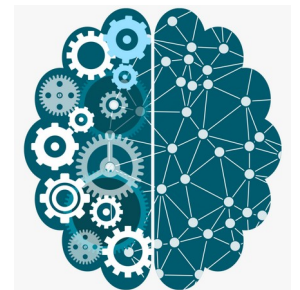


Different Branches of AI

Tushar B. Kute,
<http://tusharkute.com>



Artificial Intelligence

- Types
 - Artificial Narrow Intelligence
 - Artificial General Intelligence
 - Artificial Super Intelligence
- These are the three stages through which AI can evolve, rather than the 3 types of Artificial Intelligence.

Artificial Narrow Intelligence

- Also known as Weak AI, ANI is the stage of Artificial Intelligence involving machines that can perform only a narrowly defined set of specific tasks.
- At this stage, the machine does not possess any thinking ability, it just performs a set of pre-defined functions.
- Examples of Weak AI include Siri, Alexa, Self-driving cars, Alpha-Go, Sophia the humanoid and so on.
- Almost all the AI-based systems built till this date fall under the category of Weak AI.

Artificial General Intelligence (AGI)

- Also known as Strong AI, AGI is the stage in the evolution of Artificial Intelligence wherein machines will possess the ability to think and make decisions just like us humans.
- There are currently no existing examples of Strong AI, however, it is believed that we will soon be able to create machines that are as smart as humans.

Artificial General Intelligence (AGI)

- Strong AI is considered a threat to human existence by many scientists, including Stephen Hawking who stated that:
 - “The development of full artificial intelligence could spell the end of the human race.... It would take off on its own, and re-design itself at an ever-increasing rate. Humans, who are limited by slow biological evolution, couldn't compete and would be superseded.”

Artificial Super Intelligence (ASI)

- Artificial Super Intelligence is the stage of Artificial Intelligence when the capability of computers will surpass human beings.
- ASI is currently a hypothetical situation as depicted in movies and science fiction books, where machines have taken over the world.

Artificial Super Intelligence (ASI)

- I believe that machines are not very far from reaching this stage taking into considerations our current pace.
- “The pace of progress in artificial intelligence (I’m not referring to narrow AI) is incredibly fast. Unless you have direct exposure to groups like Deepmind, you have no idea how fast—it is growing at a pace close to exponential. The risk of something seriously dangerous happening is in the five-year timeframe. 10 years at most.” —Elon Musk quoted.
- So, these were the different stages of intelligence that a machine can acquire.

AI on Functionalities

- When someone asks you to explain the different types of Artificial Intelligence systems, you must categorize them based on their functionalities.
- Based on the functionality of AI-based systems, AI can be categorized into the following types:
 - Reactive Machines AI
 - Limited Memory AI
 - Theory Of Mind AI
 - Self-aware AI

Reactive Machine AI

- This type of AI includes machines that operate solely based on the present data, taking into account only the current situation.
- Reactive AI machines cannot form inferences from the data to evaluate their future actions. They can perform a narrowed range of pre-defined tasks.
- An example of Reactive AI is the famous IBM Chess program that beat the world champion, Garry Kasparov.

Limited Memory AI

- Like the name suggests Limited Memory AI, can make informed and improved decisions by studying the past data from its memory.
- Such an AI has a short-lived or a temporary memory that can be used to store past experiences and hence evaluate future actions.
- Self-driving cars are Limited Memory AI, that uses the data collected in the recent past to make immediate decisions.
- For example, self-driving cars use sensors to identify civilians crossing the road, steep roads, traffic signals and so on to make better driving decisions. This helps to prevent any future accidents.

Theory Of Mind AI

- The Theory Of Mind AI is a more advanced type of Artificial Intelligence.
- This category of machines is speculated to play a major role in psychology.
- This type of AI will focus mainly on emotional intelligence so that human believes and thoughts can be better comprehended.
- The Theory of Mind AI has not yet been fully developed but rigorous research is happening in this area.

