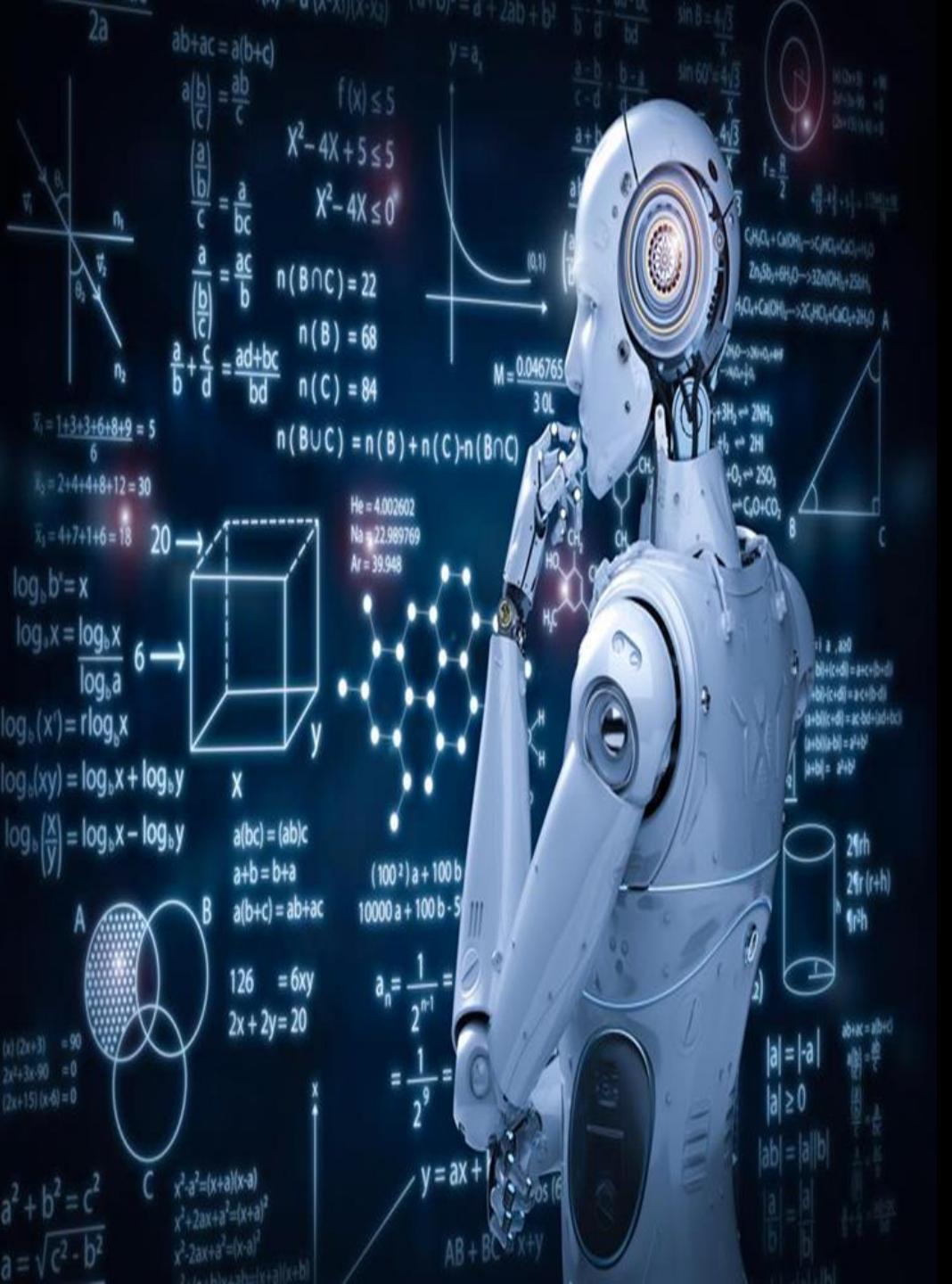
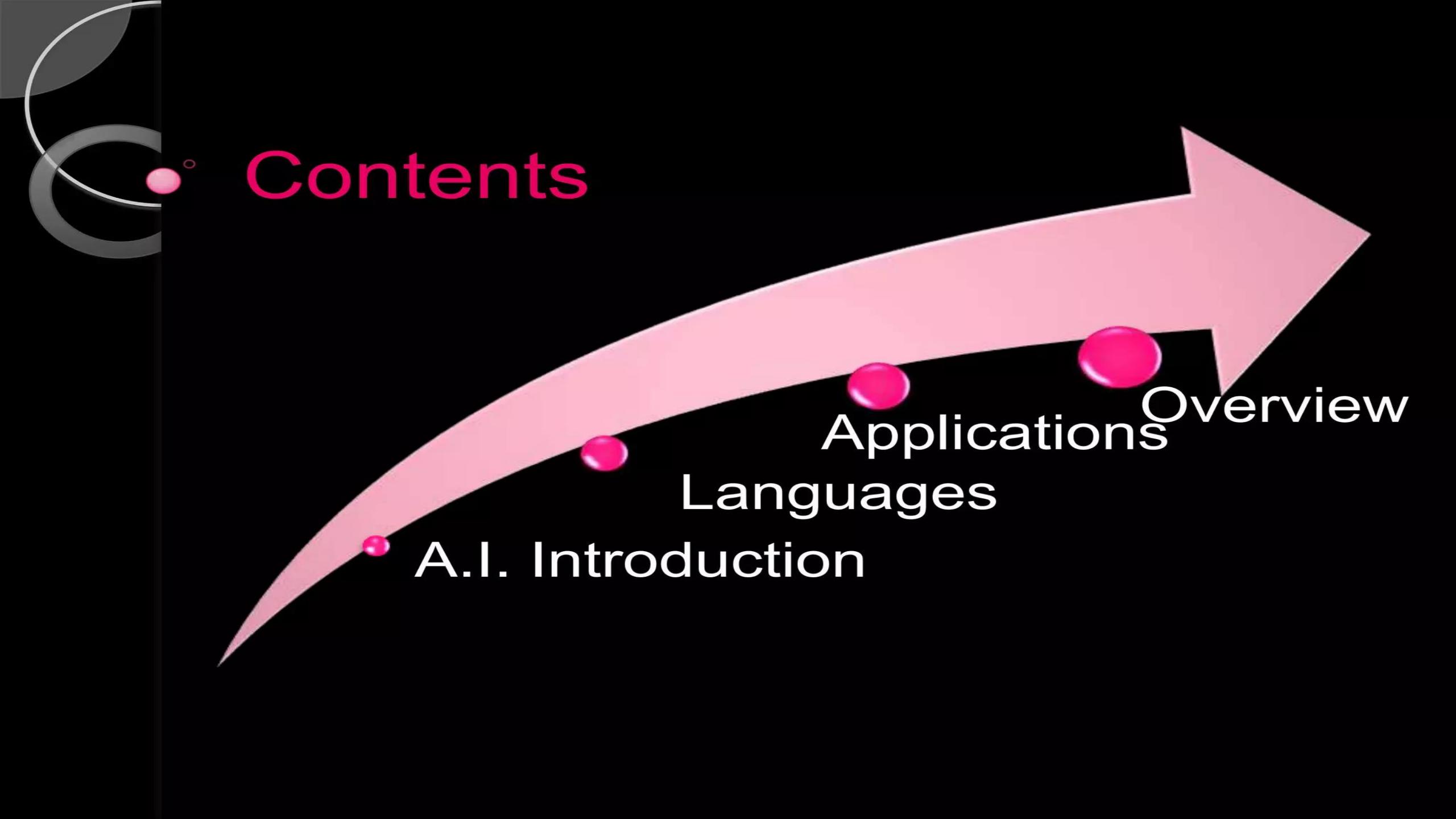


Artificial Intelligence and Machine Learning

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CDAC Mumbai





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A.I. Introduction

Languages

Applications

Overview

Introduction

- **Definition of AI:**

- Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think and learn.
- AI can perform tasks that typically require human intelligence, such as
 - visual perception,
 - speech recognition,
 - decision-making, and
 - language translation.
- AI is an science and engineering of making intelligent machines, by writing computer programs





Are there limits to how intelligent machines can be?

