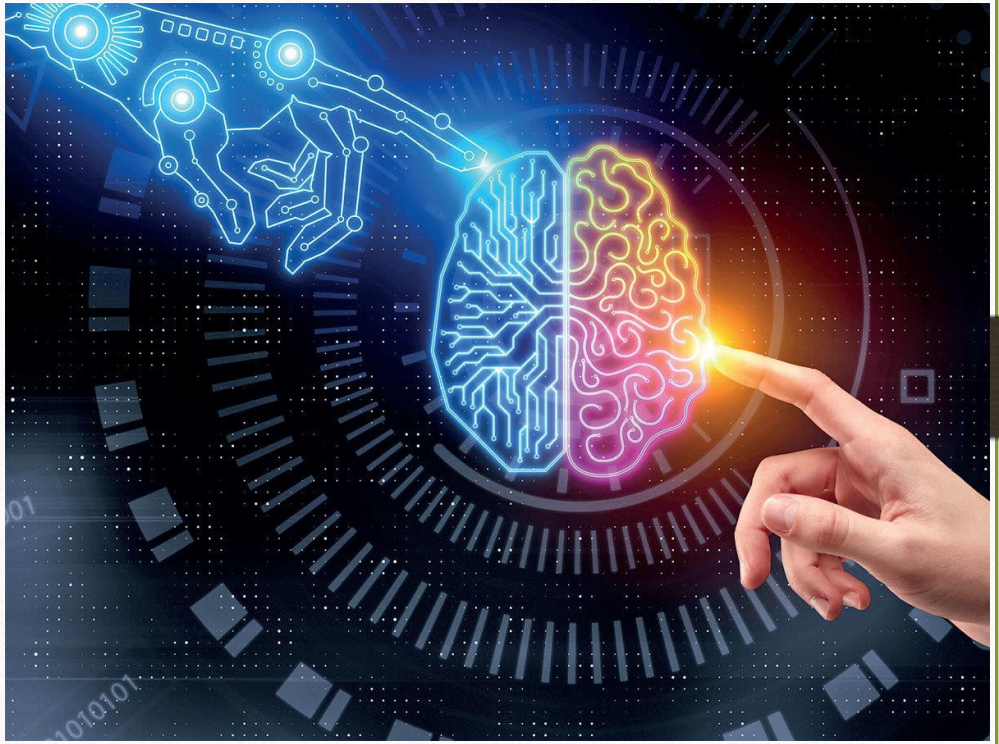
INTRODUCTION TO

Artificial Intelligence

WHAT IS AI ?

Artificial Intelligence is just as the word implies, the intelligence is artificial, programmed by humans to perform human activities.

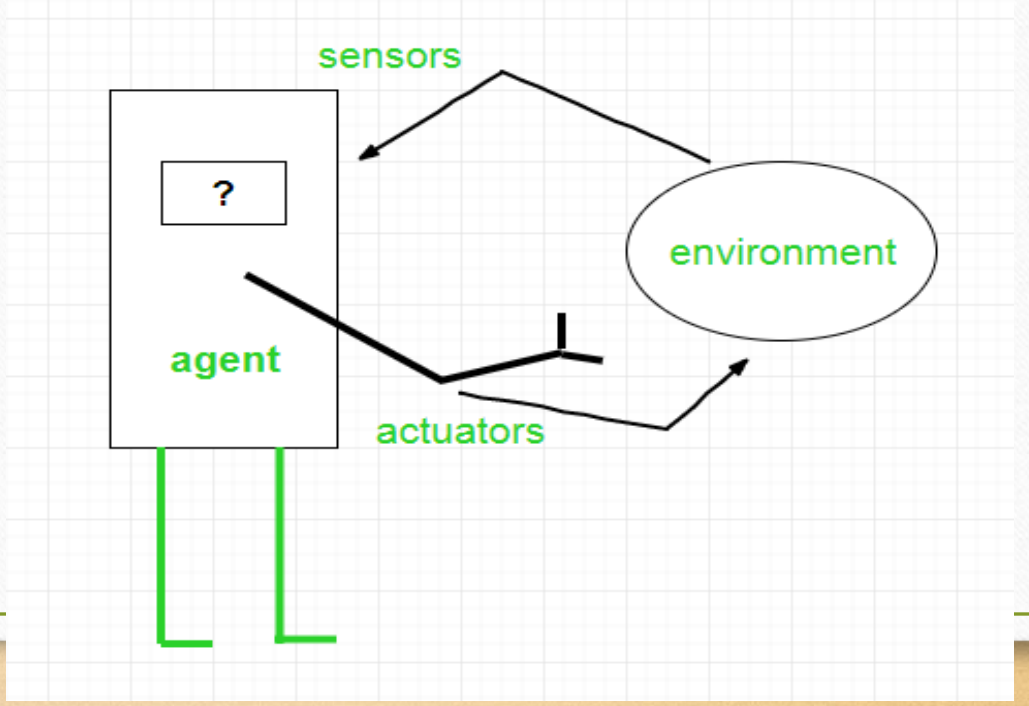
"It is a branch of computer science by which we can create intelligent machines which can behave like a human, think like humans, and able to make decisions."



Artificial intelligence is defined as a study of rational agents. A rational agent could be anything which makes decisions, as a person, firm, machine, or software. It carries out an action with the best outcome after considering past and current percepts(agent's perceptual inputs at a given instance).

