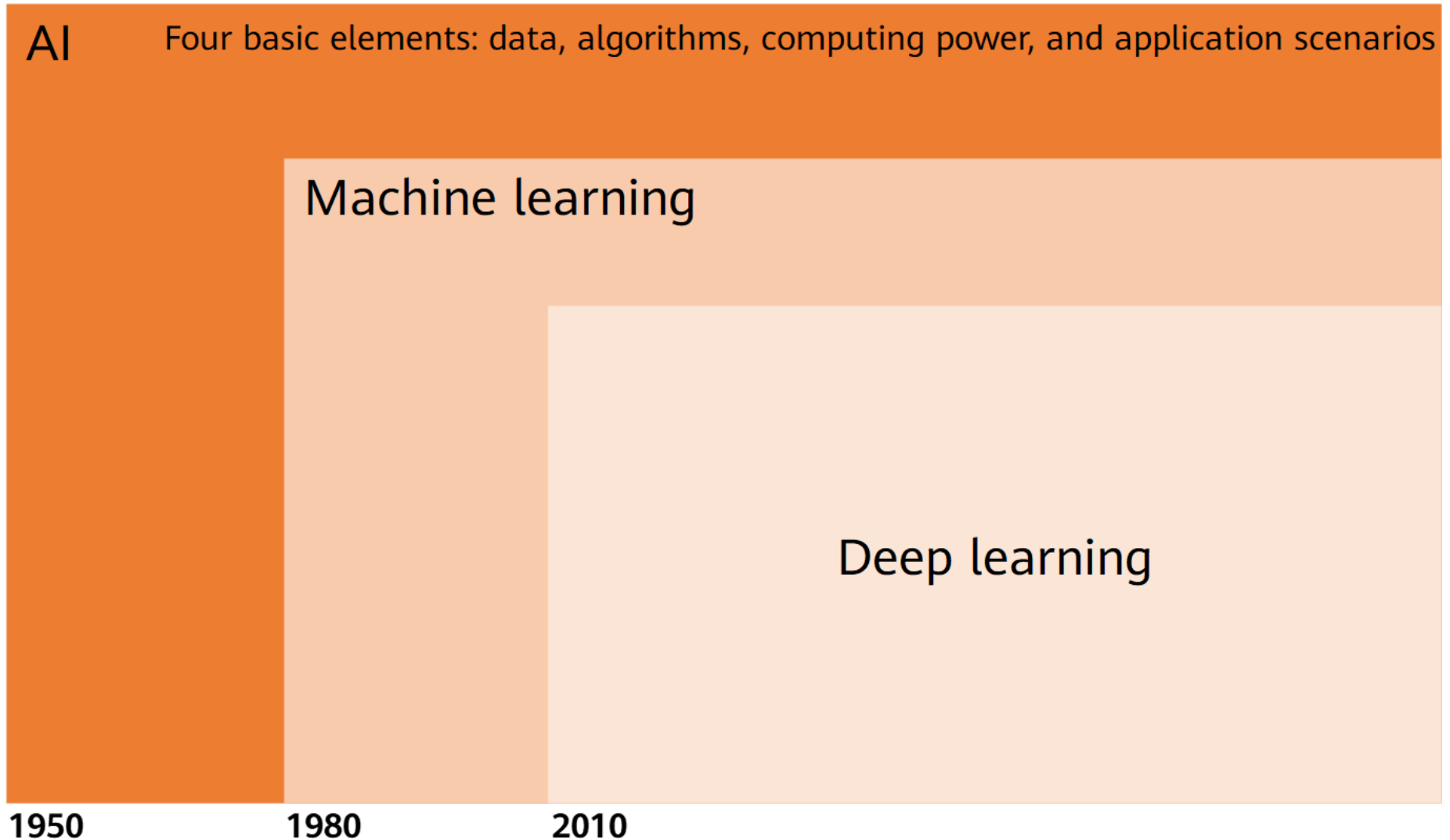
- According to the theory of multiple intelligences proposed by Professor Howard Gardner, multiple intelligences are manifested by eight capabilities:
 - Linguistic-verbal intelligence
 - Logical-mathematical intelligence
 - Visual-spatial intelligence
 - Bodily-kinesthetic intelligence
 - Musical-rhythmic and harmonic intelligence
 - Interpersonal intelligence
 - Intrapersonal intelligence
 - Naturalistic intelligence