- Intelligence:
“the capacity to learn and solve problems”
- Artificial Intelligence:
 - Artificial intelligence (AI) is the intelligence of machines and robots and the branch of computer science that aims to create it
 - the ability to solve problems
 - the ability to act rationally
 - the ability to act like humans

Philosophy of A.I.

- Searle's strong AI hypothesis:
"The appropriately programmed computer with the right inputs & outputs would thereby have a mind in exactly the same sense human beings have minds."
- The artificial brain argument:
The brain can be simulated.
- Technologically feasible to copy the brain directly into hardware and software, and that such a simulation will be essentially identical to the original.

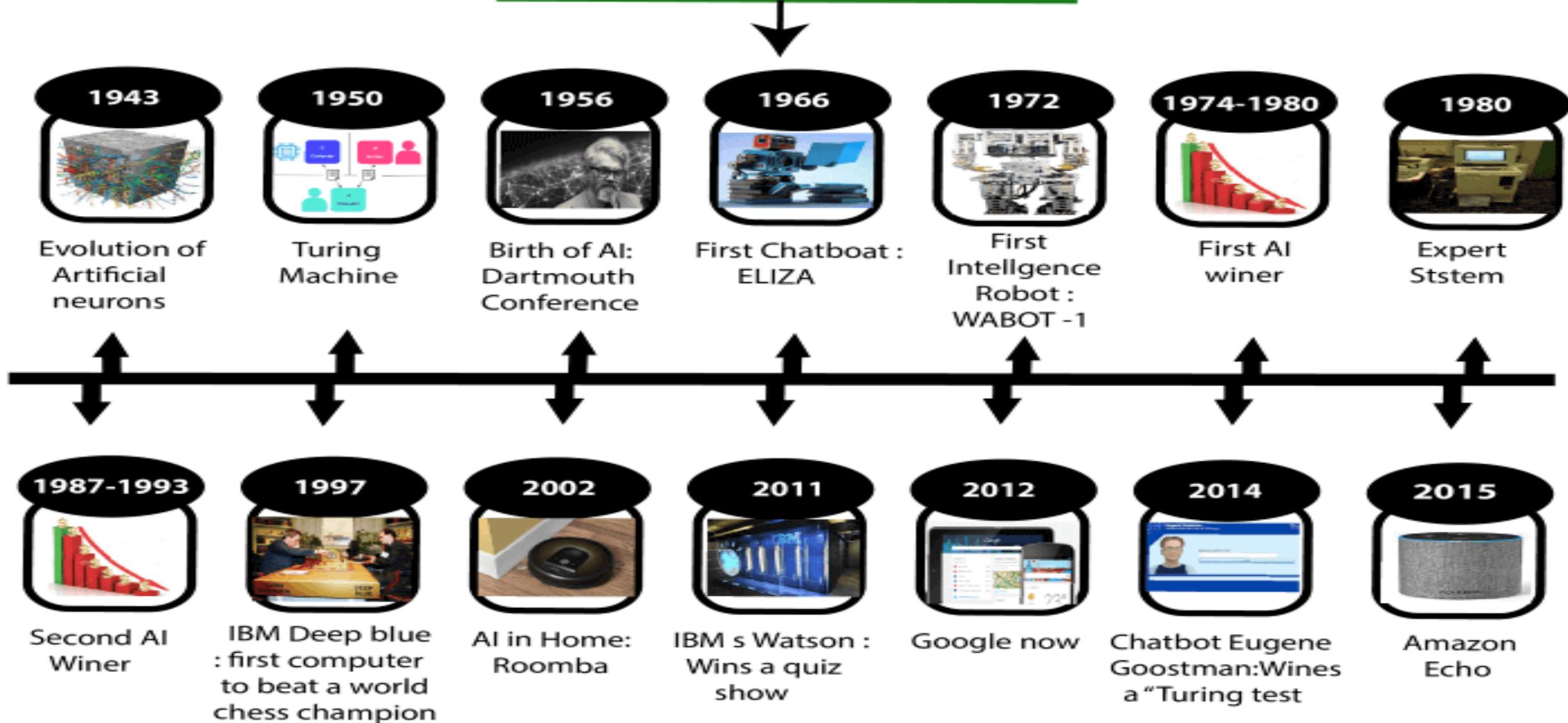




History of artificial intelligence

- Classical philosophers
- Programmable Digital Computers (1940)
- 1943-1956:
- McCulloch & Pitts: Boolean circuit model of brain
- Dartmouth meeting: "Artificial Intelligence" name adopted
- **The golden years 1956–1974**

History of AI



Types of AI

- **Narrow AI:**

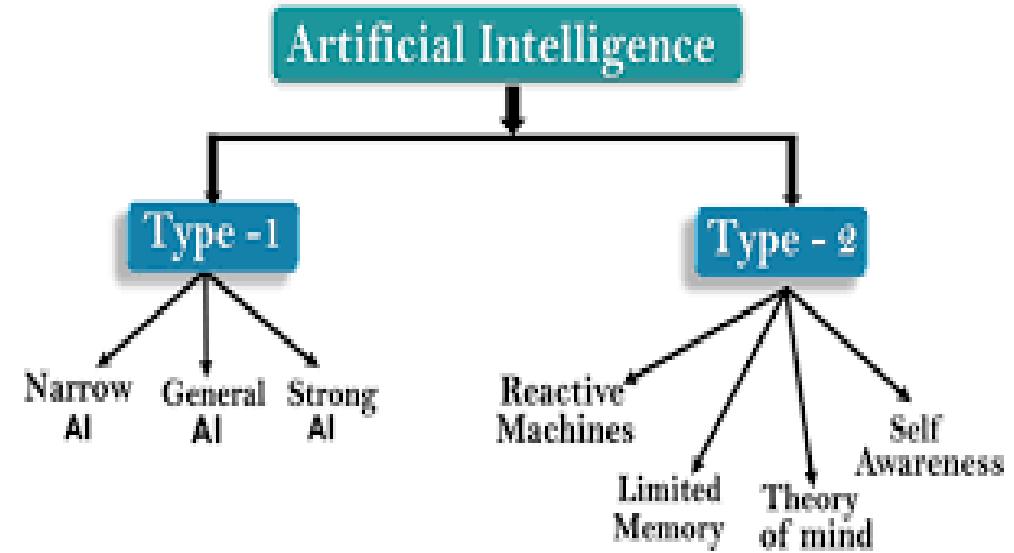
- AI systems designed for specific tasks.
- Examples: Voice assistants (Siri, Alexa), recommendation systems (Netflix, Amazon).

- **General AI:**

- AI that possesses the ability to perform any intellectual task that a human can.
- Still a theoretical concept.