An AI system is composed of an **agent and its environment**. The agents act in their environment. The environment may contain other agents. An agent is anything that can be viewed as:

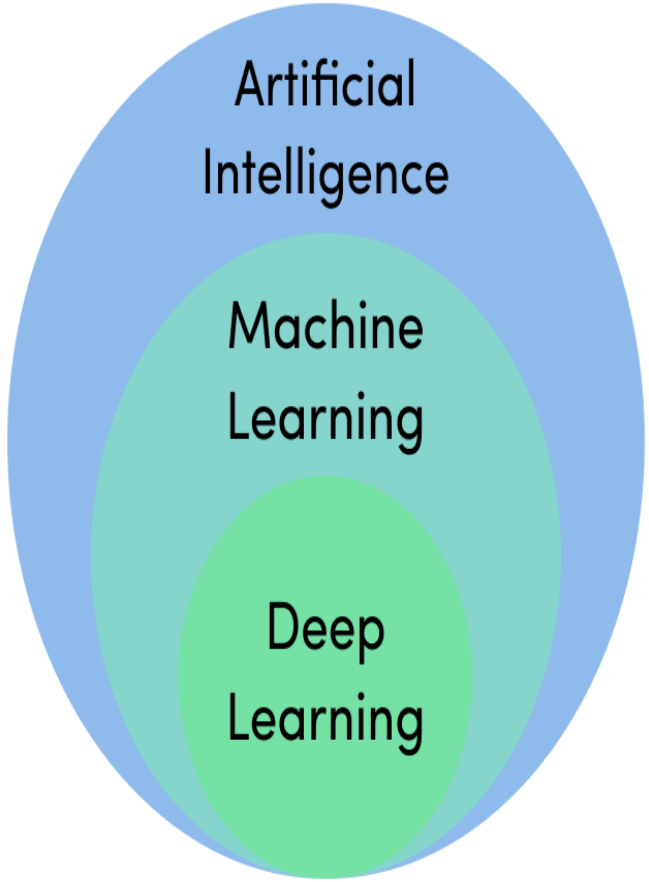
- perceiving its environment through **sensors** and
- acting upon that environment through **actuators**

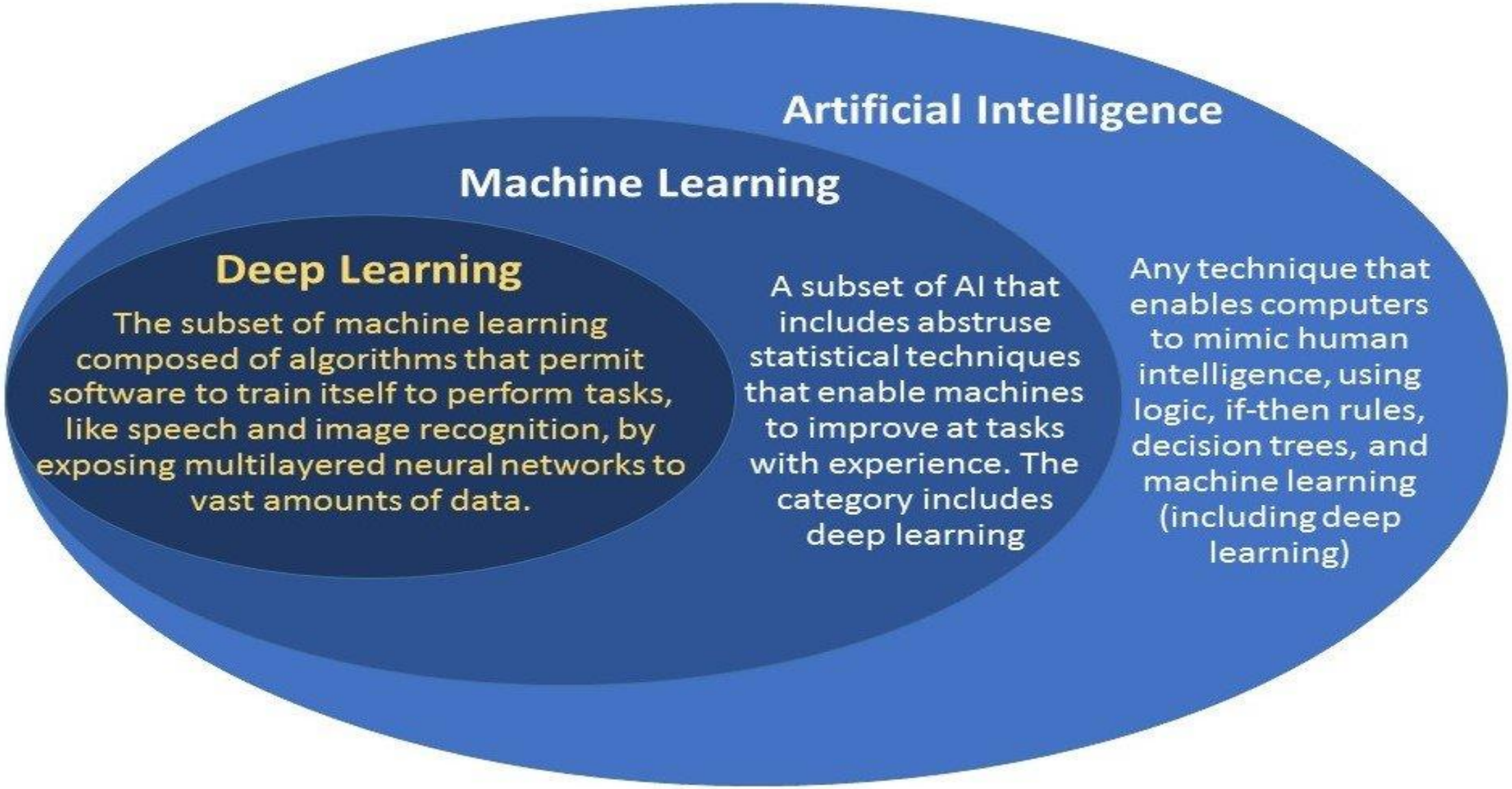


Artificial intelligence stands for **computer systems that behave intelligently** .Intelligence means here: They solve tasks that normally require intelligence, such as image recognition, decision-making or translations.