- "Artificial" in artificial intelligence (AI) means that it is designed by and is created for humans.
- AI is a scientific discipline that studies and develops theories, techniques, and application systems used to simulate and extend human intelligence. The term was first coined by John McCarthy in 1956, who defined it as the "science and engineering of making intelligent machines, especially intelligent computer programs".
- The very premise of AI technology is to enable machines to learn from collected data, and make human-like decisions.
- Today, AI has involved various fields.



Relationship Between AI, Machine Learning, and Deep Learning



- **AI "artificial intelligence"**: was previously used to describe machines that imitate and demonstrate "human" cognitive skills related to human thinking.
- **Machine learning (ML)** : refers to the ability of computers to learn, simulate, or implement human behavior to acquire new knowledge or skills, and continuously update existing knowledge structures to improve performance.
- **Deep learning (DL)**: is a research field in ML and originates from artificial neural network (NN) studies. Deep learning uses higher level features derived from the lower level features to form a hierarchical representation. Deep learning aims to establish neural networks that simulate the human brain to analyze and interpret data, such as images, voice, and text.

- Symbolicism, also called psychologism, or computerism, refers to the symbolic AI that is derived from mathematical logic.
- It suggests the basic cognition units of humans are symbols, and human cognition is a reasoning process based on various symbols.
- As humans and computers are both physical symbol systems, computers can be used to simulate intelligent human behaviors.
- This theory, proposed by McCarthy et al in 1956
- symbolism developed heuristic algorithms -> expert systems -> knowledge engineering theory and technology and made great progress in the 1980s.

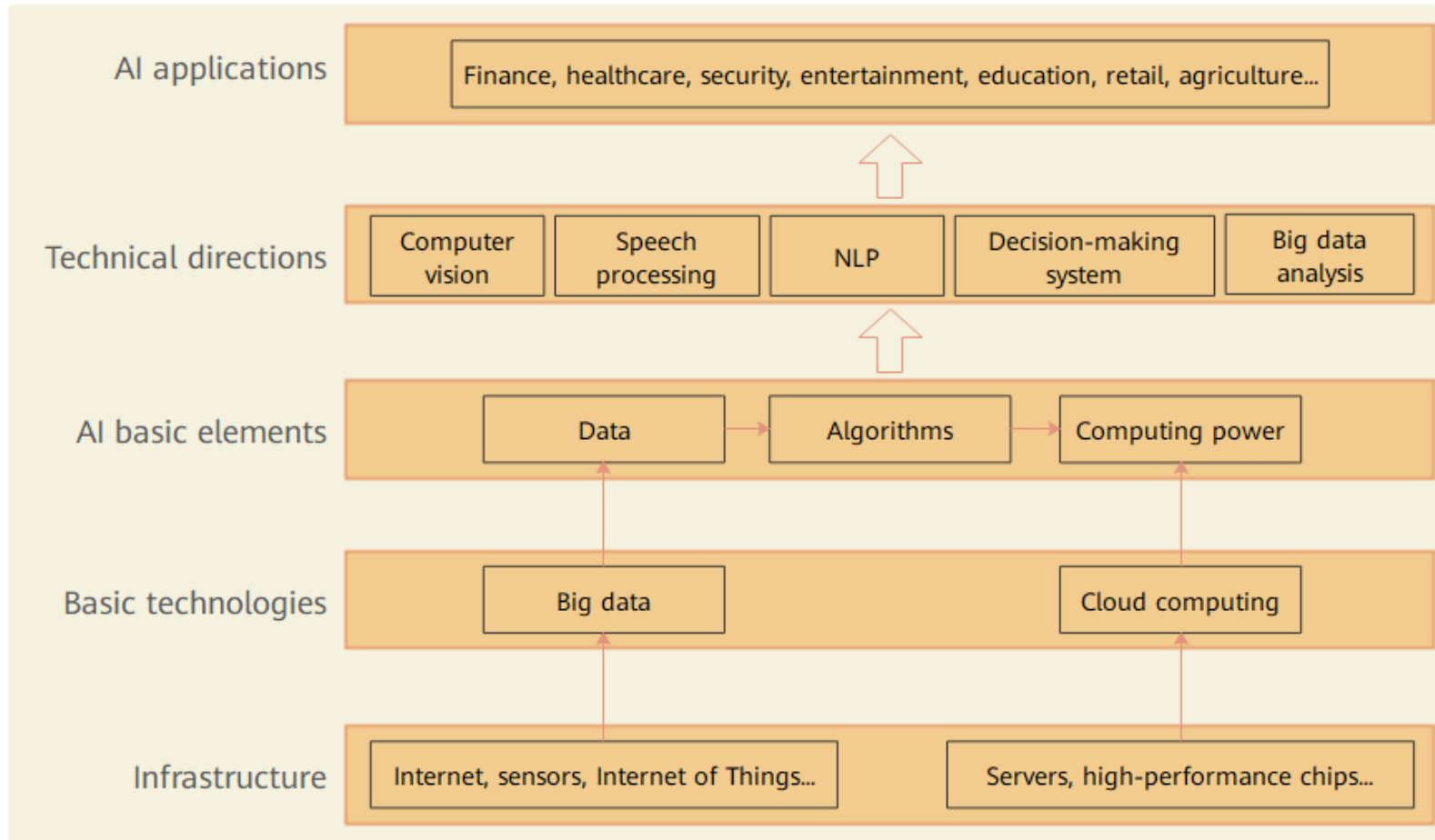
- Connectionism, argues AI originates from bionics, that is, it is the study of human brain.
- Researchers believe the neuron is the basic thinking unit. Connectionism starts with neurons and studies NNs and brain models, to create a new development path for AI.
- The McCulloch-Pitts (MP) neuron model was proposed in 1943. However, the study of brain models was limited due to biological prototypes and technical conditions in the 1970s and 80s. It was not until the proposal of hardware-simulated neural networks that the trend of connectionism reemerged again.
- Nowadays, the artificial neural network (ANN) is a common technique but its complexity and scale has brought many interpretability problems.