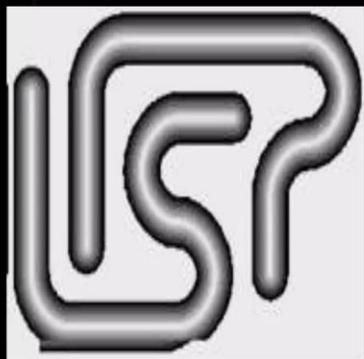
- **Super intelligent AI:**

- AI that surpasses human intelligence in all aspects.
- Raises ethical and existential concerns.

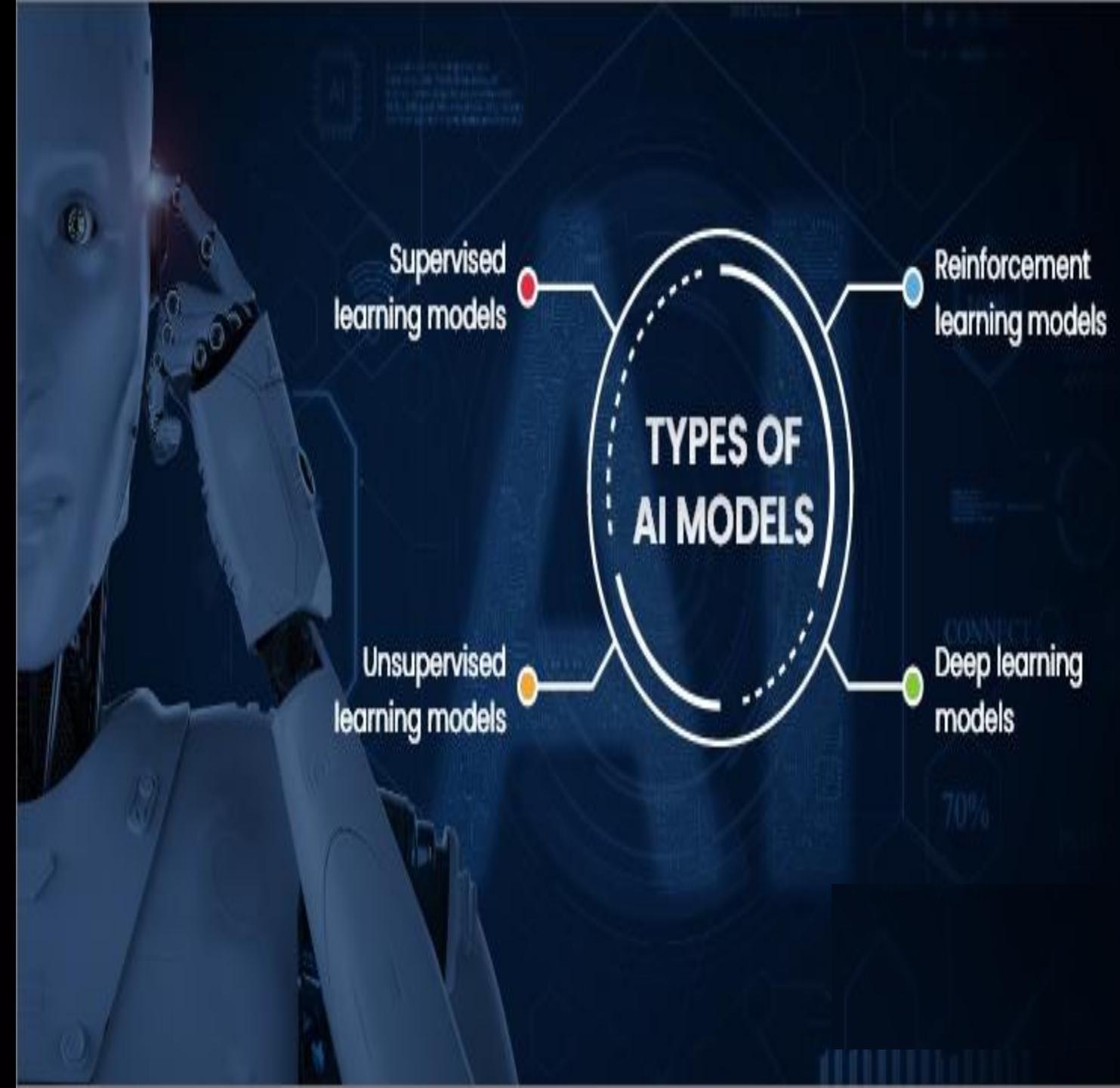


Languages

Artificial intelligence researchers have developed several specialized programming languages for artificial intelligence which include IPL, Lisp, Prolog, STRIPS, Planner, POP-11 etc.



Prolog



What is Human Intelligence?

It's a composition of abilities like:



What is Human Intelligence?

It's a composition of abilities like:

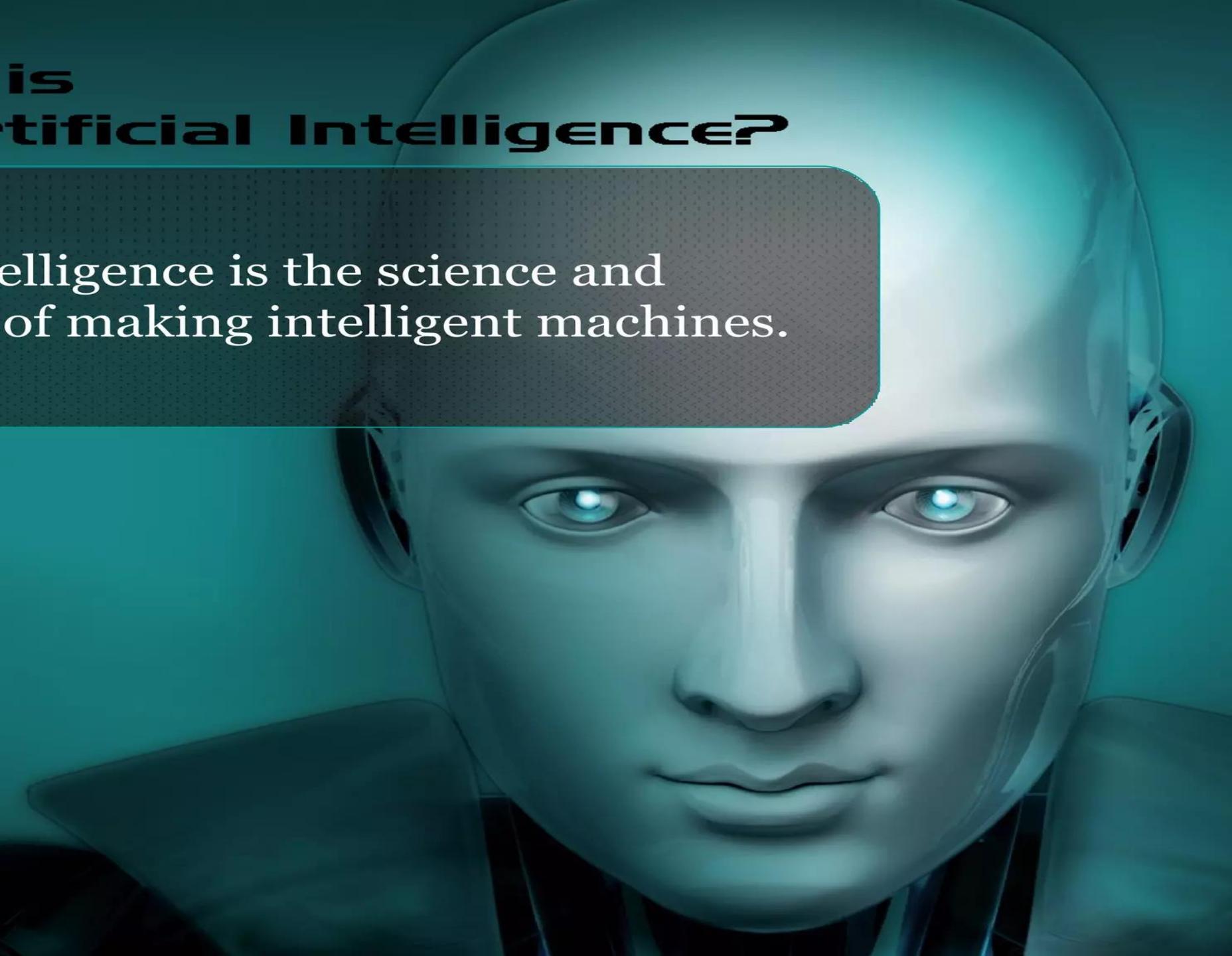


PERCEIVING



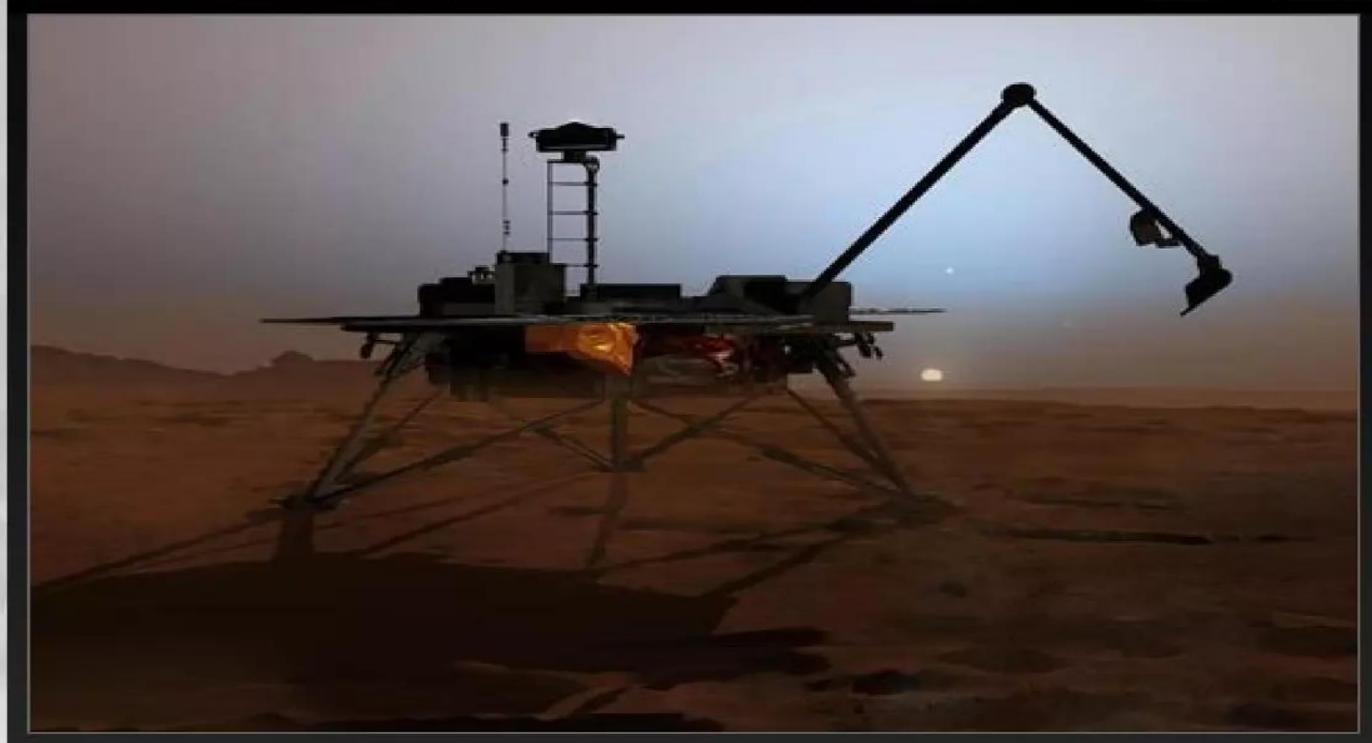
What is Artificial Intelligence?

Artificial intelligence is the science and engineering of making intelligent machines.



AI IS REAL!

Space Program

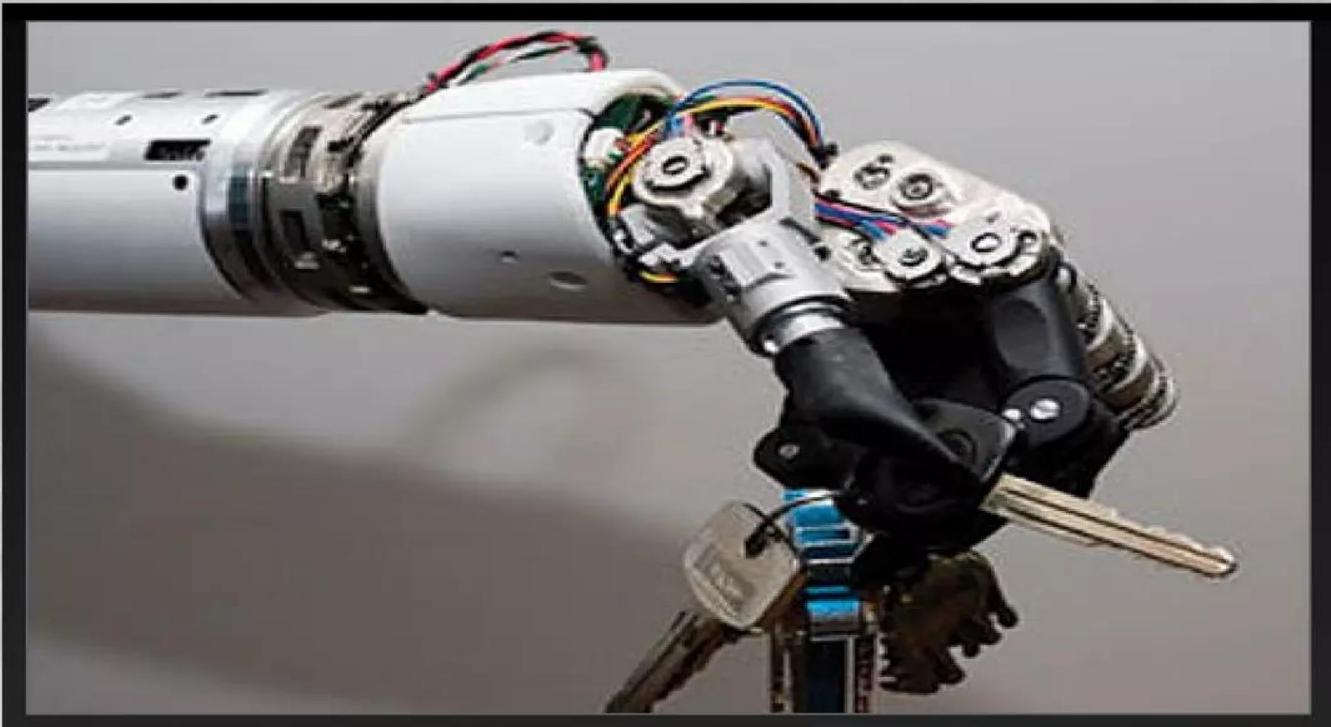


The Mars Lander:
Being able to Navigate on the Red Planet,
the robot arm has been digging in the
Martian Soil & Ice for 2.5 hours a day.