Machine learning is a subset of AI. The theory is simple, machines take data and 'learn' for themselves using different techniques.

Deep learning is a subset of machine learning. Deep artificial neural networks are a set of algorithms reaching new levels of accuracy for many important problems




Artificial Intelligence
Any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision trees, and machine learning (including deep learning)
Machine Learning
A subset of AI that includes abstruse statistical techniques that enable machines to improve at tasks with experience. The category includes deep learning
Deep Learning
The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data.

AI	ML
AI aims to make a smart computer system like humans, to solve complex problems.	ML allows machines to learn from data so that they can give accurate output.
Based on capability, AI can be divided into three types. Weak AI, General AI, and Strong AI.	ML is also divided into 3 types- Supervised learning, Unsupervised learning, and Reinforcement learning.
AI systems are concerned with maximizing the chances of success.	Machine learning is mainly concerned with accuracy and patterns.
AI enables a machine to simulate human behavior.	Machine learning is a subset of AI.
Mainly deals with structured, semi-structured, and unstructured data.	ML deals with structured and semi-structured data.

AI TYPES

Narrow AI or weak ai : is a type of AI which is able to perform a dedicated task(one task) with intelligence . The most common and currently available AI is Narrow AI in the world of Artificial Intelligence.

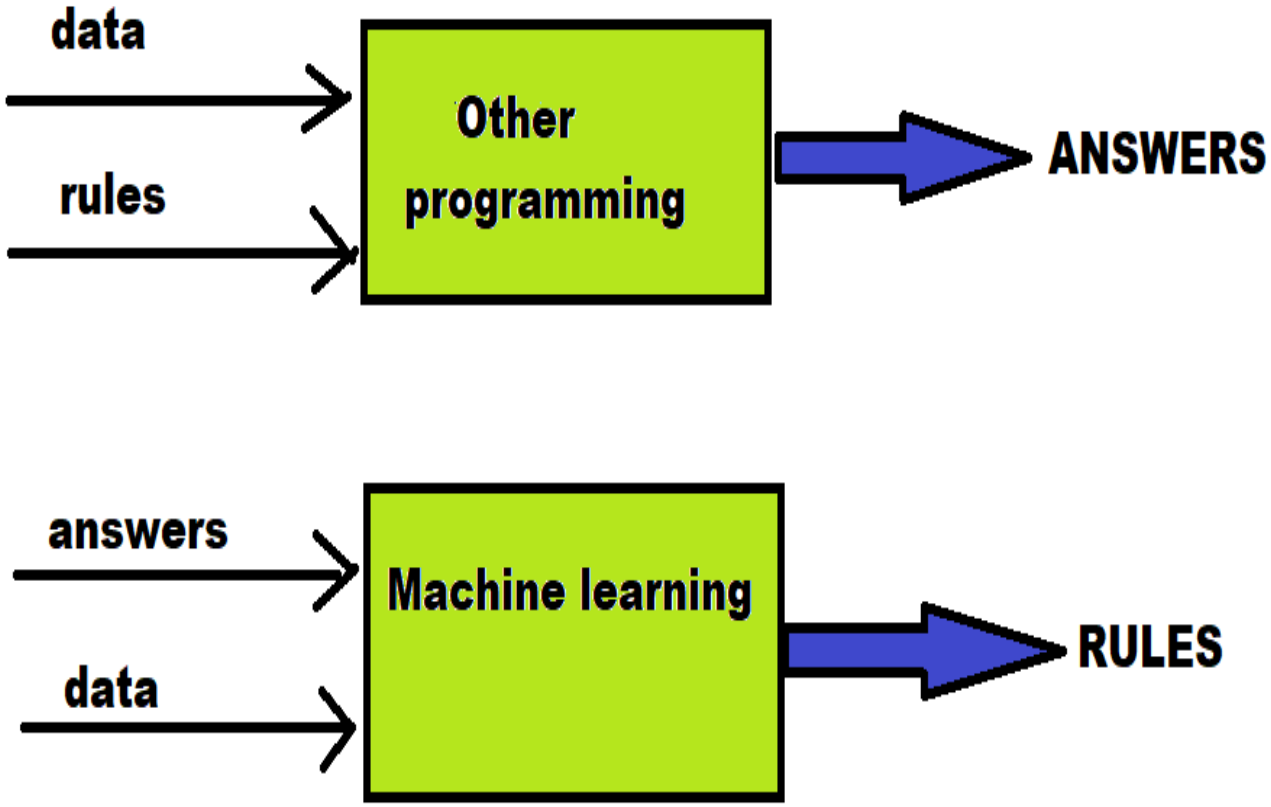
General AI or strong AI : is a type of intelligence which could perform any intellectual task with efficiency like a human. The worldwide researchers are now focused on developing machines with General AI.

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.

WHAT IS MACHINE LEARNING ?

