



Introduction

CSE3007
ARTIFICIAL INTELLIGENCE

Artificial Intelligence

❑ What is Artificial Intelligence ?

- "It is a branch of computer science by which we can create intelligent machines which can behave like a human, think like humans, and able to make decisions."

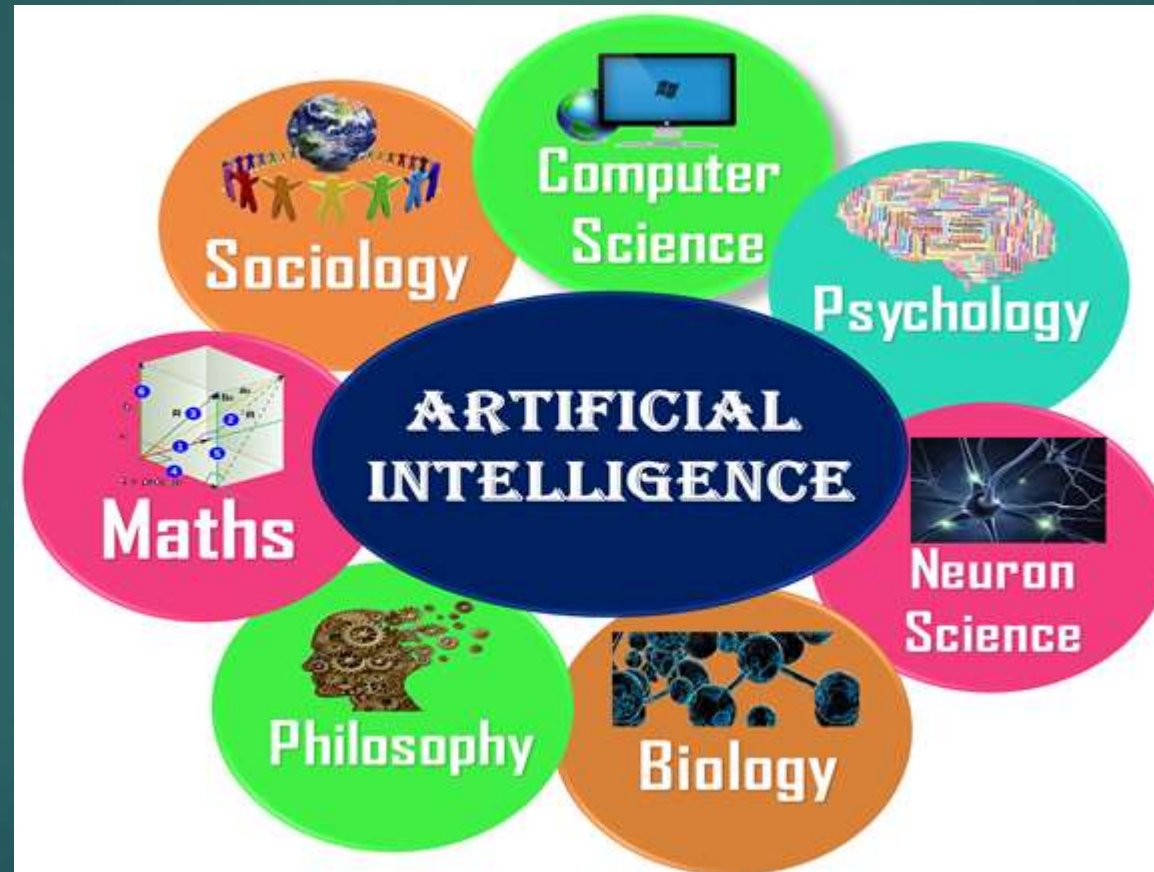
❑ Why is Artificial Intelligence ?

- With the help of AI, you can create such software or devices which can solve real-world problems very easily and with accuracy such as health issues, marketing, traffic issues, etc.
- With the help of AI, you can create your personal virtual Assistant, such as Cortana, Google Assistant, Siri, etc.
- With the help of AI, you can build such Robots which can work in an environment where survival of humans can be at risk.
- AI opens a path for other new technologies, new devices, and new Opportunities.

Goals of Artificial Intelligence

- Replicate human intelligence
- Solve Knowledge-intensive tasks
- An intelligent connection of perception and action
- Building a machine which can perform tasks that requires human intelligence such as:
 - Proving a theorem
 - Playing chess
 - Plan some surgical operation
 - Driving a car in traffic
- Creating some system which can exhibit intelligent behavior, learn new things by itself, demonstrate, explain, and can advise to its user.

What Comprises to Artificial Intelligence?