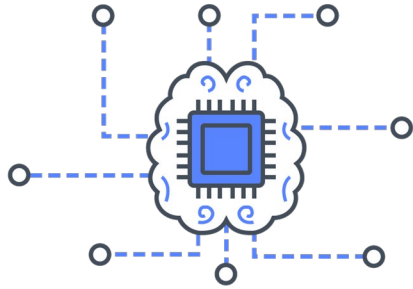
Self-Aware AI

- Let's just pray that we don't reach the state of AI, where machines have their own consciousness and become self-aware.
- This type of AI is a little far fetched given the present circumstances. However, in the future, achieving a stage of superintelligence might be possible.
- Geniuses like Elon Musk and Stephen Hawkings have consistently warned us about the evolution of AI.
- AI is a very vast field that covers many domains like Machine Learning, Deep Learning and so on.

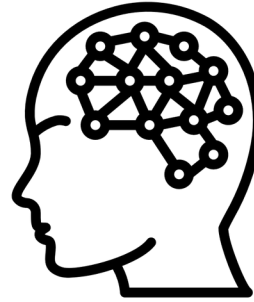
Branches Of Artificial Intelligence

- Artificial Intelligence can be used to solve real-world problems by implementing the following processes/ techniques:
 - Machine Learning
 - Deep Learning
 - Natural Language Processing
 - Robotics
 - Expert Systems
 - Fuzzy Logic
 - Computer Vision