- **Machine learning** is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.
- Simply, **Machine learning** is a technique for turning information into knowledge
- Machine Learning is generally categorized into three types: Supervised Learning, Unsupervised Learning, Reinforcement learning

- Other programming methods will give the output that is answers
- While the machine learning gives the rules which is a model.



WHAT IS SUPERVISED LEARNING ?

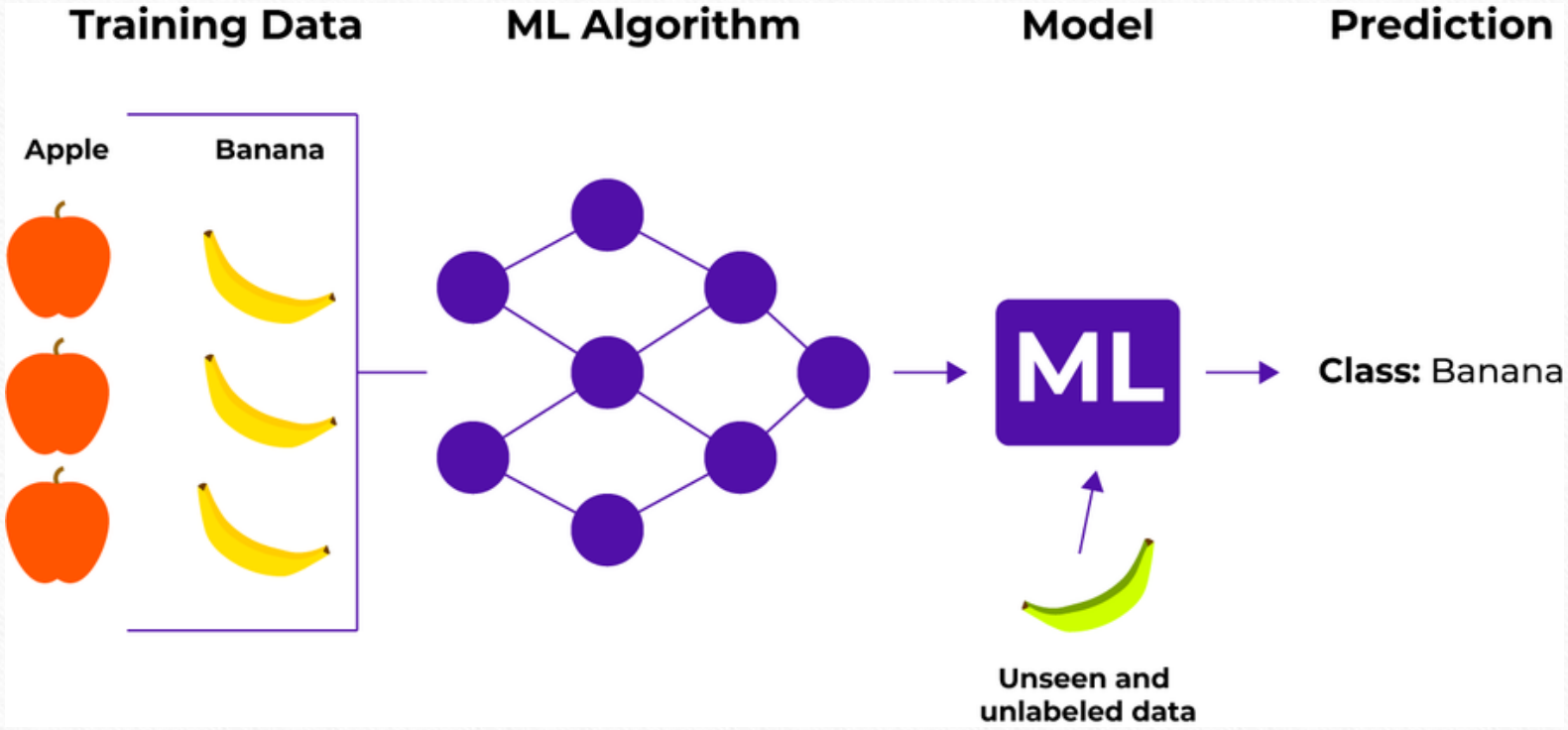
Supervised learning is a type of machine learning where you have input variables (x) and an output variable (Y) and you use an algorithm to learn the mapping function from the input to the output.

$$Y = f(X)$$

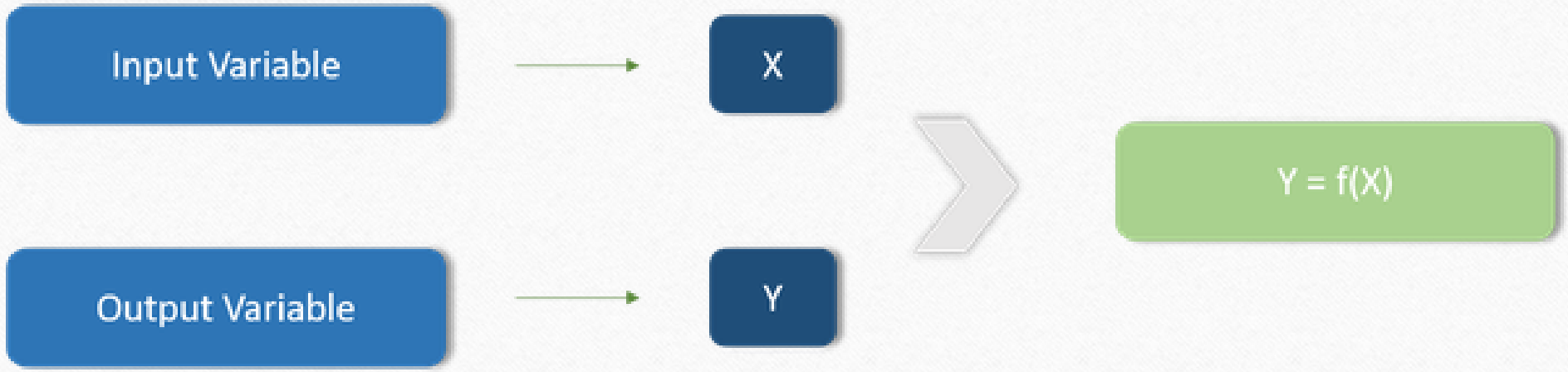
The algorithm learns from "labeled" training data helps you to predict outcomes for unseen data.