Advantages of Artificial Intelligence

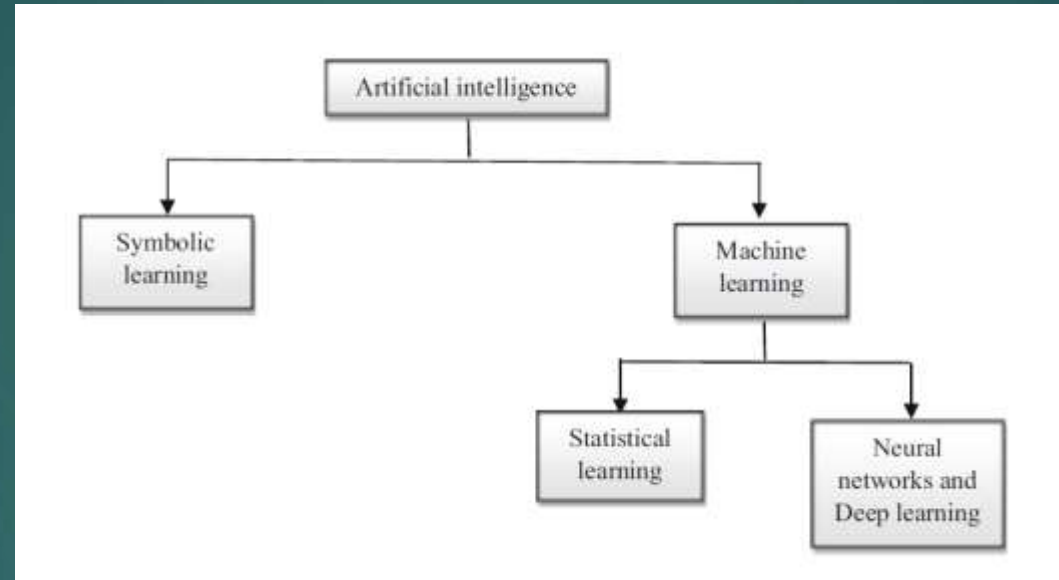
- ❑ High Accuracy with less errors
- ❑ High reliability
- ❑ Useful for risky areas
- ❑ Digital Assistant
- ❑ Useful as a public utility

Disadvantages of Artificial Intelligence

- ❑ High Cost
- ❑ Can't think out of the box
- ❑ No feelings and emotions
- ❑ Increase dependency on machines
- ❑ No Original Creativity

Classification of ARTIFICIAL INTELLIGENCE

- There are two ways AI works. One is symbolic based and another is data based.



- Symbolic AI is the collective name for all the techniques in AI research that are based on high-level or symbolic representation of problems.
- However, for the data based called machine learning, we need to feed lots of data to the machine before it learns, for example, if we have lots of data for sales versus advertising spent. We can plot the data to see some kind of patterns. If a machine can learn these patterns, it can make predictions based on what it has learnt.

Introduction to ARTIFICIAL INTELLIGENCE

- While one or two or even three dimensions is easy for humans to understand and learn, machine can learn in many more dimensions, even hundreds or thousands.
- That is why a machine can look at lots of high-dimensional data and can determine patterns. Once it learns these patterns, it can make predictions that humans cannot even come close to.
- We will discuss the concepts of machine learning and deep learning in unit 5.

About Machine Learning

- The goal of AI is to create a machine that can mimic the human brain. To do this, it needs learning capabilities. However, it is more than just about learning. In addition, it is also about knowledge representation, reasoning, abstract thinking, etc.
- Machine learning on the other hand solely focuses on writing a software that can learn from the past experience.
- The informal definition of machine learning is coined by Arthur Samuel in 1960 as “machine learning is the field of study that gives computers the ability to learn without being explicitly programmed.”
- A modern definition of machine learning is given by Tom Mitchell in 1998 as “A computer is said to learn from experience E with respect to some task T and some performance measure P , if its performance on T , as measured by P , improves with experience E .”

Introduction to Machine Learning

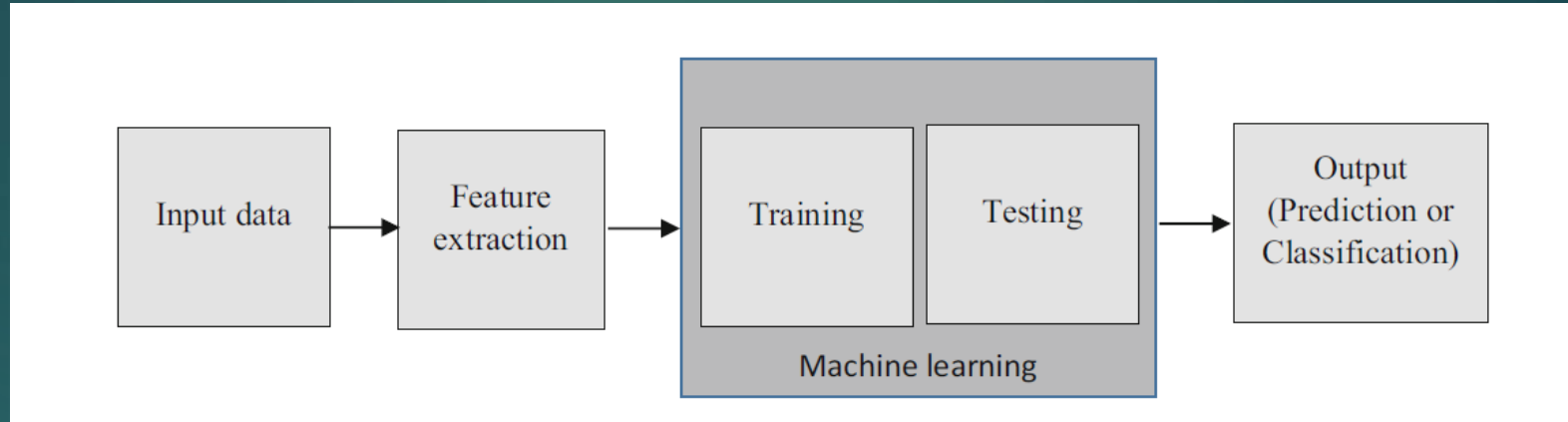
- A well-known example of machine learning system is a spam filter in email services.