AI IS REAL!

Prosthetic Limbs



Mind-controlled prosthetic arm :
The user controls the arm through existing nerves and it is sensitive enough to pick up even a piece of paper!

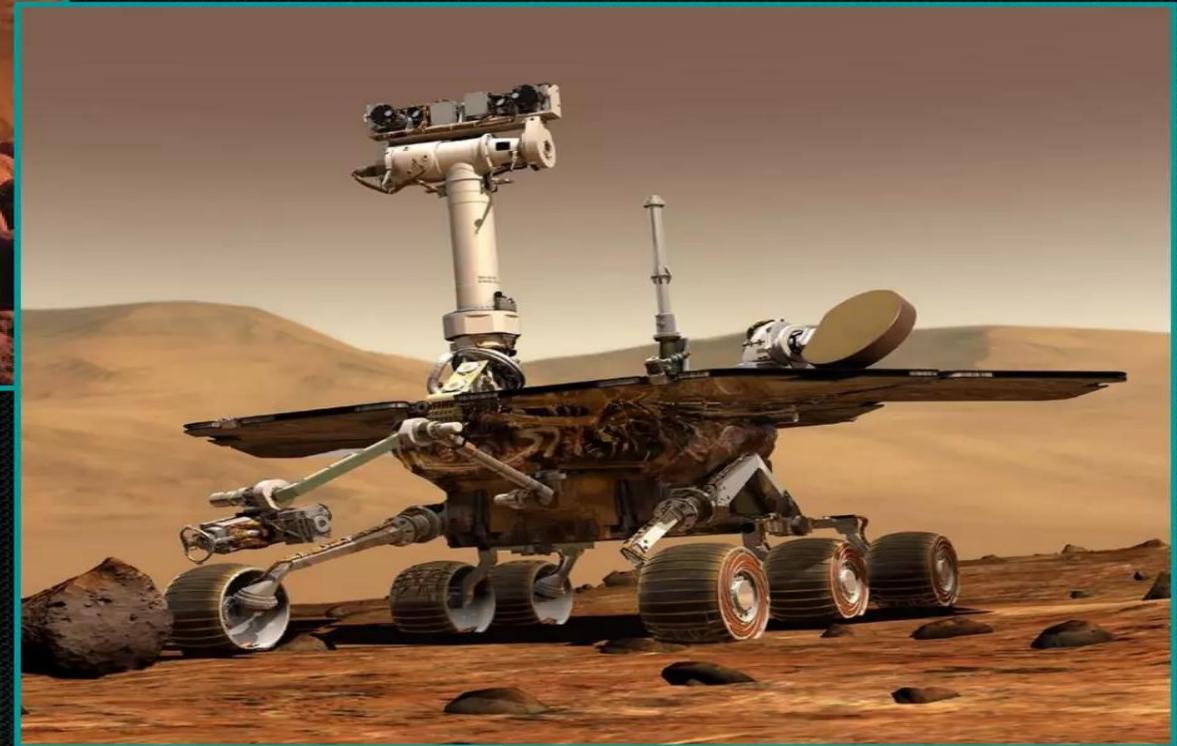


Space Exploration:

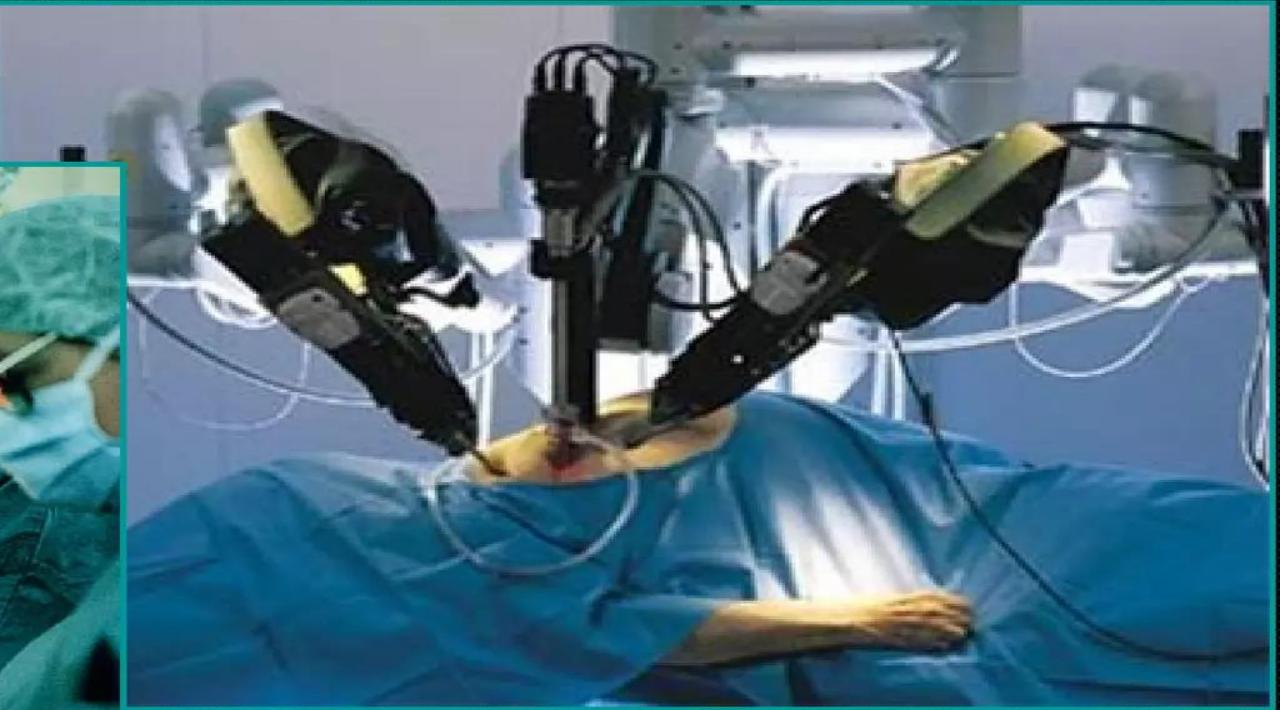


None of these issues concern a robot.

Humans need provisions for:
Water, Recycling, Food, Space
Radiation and Psychological
Issues of confinement.



Medical Research



AI Technology can perform delicate operations more precisely and efficiently.



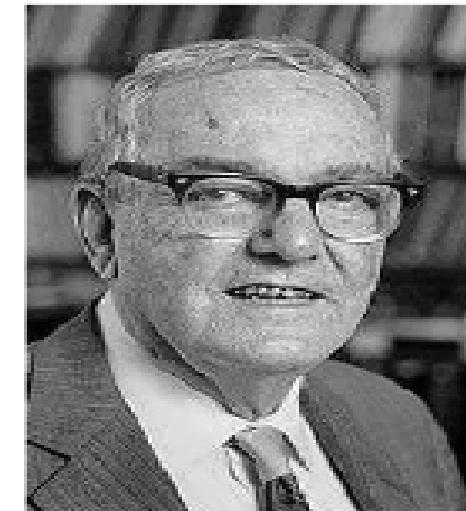
...Or
**Will they
Replace us?**

Machine Learning

- Machine learning (ML) is a branch of artificial intelligence (AI) and computer science that focuses on the using data and algorithms to enable AI to imitate the way that humans learn, gradually improving its accuracy.
- **Difference in AI & ML:**
 - While artificial intelligence encompasses the idea of a machine that can mimic human intelligence, machine learning does not.
 - Machine learning aims to teach a machine how to perform a specific task and provide accurate results by identifying patterns.