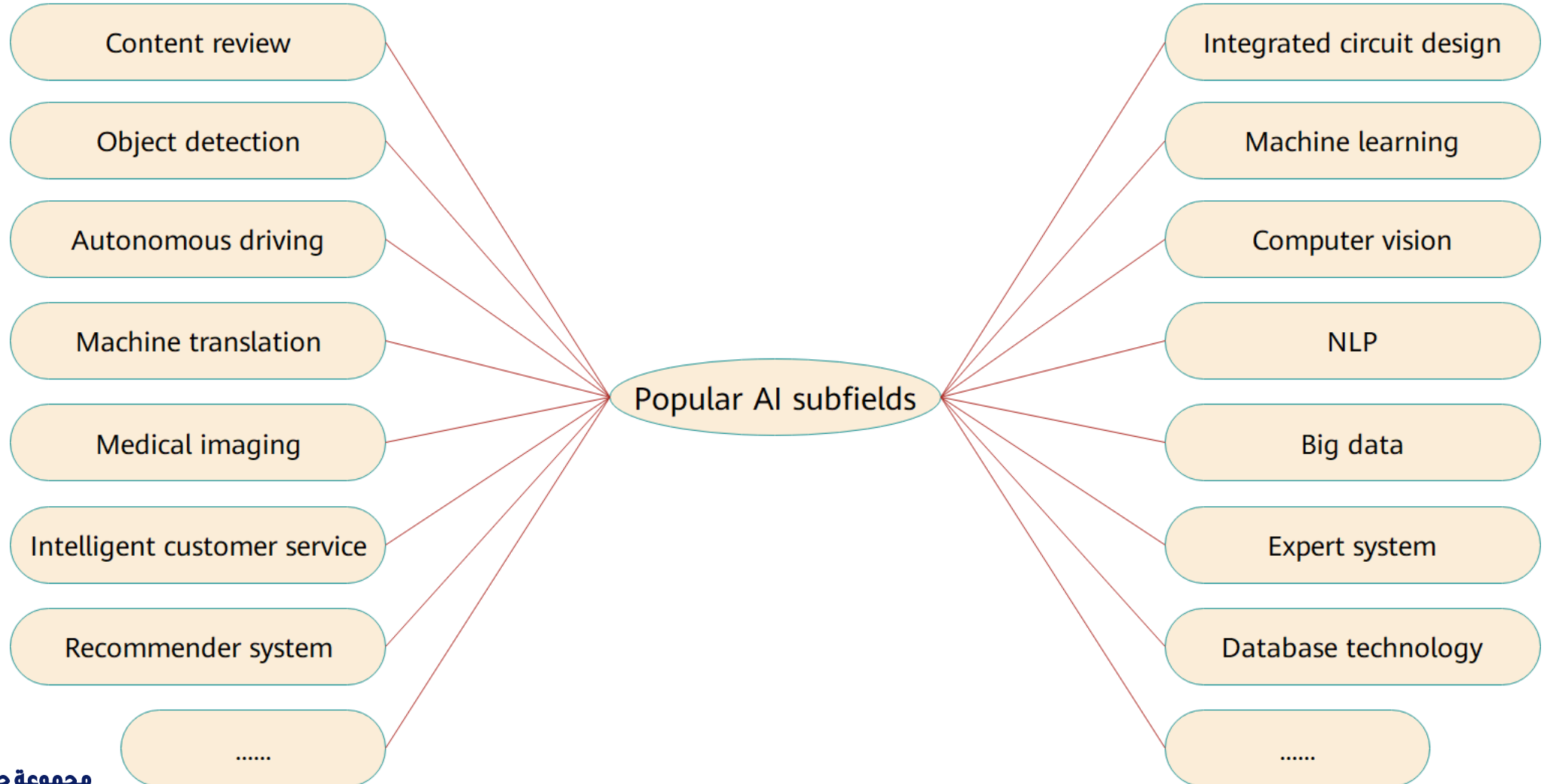
- Actionism is also known as evolutionism or cyberneticsism and states that AI originates from cybernetics.
- It suggests intelligence depends on perception and actions, and that intelligence does not require knowledge, representation, or reasoning. AI can evolve like human intelligence, and intelligent behavior can only be manifested in the real world by interacting with the surrounding environment.
- Early research on actionism focused on simulating intelligent behavior of people in the control process. It led to the birth of intelligent control and robotics in the 1980s.