- Suppose your email program is watching emails you do or do not mark as spam and based on that learns how to better filter the spam.
- What is the task T in this example?
The answer is “classifying emails as spam or not spam.” In the same way, the experience E is watching your label emails as spam or not spam.
- Similarly, the performance is the number of emails correctly classified as spam or not spam.

Introduction to Machine Learning

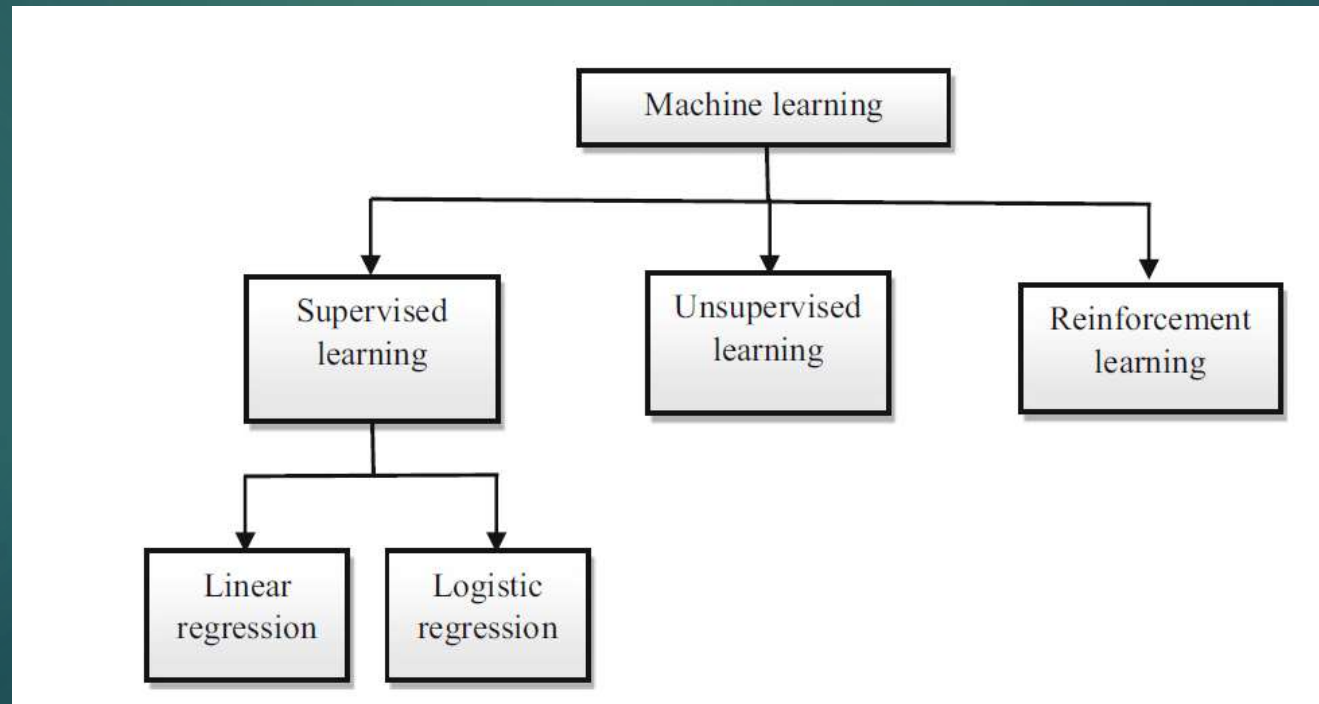
- ▶ A general block diagram of a machine learning approach is given in Figure.