Machine Learning

- **Herbert Alexander Simon:**
“Learning is any process by which a system improves performance from experience.”
- “Machine Learning is concerned with computer programs that automatically improve their performance through experience. ”



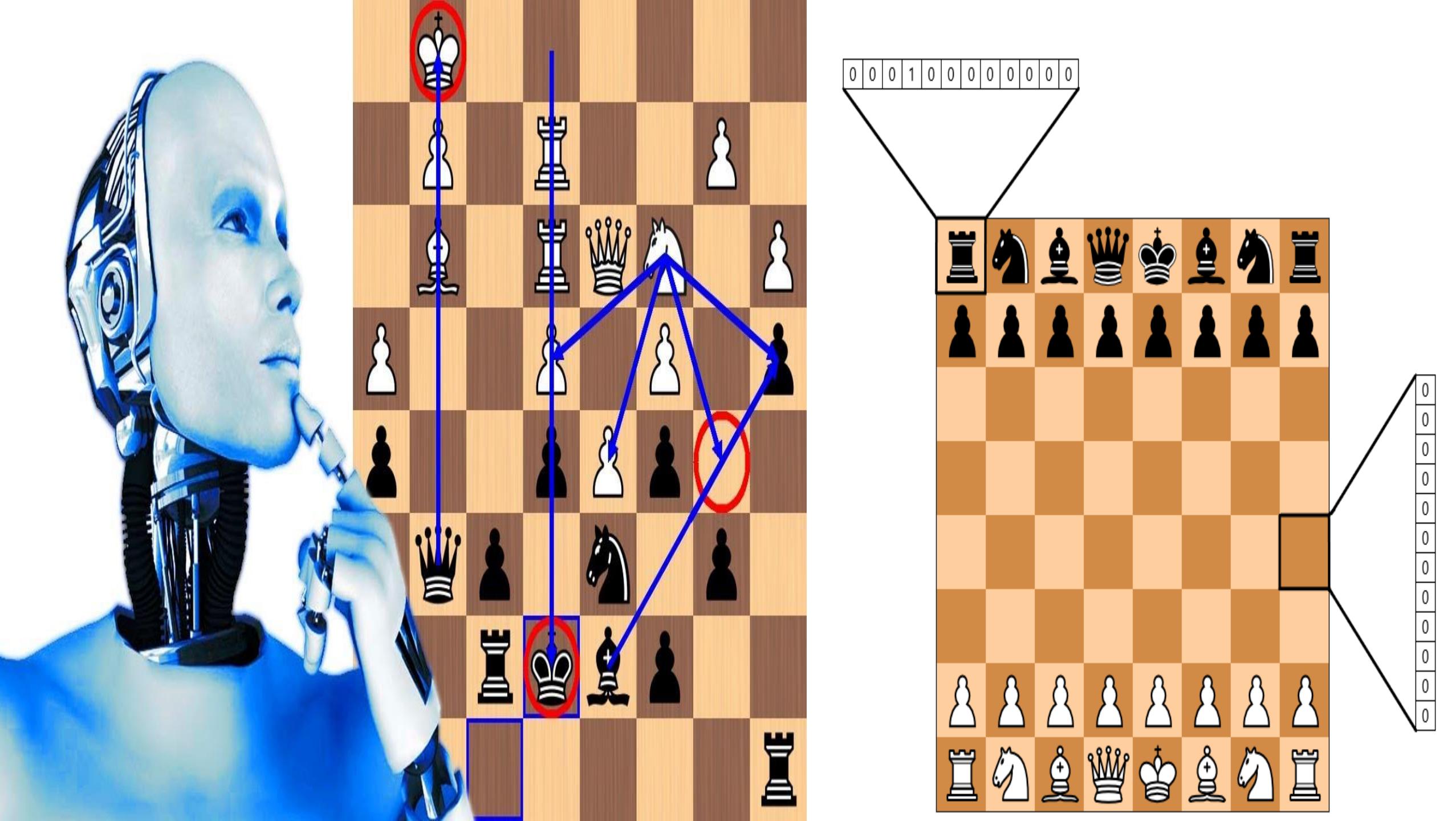
Herbert Simon
Turing Award 1975
Nobel Prize in Economics 1978

The concept of learning in a ML system

- Learning = Improving with experience at some task
 - Improve over task T ,
 - With respect to performance measure, P
 - Based on experience, E .

Definition

A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P , if its performance at tasks T , as measured by P , improves with experience E .



Definition

A computer program which learns from experience is called a *machine learning program* or simply a *learning program*. Such a program is sometimes also referred to as a *learner*.

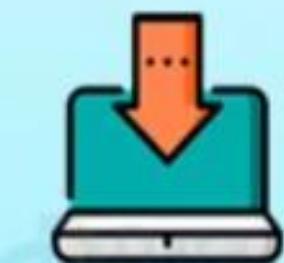
What is Machine Learning?

- If you are a Scientist



How does Machine Learning Work?

Input Data → Analyze Data → Find Patterns → Prediction → Stores the Feedback

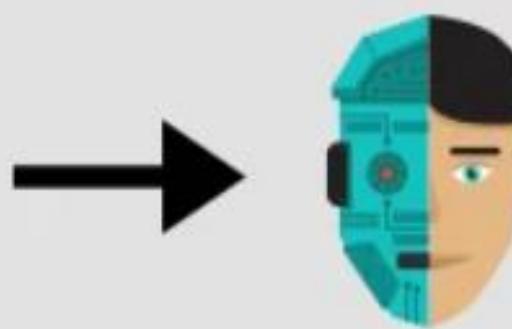


0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
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9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