- Strong AI:
 - This hypothesis aims to create intelligent machines that replicate human functions, such as reasoning and problem-solving, and are perceptive and self-conscious. Strong AI will be able to think independently and teach itself to solve new problems, and have its own values and worldviews, and will even have the same instincts as creatures, such as survival and safety needs. In a sense, strong AI can be seen as a new species.
- Weak AI:
 - Weak AI aims to build intelligent machines that can perform specific tasks but rely heavily on human interference. These machines may seem intelligent but are not self-conscious.

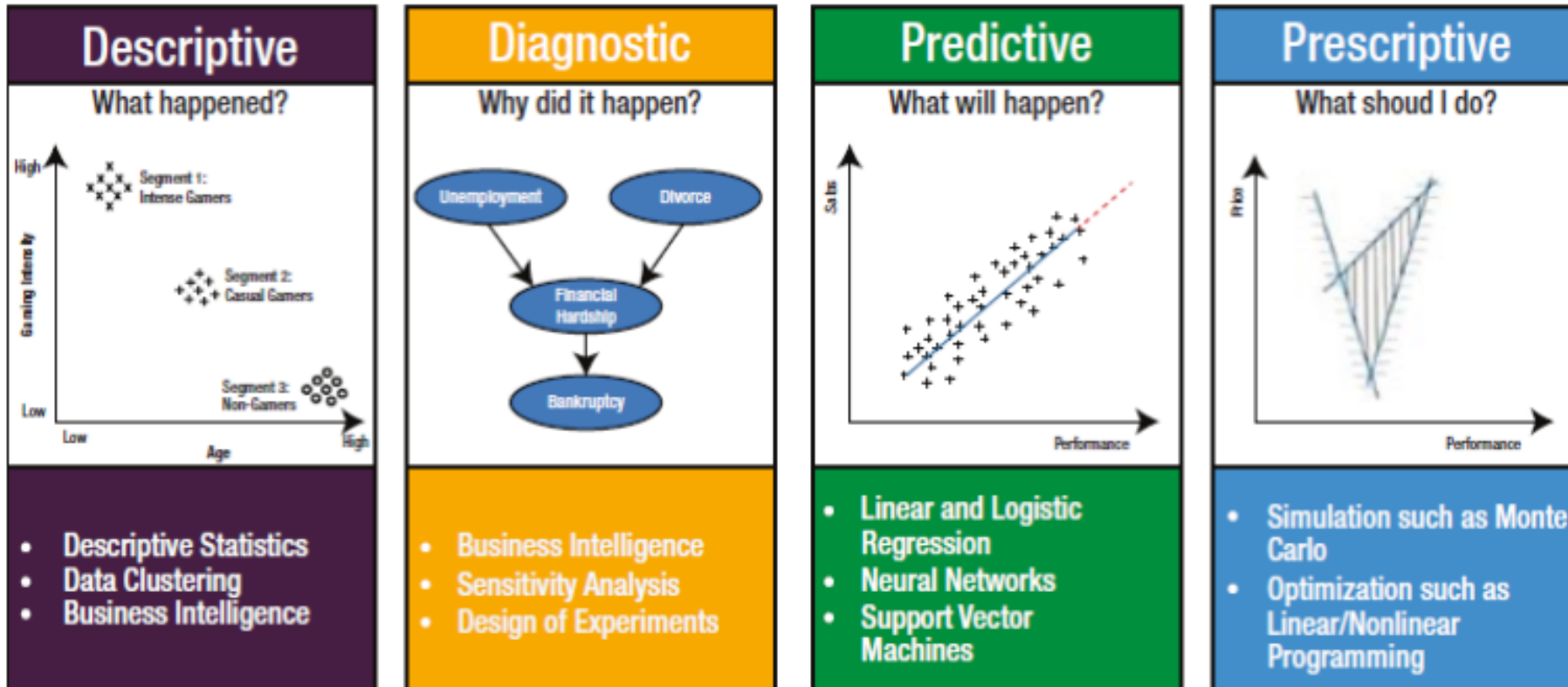
AI - Ecosystem

Data, algorithms, computing power, and application scenarios are the basic elements of AI applications. We must combine AI with premium cloud computing, big data, and IoT to facilitate our intelligent society.





- Data Mining (DM):
 - Process of finding the existing patterns in data. Deals with analysis of structured data & places emphasis on commercial applications
- Machine Learning (ML):
 - Design & evaluation of algorithms for extracting patterns or learn from data
- Data Science:
 - Unifies DM & ML, can use big data technologies & incorporates tasks related to ethics & regulation



Low Level

High Level

- **Descriptive Analytics:**

- Used to explain what is happening in a given situation
- E.g., Who are my customers? How many types of users do we have?

- **Diagnostic Analytics:**

- Helps you understand why certain things happened & the key drivers
- E.g., Why are dropped calls increasing? Why a drop in sales over 3rd qrt.?

- **Predictive Analytics:**

- Helps to predict what will happen in the future. Use current & historical data
- E.g., Predict if a credit card transaction is fraudulent or not

- **Prescriptive Analytics:**

- Necessary actions that to be taken in case of certain predicted event
- E.g., What measures should be taken to increase the sales in off season?

Will AI take over our jobs?

- Throughout the course of history, humans have sought ways to improve efficiency, that is, to obtain more from fewer resources. Just as sharp stones improve hunting, and steam engines reduce the demand for horses, every step towards automation has changed our society. In the AI era, what tasks will be taken over by AI?
- AI may take over:
 - Repeatable tasks
 - Non-creative tasks
 - Tasks that require weak social skills
 - Dangerous tasks
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THANK
YOU!