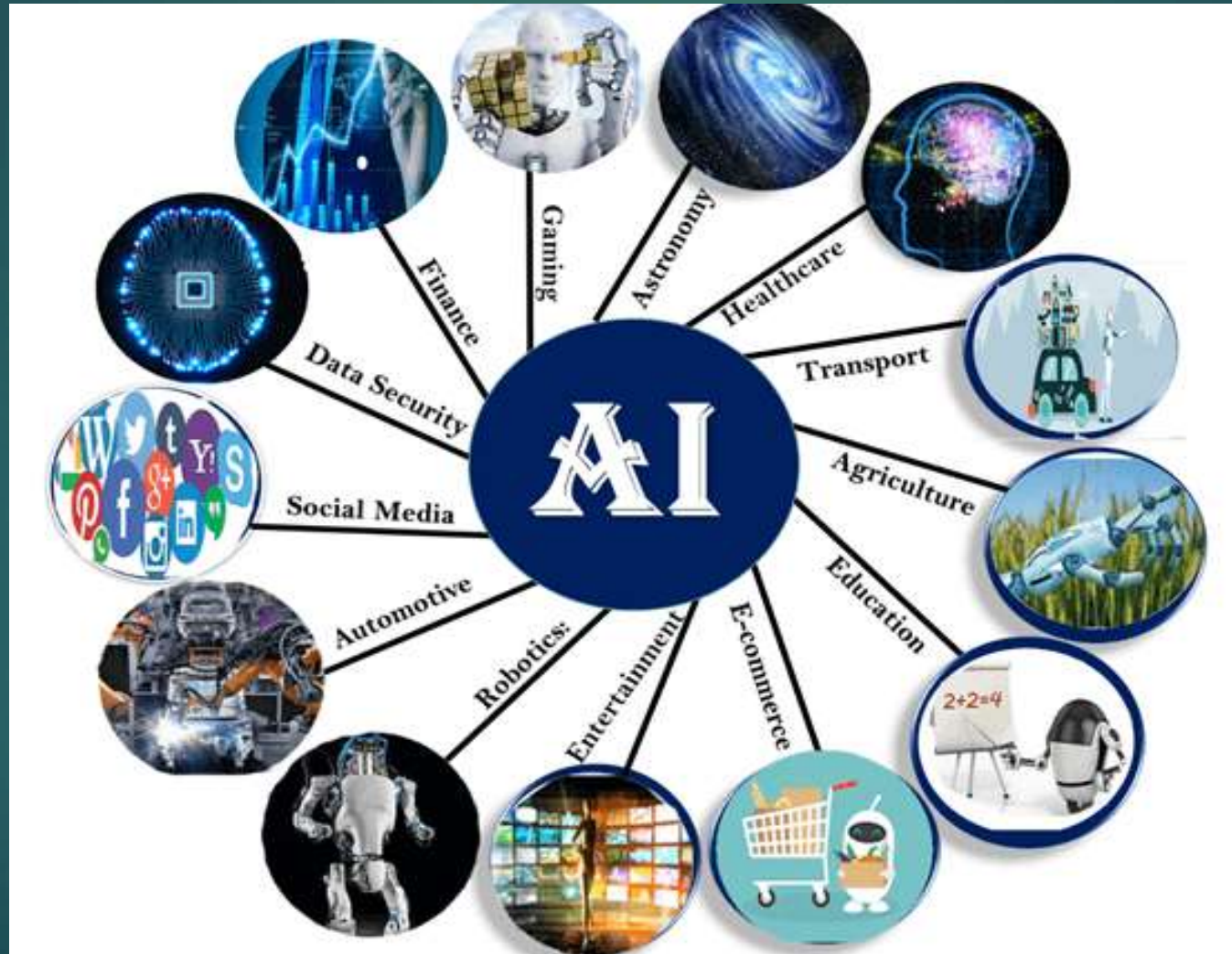
- ▶ First, desired features from the given data need to be extracted. Usually, feature extraction techniques depend on the type of classification or prediction problem.
- ▶ Next, depending on the problem and the input data, suitable machine algorithms need to be selected.
- ▶ These learning algorithms will be applied on given data features by dividing them into training and testing sets.
- ▶ Once, we supply the required features, machine learning algorithm performs the desired classification or prediction task.

Introduction to Machine Learning

- ▶ In general, these techniques are divided into three categories as displayed in Figure.
- ▶ They are:
 - Supervised learning, unsupervised learning, and reinforcement learning algorithms.