Machine Learning



Ordinary
System



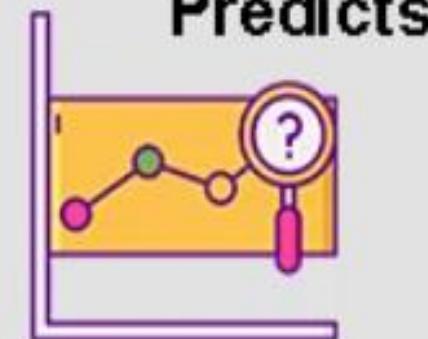
With AI



Machine
Learning



Learns



Predicts



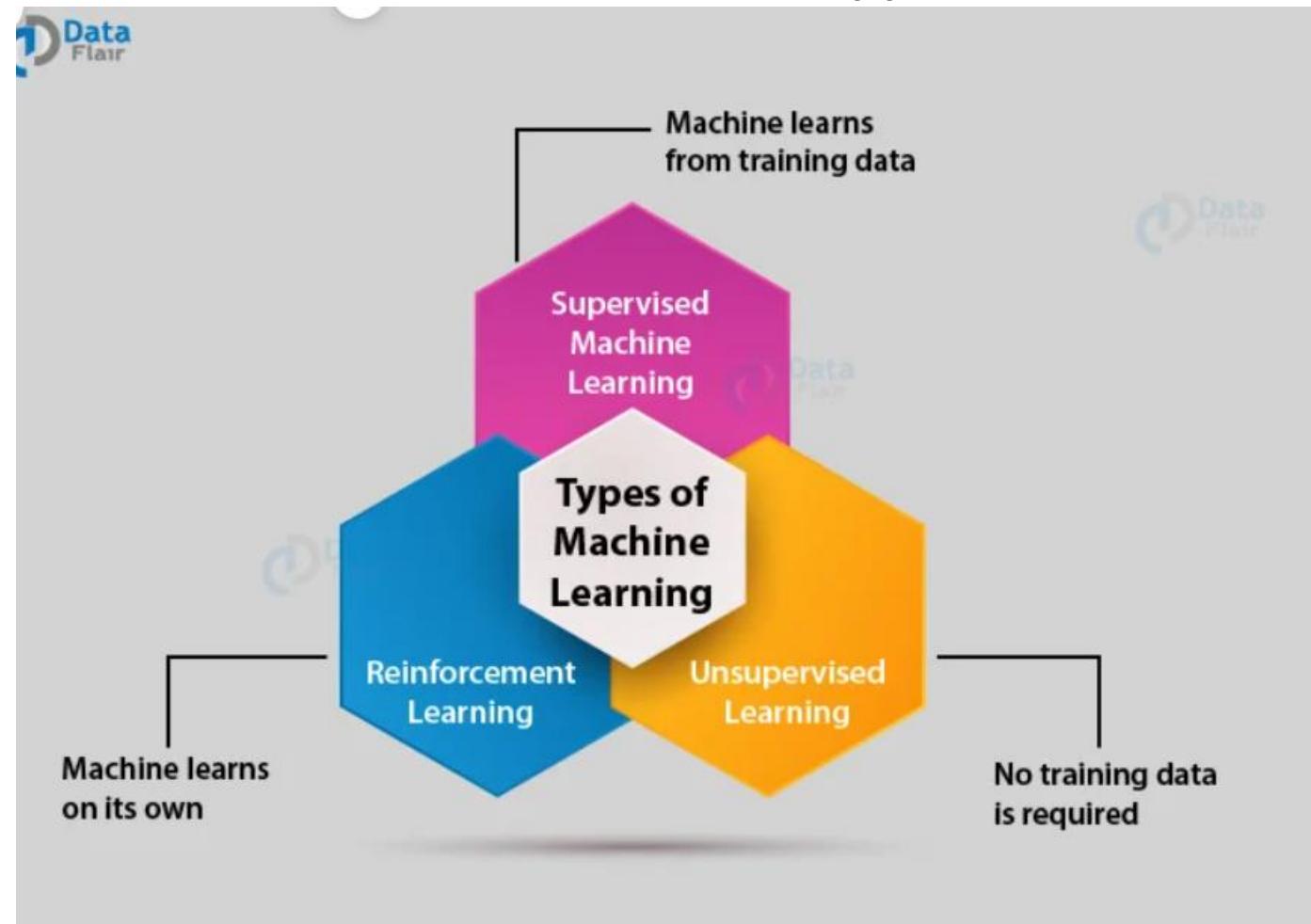
Improves



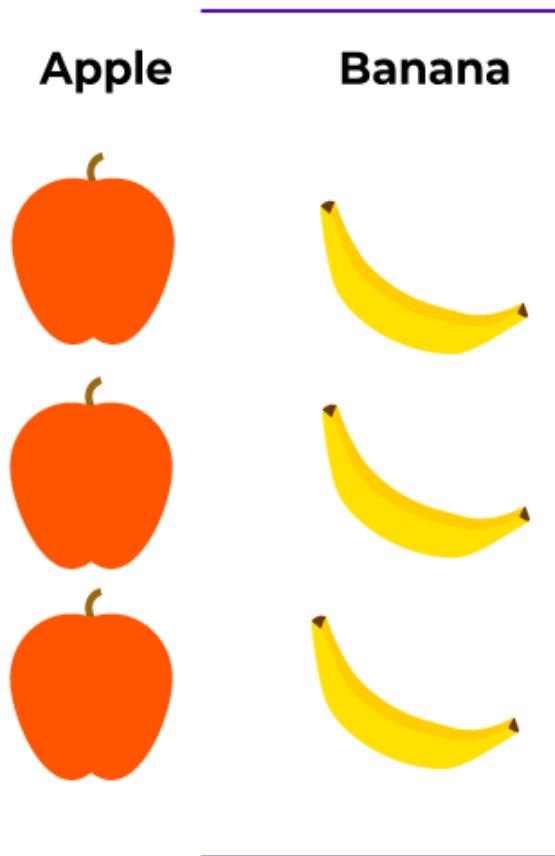
Types of Machine Learning

- Machine Learning Algorithms can be classified into 3 types as follows –

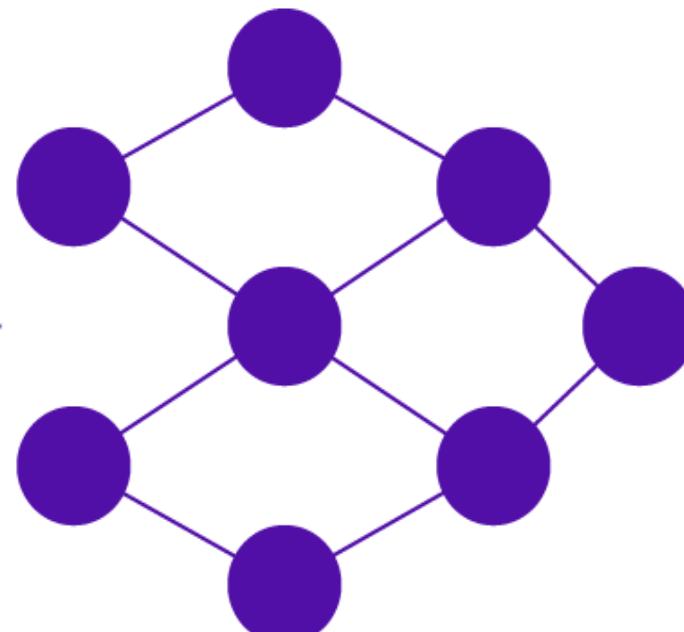
- **Supervised Learning**
- **Unsupervised Learning**
- **Reinforcement Learning**



Training Data



ML Algorithm



Model



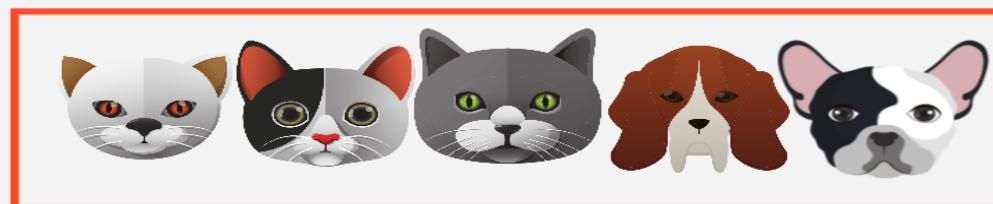
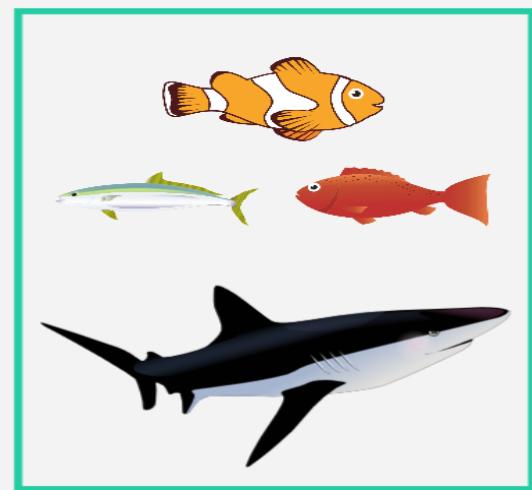
Prediction