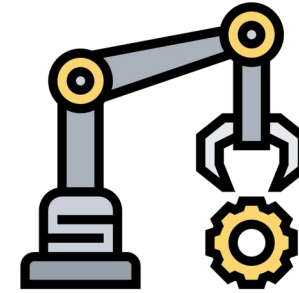
Branches Of Artificial Intelligence



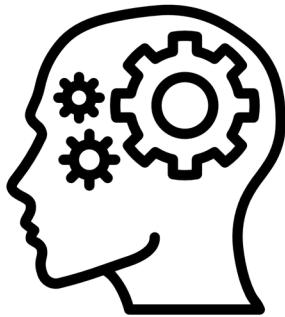
Machine Learning



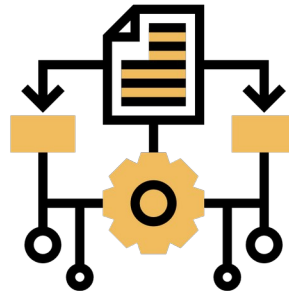
Neural Networks



Robotics



Expert Systems



Fuzzy Logic



Natural Language
Processing

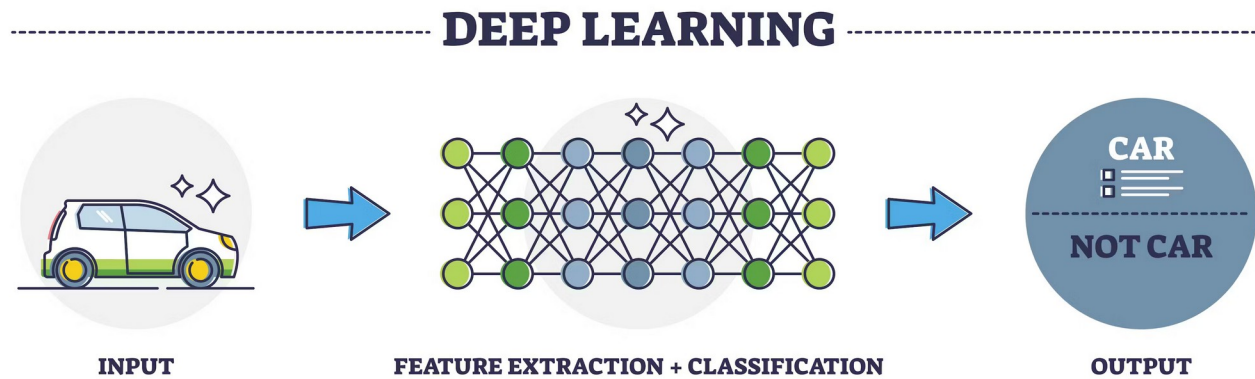
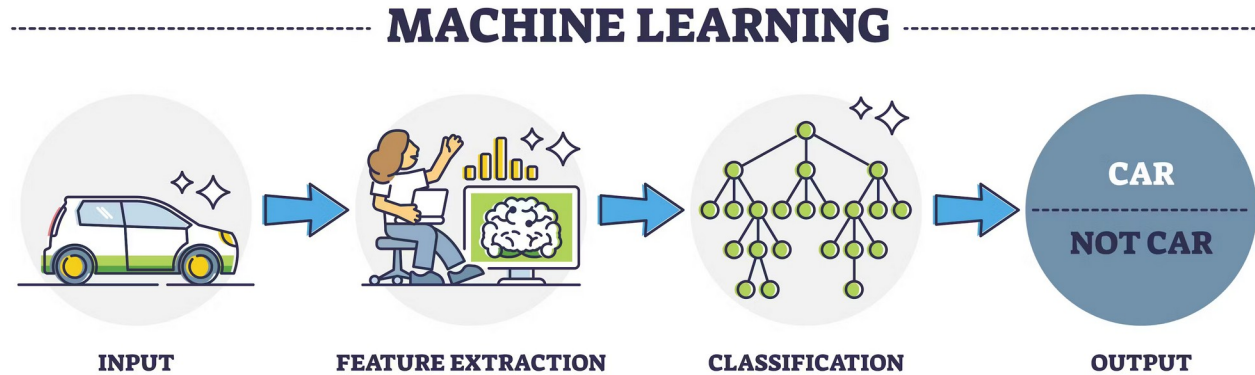
Machine Learning

- Machine Learning is the science of getting machines to interpret, process and analyze data in order to solve real-world problems.
- Under Machine Learning there are three categories:
 - Supervised Learning
 - Unsupervised Learning
 - Reinforcement Learning

Deep Learning

- Deep Learning is the process of implementing Neural Networks on high dimensional data to gain insights and form solutions.
- Deep Learning is an advanced field of Machine Learning that can be used to solve more advanced problems.
- Deep Learning is the logic behind the face verification algorithm on Facebook, self-driving cars, virtual assistants like Siri, Alexa and so on.

Deep Learning



Natural Language Processing

- Natural Language Processing (NLP) refers to the science of drawing insights from natural human language in order to communicate with machines and grow businesses.
- Twitter uses NLP to filter out terroristic language in their tweets, Amazon uses NLP to understand customer reviews and improve user experience.

Natural Language Processing



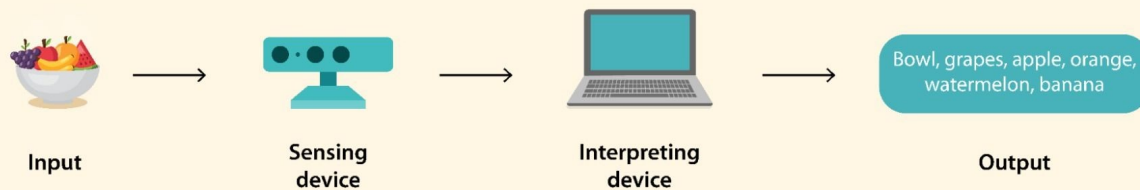
Computer Vision

- Computer vision is one of the fields of artificial intelligence that trains and enables computers to understand the visual world.
- Computers can use digital images and deep learning models to accurately identify and classify objects and react to them.
- Computer vision in AI is dedicated to the development of automated systems that can interpret visual data (such as photographs or motion pictures) in the same manner as people do.

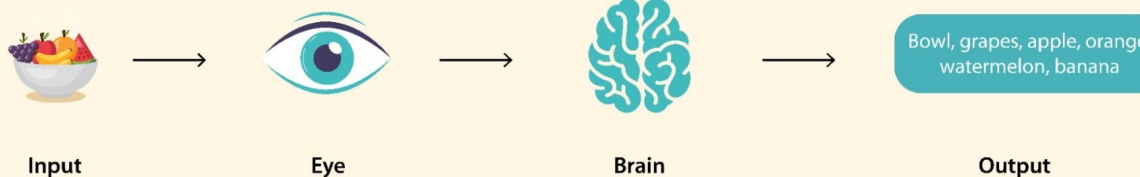
Computer Vision: How?