Application of AI



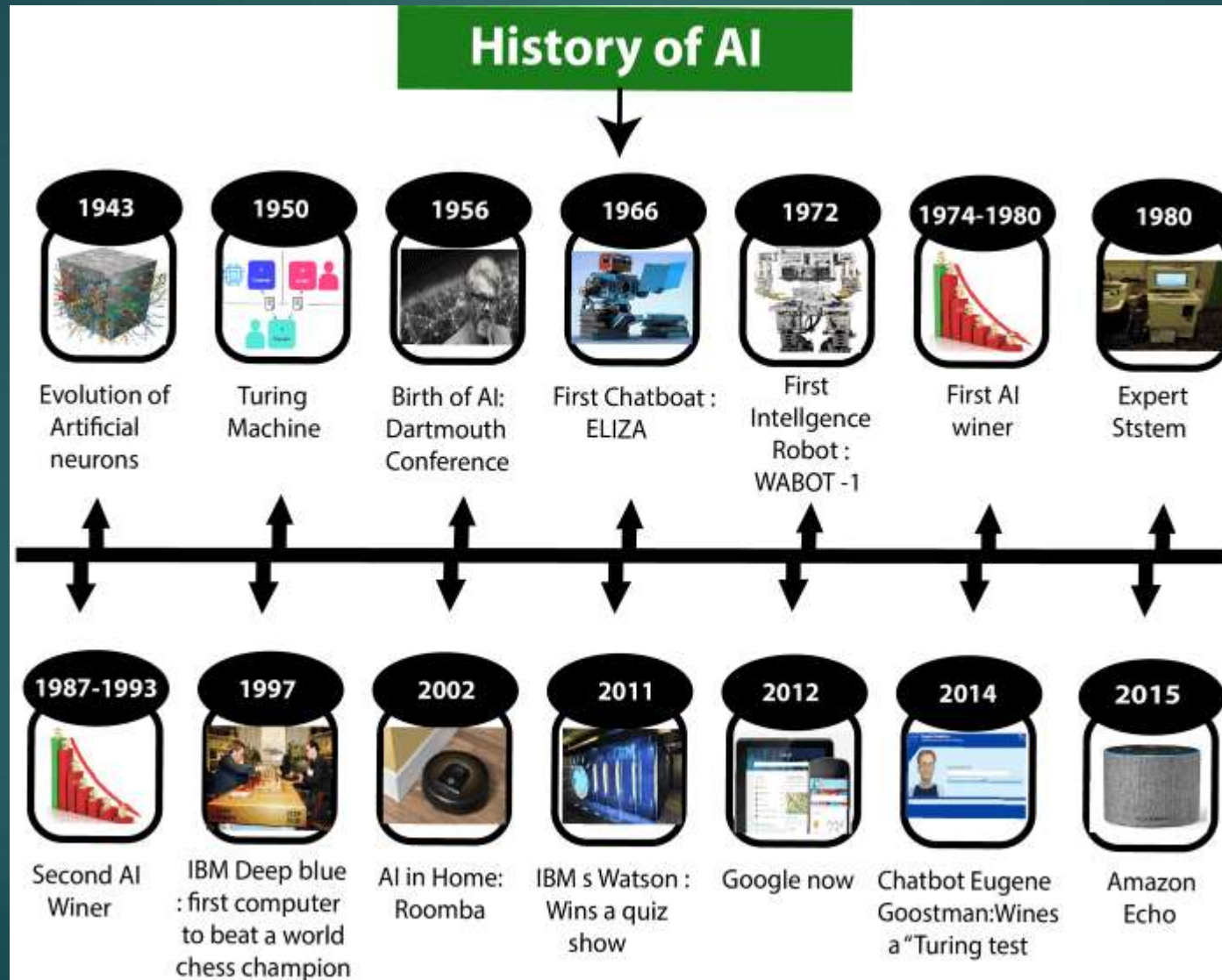
Application of AI

- ❑ AI in Astronomy
- ❑ AI in Healthcare
- ❑ AI in Gaming
- ❑ AI in Finance
- ❑ AI in Data Security
- ❑ AI in Social Media
- ❑ AI in Robotics