EXAMPLE OF SUPERVISED LEARNING

- If shape of object is rounded and depression at top having color Red then it will be labelled as –**Apple**.
- If shape of object is long curving cylinder having color Green-Yellow then it will be labelled as –**Banana**.
- Now suppose after training the data, you have given a new separate fruit based on the above inferences the new fruit should be identified



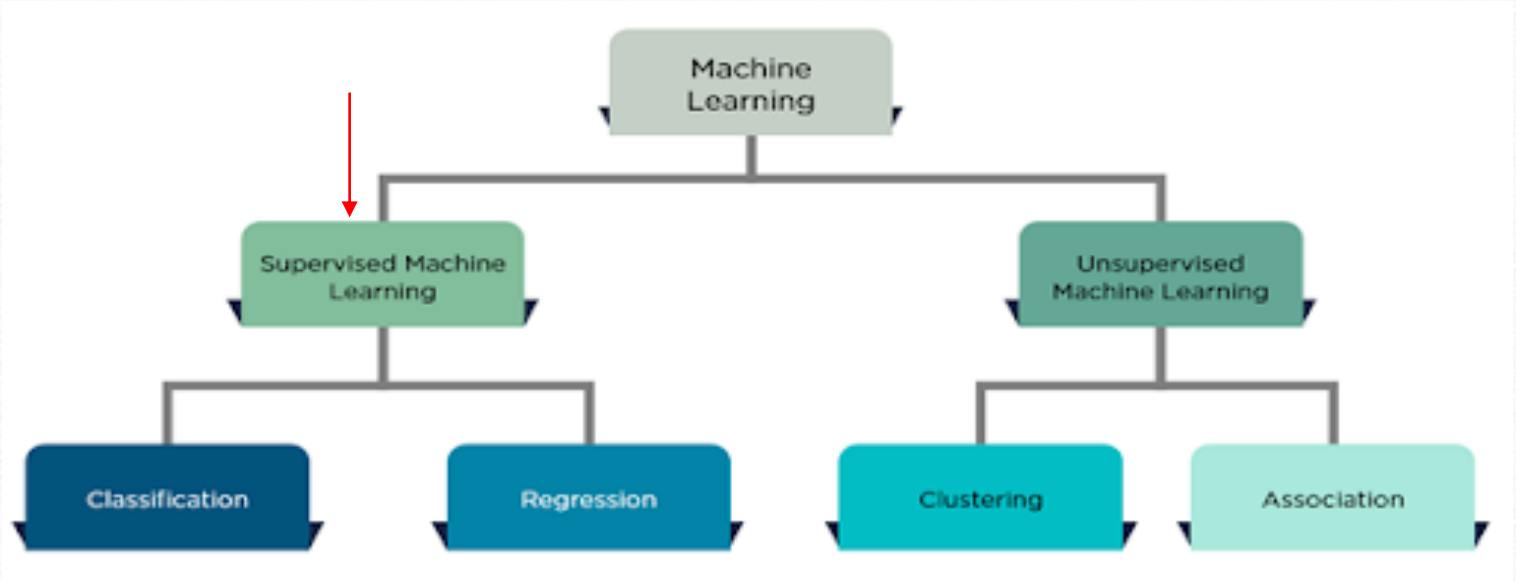
GOAL OF USING SUPERVISED LEARNING



The goal is to approximate the mapping function well , so that you can predict the output variables (Y) for that given input variable (x)

TYPES IN SUPERVISED LEARNING

Supervised learning can be split into two subcategories :
Classification and regression.



CLASSIFICATION :

Classification predictive modeling is the task of approximating a mapping function (f) from input variables (X) to discrete output variables (y)(classes).

Here the output variable is usually a category, such as “Red” or “blue” or “disease” and “no disease” or “spam” or “not spam”.

REGRESSION:

Regression predictive modeling is the task of approximating a mapping function (f) from input variables (X) to a real or continuous output variable (y)