How Does Computer Vision Work?

Computer Vision



Human Vision



Robotics

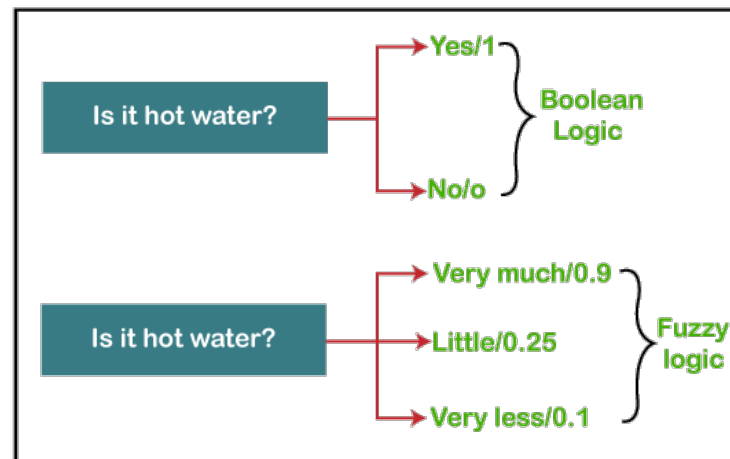
- Robotics is a branch of Artificial Intelligence which focuses on different branches and application of robots.
- AI Robots are artificial agents acting in a real-world environment to produce results by taking accountable actions.

Robotics



Fuzzy Logic

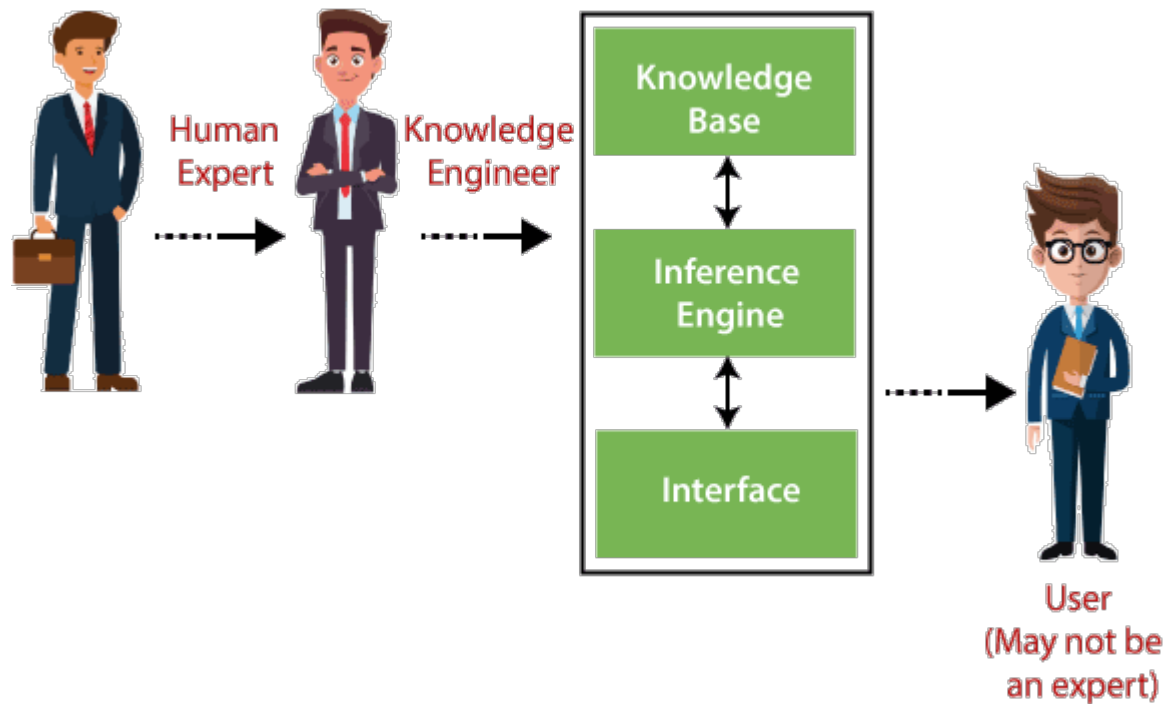
- Fuzzy logic is a computing approach based on the principles of “degrees of truth” instead of the usual modern computer logic i.e. boolean in nature.