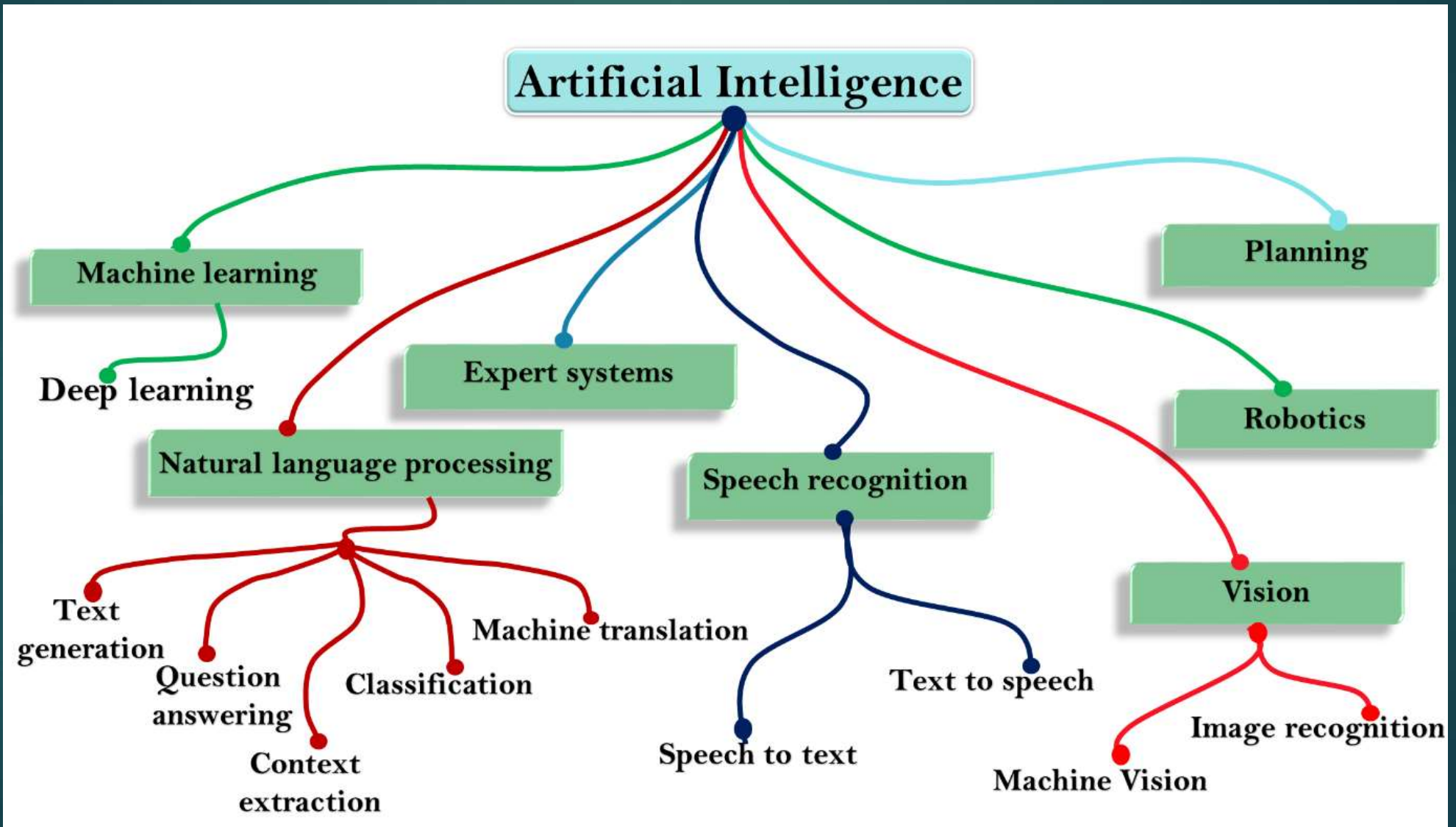
Boston dynamics

- ❑ AI in Automotive Industry
- ❑ AI in E-commerce
- ❑ AI in Entertainment
- ❑ AI in Travel & Transport
- ❑ AI in Agriculture
- ❑ AI in education