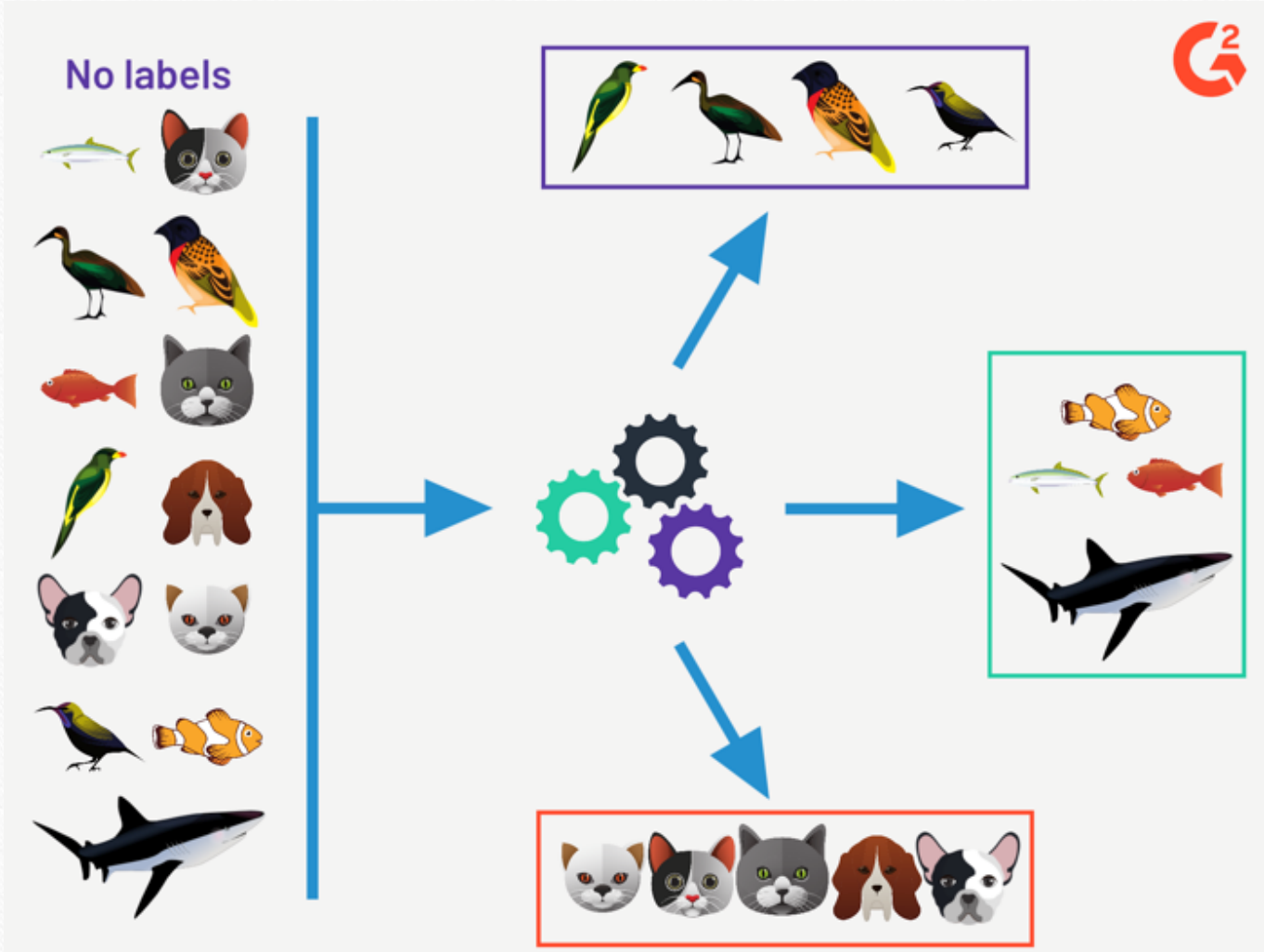
Here , output variable is usually a real value, such as “dollars” or “weight”.

WHAT IS UN-SUPERVISED LEARNING ?

- Unsupervised learning allows us to approach problems with little or no idea what our results should look like that is you only have input data (X) and no corresponding output variables.
- We can derive structure from data where we don't necessarily know the effect of the variables.

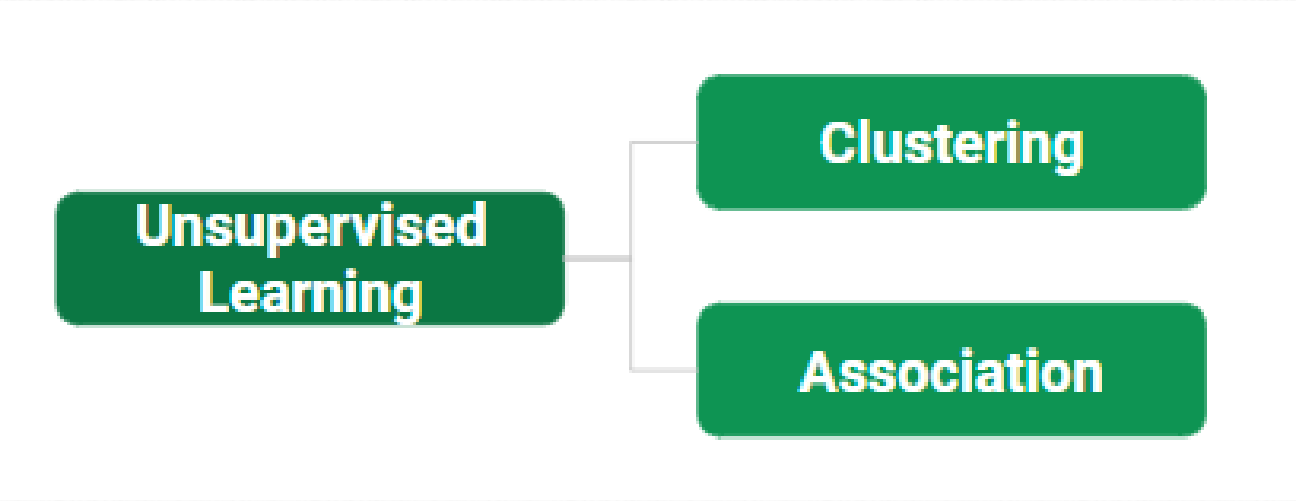
EXAMPLE OF UN-SUPERVISED LEARNING

we can see that even without labels, the algorithm was able to sort the data based on the structures it identified this is achieved by unsupervised learning



TYPES IN UN-SUPERVISED LEARNING

UN-Supervised learning can be split into two subcategories :
Clustering and association



CLUSTERING:

A clustering problem is where you want to discover the inherent groupings in the data, such as grouping customers by purchasing behavior.