Class: Banana



**Unseen and
unlabeled data**

No labels



Artificial Intelligence

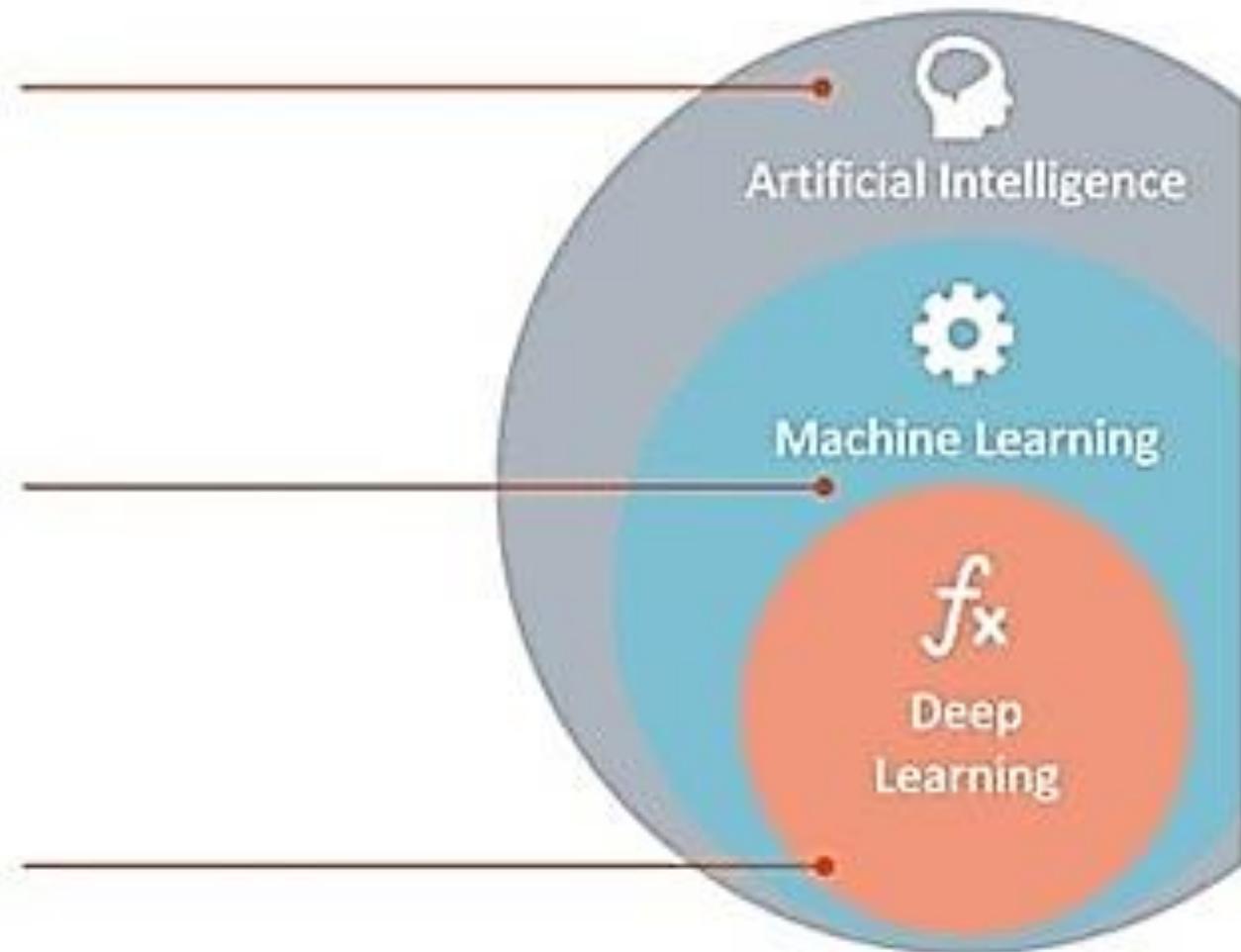
Any technique which enables computers to mimic human behavior.

Machine Learning

Subset of AI techniques which use statistical methods to enable machines to improve with experiences.

Deep Learning

Subset of ML which make the computation of multi-layer neural networks feasible.



Future Applications

Machine Learning
in Education

01

Machine Learning
in Digital Marketing

03

Machine Learning
in Search Engine

04

Machine Learning
in Health Care



Transit
1:30min

120m



Restaurant
★★★★★

25m



Grocery Store
★★★★★

30m



Hotel



40m



Transit
1:30min

120m



Hotel



40m



Restaurant



25m

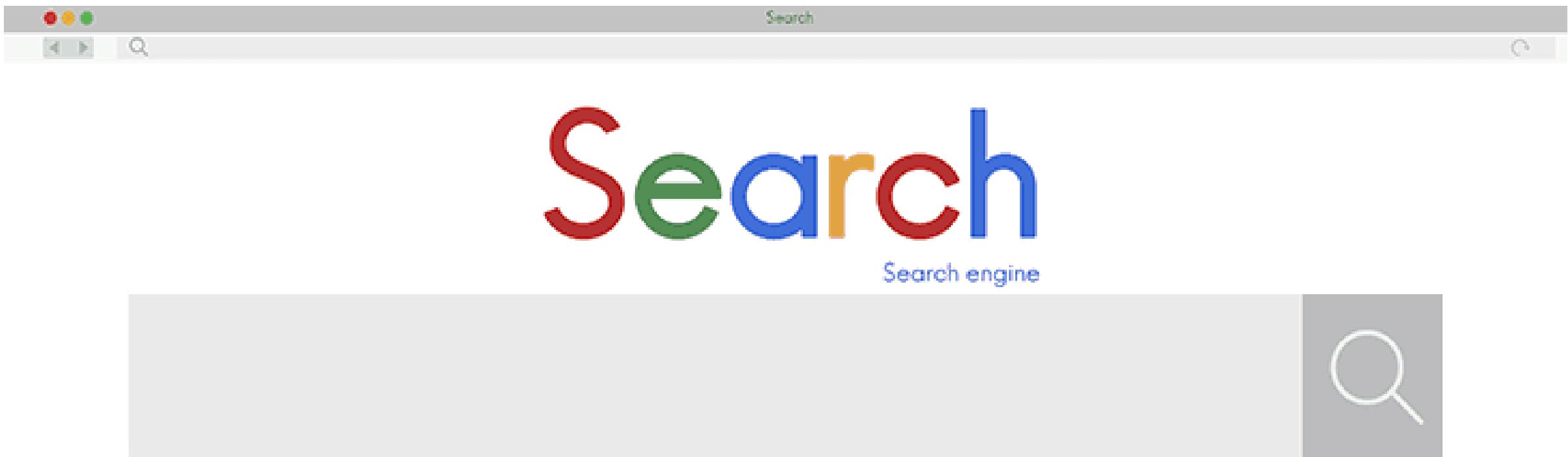


Grocery Store



30m





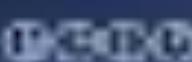
DIGITAL MARKETING

product

content

social media

internet



advertising

target

market
analysis

branding



Important Python Libraries

05

scikit-learn

06

Seaborn

07

Scrapy

SciPy

NumPy

Matplotlib

01

02

03

04

06

07

Pandas