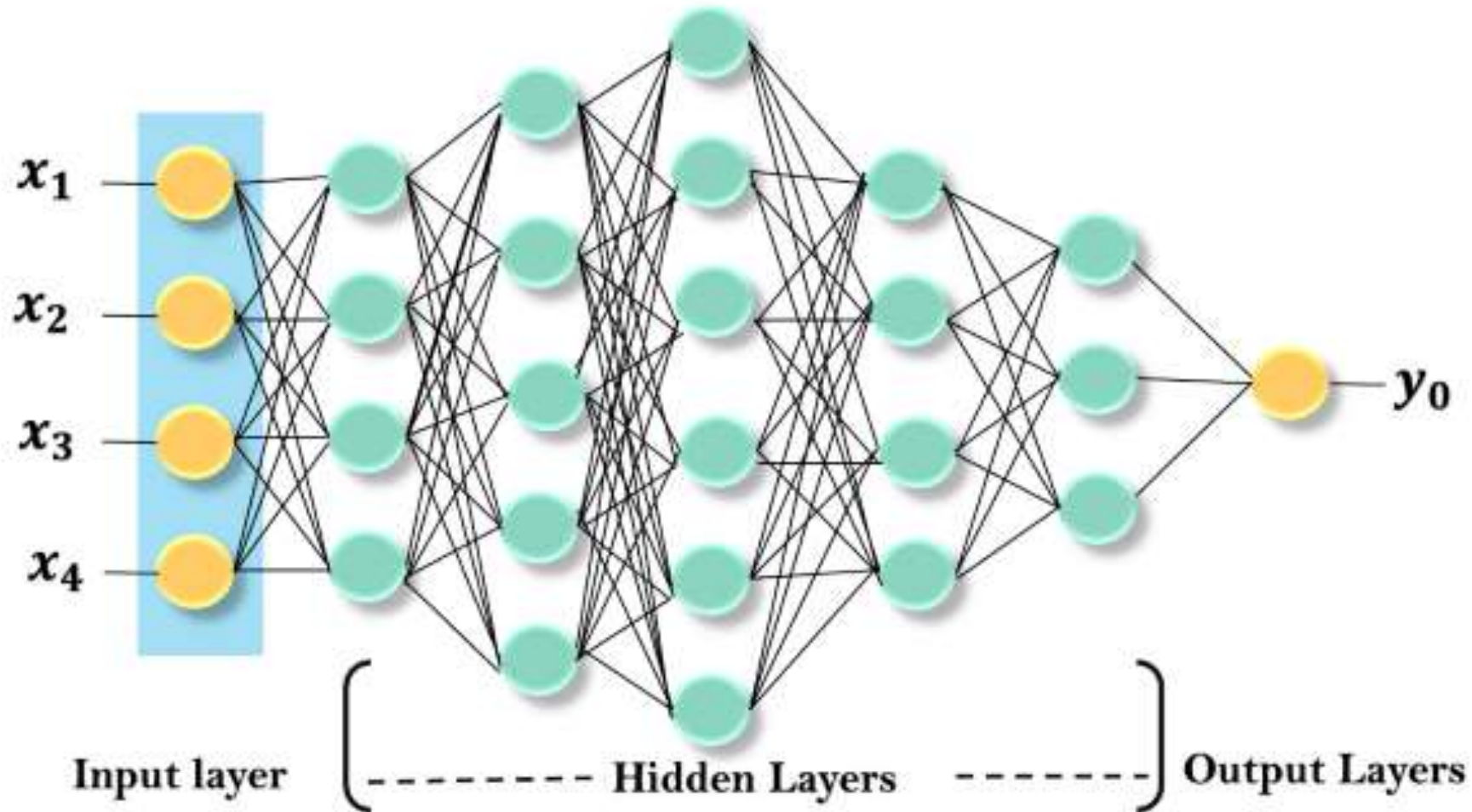
History of Artificial Intelligence



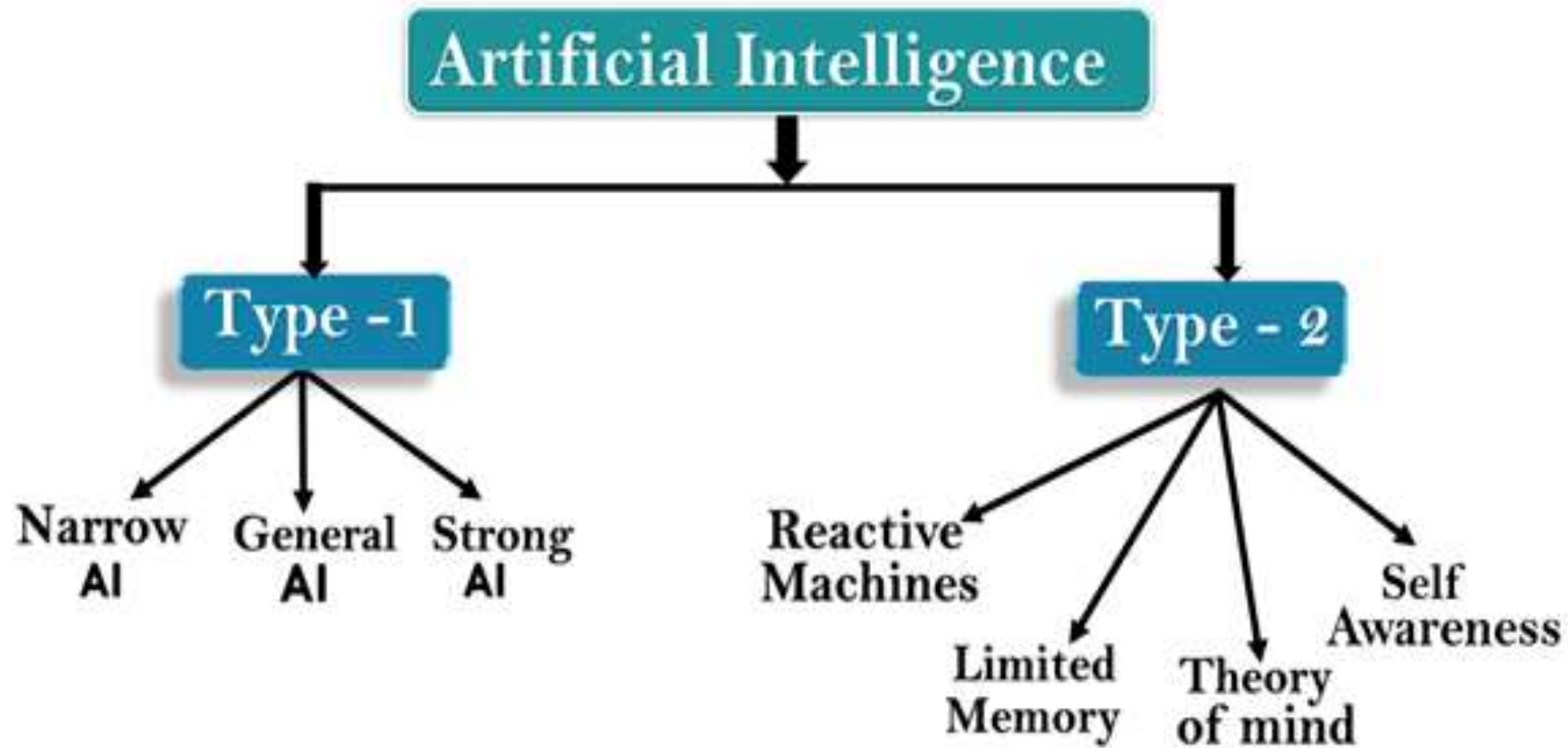
Subsets of AI



Deep Learning:

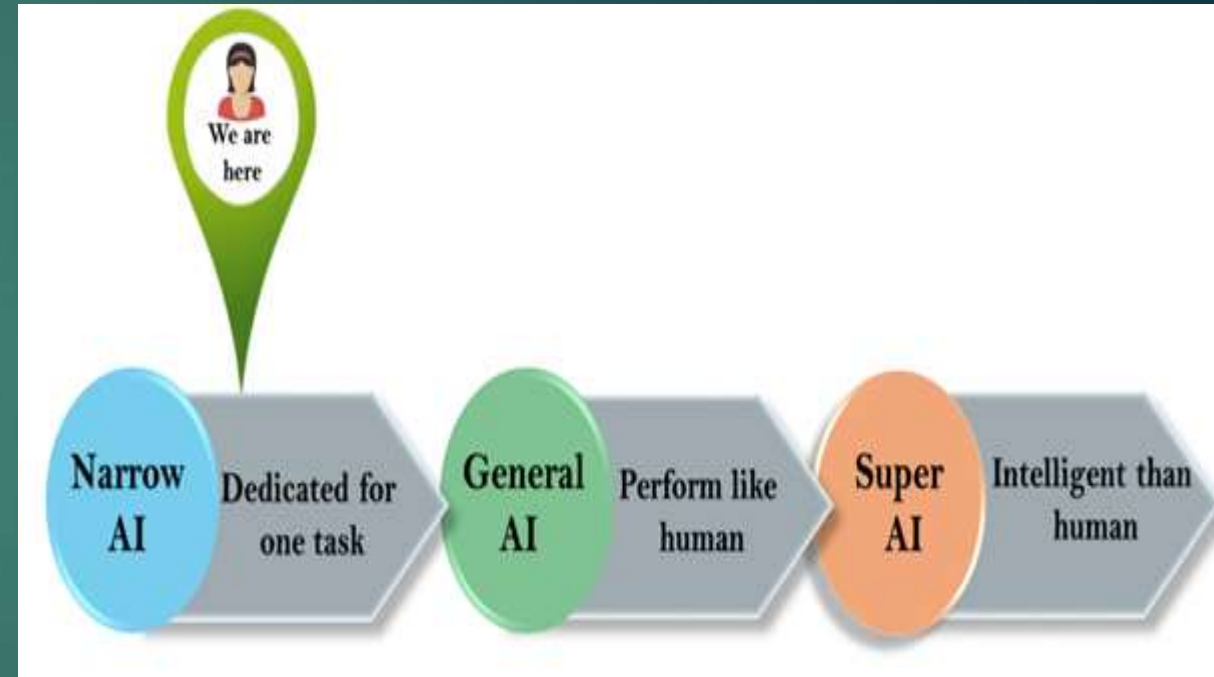


Types of Artificial Intelligence



AI type-1: Based on Capabilities

- ❑ Weak AI or Narrow AI
 - Narrow AI is a type of AI which is able to perform a dedicated task with intelligence.
- ❑ General AI
 - General AI is a type of intelligence which could perform any intellectual task with efficiency like a human.
- ❑ Super AI
 - Super AI is a level of Intelligence of Systems at which machines could surpass human intelligence, and can perform any task better than human with cognitive properties. It is an outcome of general AI.



AI type-2: Based on functionality

❑ Reactive Machines

- AI systems do not store memories or past experiences for future actions.

Example: IBM's Deep Blue and Google's Alpha Go systems

❑ Limited Memory

- These machines can use stored data for a limited time period only..

Example: Self-driving cars

❑ Theory of Mind

- Theory of Mind AI should understand the human emotions, people, beliefs, and be able to interact socially like humans.

Example: Not yet developed.

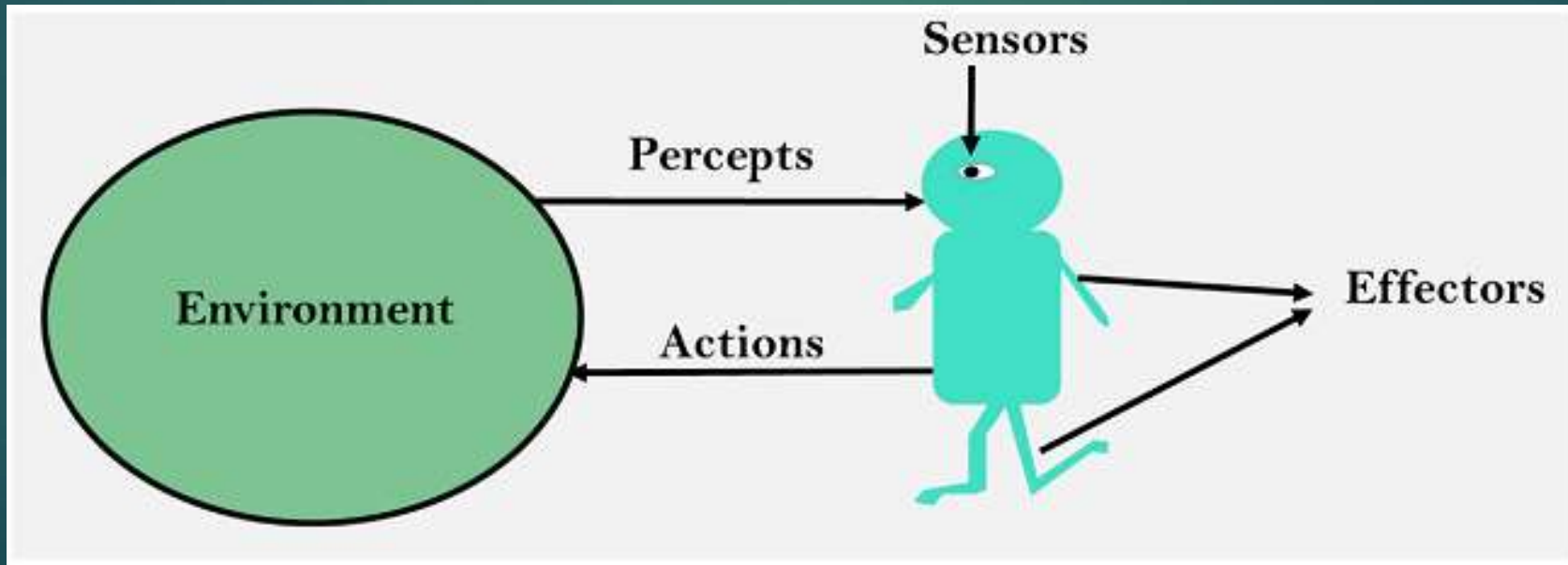
❑ Self-Awareness

- These machines will be super intelligent, and will have their own consciousness, sentiments, and self-awareness.

- Example: Doesn't exist

Agents in Artificial Intelligence:

- ❑ What is an Agent?
 - An agent can be anything that perceive its environment through sensors and act upon that environment through actuators.
 - Example: **Human-Agent, Robotic Agent, Software Agent**



Intelligent Agents

- ❑ An intelligent agent is an autonomous entity which act upon an environment using sensors and actuators for achieving goals.
- ❑ main rules of an AI agent:
 - **Rule 1:** An AI agent must have the ability to perceive the environment.
 - **Rule 2:** The observation must be used to make decisions.
 - **Rule 3:** Decision should result in an action.
 - **Rule 4:** The action taken by an AI agent must be a rational action.