ASSOCIATION:

An association rule learning problem is where you want to discover rules that describe large portions of your data, such as people that buy X also tend to buy Y.

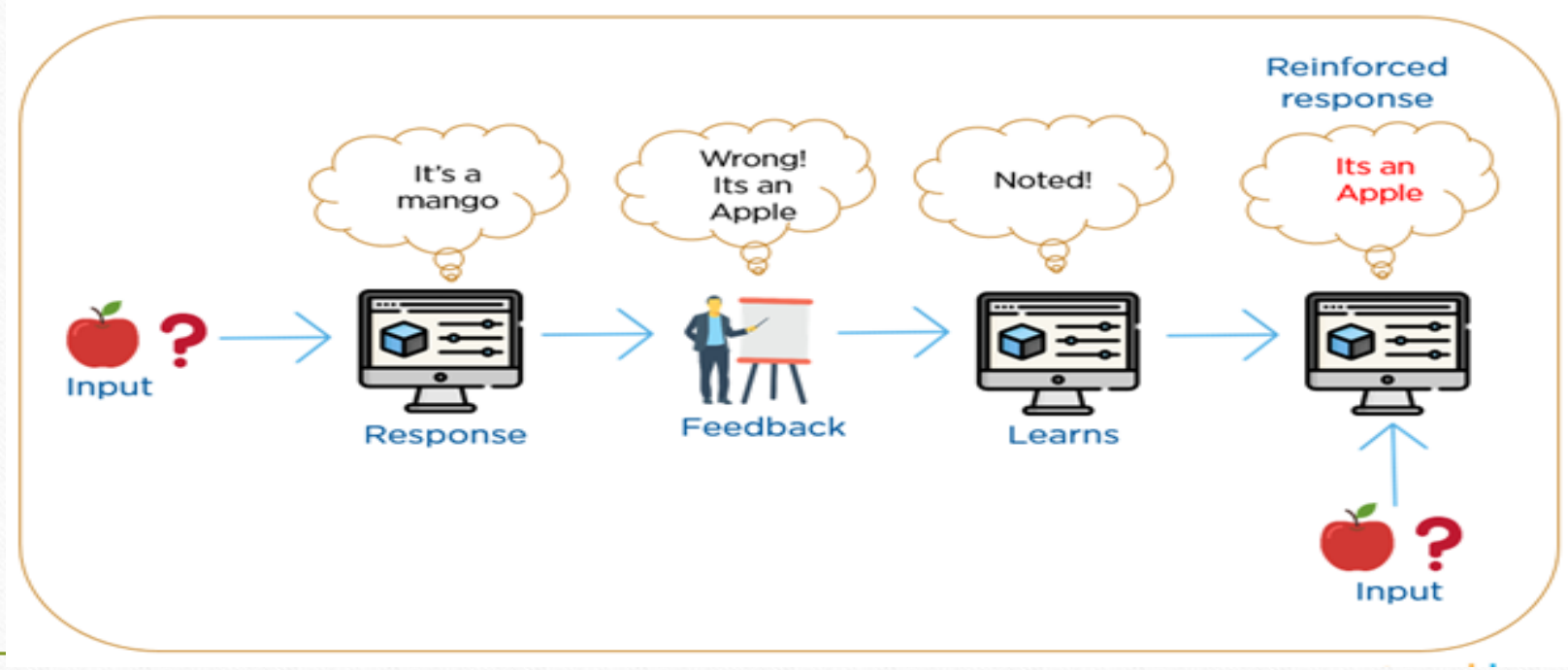
WHAT IS REINFORCEMENT LEARNING ?

- Reinforcement learning is all about making decisions sequentially. In simple words we can say that the output depends on the state of the current input and the next input depends on the output of the previous input

- In Reinforcement learning decision is dependent, So we give labels to sequences of dependent decisions