Expert Systems

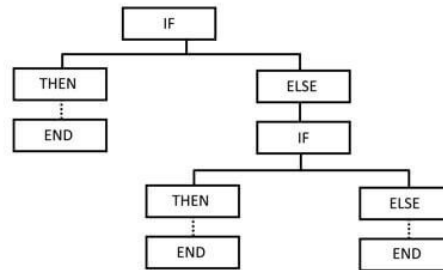
- An expert system is an AI-based computer system that learns and reciprocates the decision-making ability of a human expert.
- Expert systems use if-then logical notations to solve complex problems. It does not rely on conventional procedural programming.
- Expert systems are mainly used in information management, medical facilities, loan analysis, virus detection and so on.

Expert Systems



Major AI Approaches

- Two Major AI Techniques
 - Logic and Rules-Based Approach



- Machine Learning (Pattern-Based Approach)

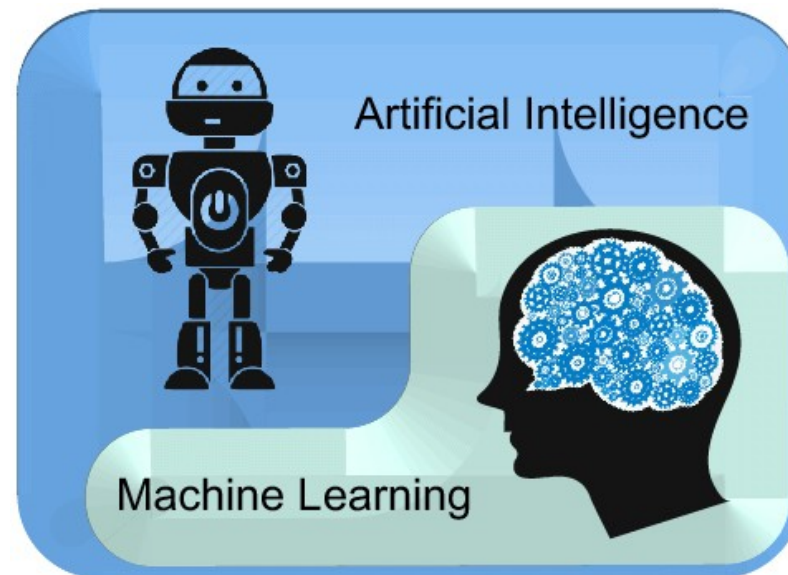


Rules based approach

- A system designed to achieve artificial intelligence (AI) via a model solely based on predetermined rules is known as a rule-based AI system.
- The makeup of this simple system comprises a set of human-coded rules that result in pre-defined outcomes. These AI system models are defined by 'if-then' coding statements (i.e. if X performs Y, then Z is the result).
- Two important elements of rule-based AI models are "a set of rules" and "a set of facts" and by using these, developers can create a basic artificial intelligence model.
- These systems can be viewed as a more advanced form of robotic process automation (RPA).

Learning vs. Designing

- AI is a bigger concept to **design** intelligent machines that can simulate human thinking capability and behavior, whereas, machine learning is an application or subset of AI that allows machines to **learn** from data without being programmed explicitly.



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. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.
- The process of learning begins with **observations** or data, such as examples, **direct experience**, or **instruction**, in order to look for patterns in data and make better decisions in the future based on the examples that we provide.
- The primary aim is to allow the computers learn automatically **without** human intervention or assistance and adjust actions accordingly.

Thank you

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