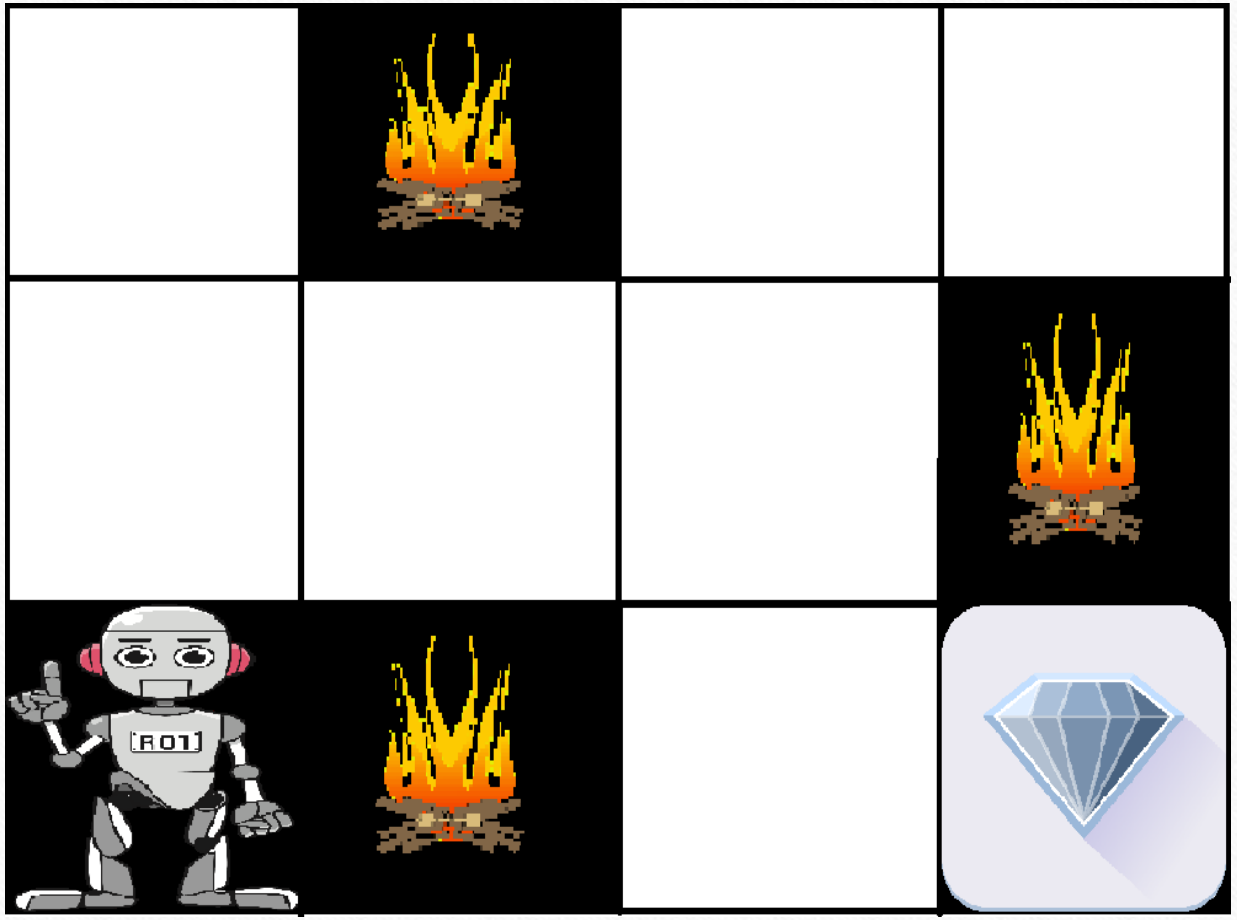
GOAL OF REINFORCEMENT LEARNING

The **goal of reinforcement learning** is to pick the best known action for any given state, which means the actions have to be ranked, and assigned values relative to one another.



EXAMPLE OF REINFORCEMENT LEARNING

- The problem is as follows: We have an agent and a reward, with many hurdles in between. The agent is supposed to find the best possible path to reach the reward.
- To reach the diamond the agent need to get a feedback which grid is not dangerous and go through the safe path



REAL WORLD APPLICATIONS OF AI

Alexa

Alexa is an AI-powered virtual assistant from Amazon.

Google Assistant

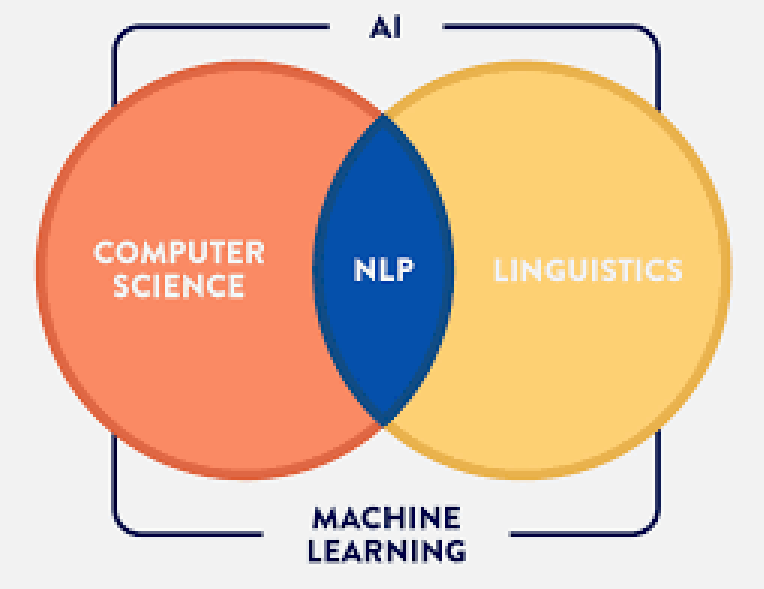
As an AI-driven virtual assistant developed by Google, Google Assistant is primarily available on mobile and smart home devices.

Siri

Siri works on using voice queries and a natural language user interface. This AI-enabled voice assistant can make calls, send text messages, answer questions, and provide recommendations.

What is Natural Language Processing

- **Natural Language Processing** or NLP is a field of Artificial Intelligence that gives the machines the ability to read, understand and derive meaning from human languages (speech or text).
- It is interdisciplinary field of computer science and linguistics, using machine learning



NLP – NATURAL LANGUAGE PROCESSING

- **NLP** is a branch of **Artificial Intelligence (AI)** that studies how machines understand human language.
- Its goal is to build systems that can make sense of text and perform tasks like translation, grammar checking, or topic classification.