

Artificial Intelligence

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Abstract: *Artificial Intelligence (A.I.) is a multidisciplinary field whose goal is to automate activities that presently require human intelligence. Recent successes in A.I. include computerized medical diagnosticians and systems that automatically customize hardware to particular user requirements. The major problem areas addressed in A.I. can be summarized as Perception, Manipulation, Reasoning, Communication, and Learning. Perception is concerned with building models of the physical world from sensory input (visual, audio, etc.). Manipulation is concerned with articulating appendages (e.g., mechanical arms, locomotion devices) in order to effect a desired state in the physical world. Reasoning is concerned with higher level cognitive functions such as planning, drawing inferential conclusions from a world model, diagnosing, designing, etc. Communication treats the problem understanding and conveying information through the use of language. Finally, Learning treats the problem of automatically improving system performance over time based on the system's experience. Many important technical concepts have arisen from A.I. that unify these diverse problem areas and that form the foundation of the scientific discipline. Generally, A.I. systems function based on a Knowledge Base of facts and rules that characterize the system's domain of proficiency. The elements of a Knowledge Base consist of independently valid (or at least plausible) chunks of information. The system must automatically organize and utilize this information to solve the specific problems that it encounters. This organization process can be generally characterized as a Search directed toward specific goals. The search is made complex because of the need to determine the relevance of information and because of the frequent occurrence of uncertain and ambiguous data.*

Keywords: Artificial Intelligence.

I. INTRODUCTION

Artificial Intelligence is an approach to make a computer, a robot, or a product to think how smart human think. AI is a study of how human brain think, learn, decide and work, when it tries to solve problems. And finally this study outputs intelligent software systems. The aim of AI is to improve computer functions which are related to human knowledge, for example, reasoning, learning, and problem-solving.

The objectives of AI research are reasoning, knowledge representation, planning, learning, natural language processing, realization, and ability to move and manipulate objects. There are long-term goals in the general intelligence sector.

II. SCOPE OF AI

The adoption of Artificial Intelligence in India is promising. However, currently, it is at a nascent stage. While there are a few industries such as IT, manufacturing, automobile, etc, that are leveraging the prowess of AI, there are still many areas in which its potential is unexplored.

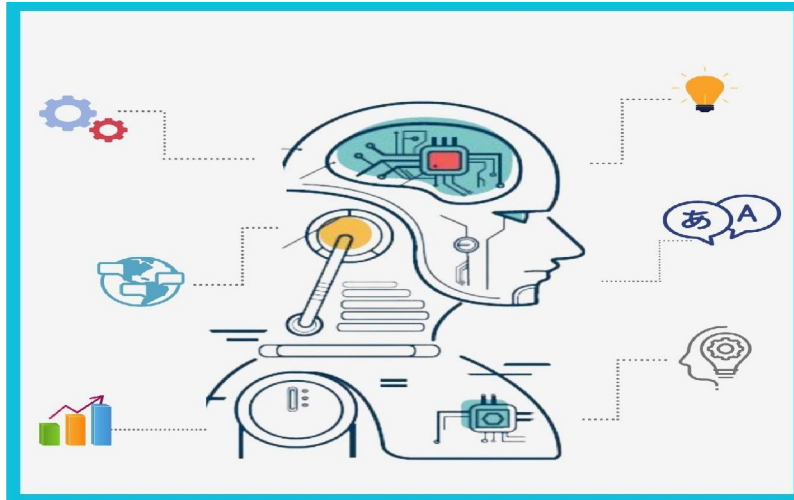
The immense potential that AI holds can be understood by the various other technologies that are covered under the umbrella of AI. Some of the examples of such technologies include self-improving algorithms, **Machine Learning**, Pattern Recognition, **Big Data**, and many others. In the next few years, it is predicted that there will hardly be any industry left untouched by this powerful tool. This is the reason why AI has so much potential to grow in India.

III. HOW DOES AI WORKS

AI systems work by combining large sets of data with intelligent, iterative processing algorithms to learn from patterns and features in the data that they analyze. Each time an AI system runs a round of data processing, it tests and measures its own performance and develops additional expertise.



Because AI never needs a break, it can run through hundreds, thousands, or even millions of tasks extremely quickly, learning a great deal in very little time, and becoming extremely capable at whatever it's being trained to accomplish. But the trick to understanding how AI truly works is understanding the idea that AI isn't just a single computer program or application, but an entire discipline, or a science.



The goal of AI science is to build a computer system that is capable of modeling human behavior so that it can use human-like thinking processes to solve complex problems.

To accomplish this objective, AI systems utilize a whole series of techniques and processes, as well as a vast array of different technologies.

By looking at these techniques and technologies, we can begin to really understand what AI actually does, and thus, how it works, so let's take a look at those next.

IV. TYPES OF AI

[1] Reactive Machines

A reactive machine follows the most basic of AI principles and, as its name implies, is capable of only using its intelligence to perceive and react to the world in front of it. A reactive machine cannot store a memory and as a result cannot rely on past experiences to inform decision making in real-time.

Perceiving the world directly means that reactive machines are designed to complete only a limited number of specialized duties. Intentionally narrowing a reactive machine's worldview is not any sort of cost-cutting measure, however, and instead means that this type of AI will be more trustworthy and reliable — it will react the same way to the same stimuli every time.

A famous example of a reactive machine is **Deep Blue**, which was designed by IBM in the 1990's as a chess-playing supercomputer and defeated international grandmaster Gary Kasparov in a game. Deep Blue was only capable of identifying the pieces on a chess board and knowing how each moves based on the rules of chess, acknowledging each piece's present position, and determining what the most logical move would be at that moment. The computer was not pursuing future potential moves by its opponent or trying to put its own pieces in better position. Every turn was viewed as its own reality, separate from any other movement that was made beforehand.

Another example of a game-playing reactive machine is Google's AlphaGo. AlphaGo is also incapable of evaluating future moves but relies on its own neural network to evaluate developments of the present game, giving it an edge over Deep Blue in a more complex game. AlphaGo also bested world-class competitors of the game, defeating champion Go player Lee Sedol in 2016.

Though limited in scope and not easily altered, reactive machine artificial intelligence can attain a level of complexity, and offers reliability when created to fulfill repeatable tasks.



[2] Limited Memory

Limited memory artificial intelligence has the ability to store previous data and predictions when gathering information and weighing potential decisions — essentially looking into the past for clues on what may come next. Limited memory artificial intelligence is more complex and presents greater possibilities than reactive machines.

Limited memory AI is created when a team continuously trains a model in how to analyze and utilize new data or an AI environment is built so models can be automatically trained and renewed. When utilizing limited memory AI in machine learning, six steps must be followed: Training data must be created, the machine learning model must be created, the model must be able to make predictions, the model must be able to receive human or environmental feedback, that feedback must be stored as data, and these these steps must be reiterated as a cycle.

There are three major machine learning models that utilize limited memory artificial intelligence:

- **Reinforcement learning**, which learns to make better predictions through repeated trial-and-error.
- **Long Short Term Memory (LSTM)**, which utilizes past data to help predict the next item in a sequence. LSTMs view more recent information as most important when making predictions and discounts data from further in the past, though still utilizing it to form conclusions
- **Evolutionary Generative Adversarial Networks (E-GAN)**, which evolves over time, growing to explore slightly modified paths based off of previous experiences with every new decision. This model is constantly in pursuit of a better path and utilizes simulations and statistics, or chance, to predict outcomes throughout its evolutionary mutation cycle.

[3] Theory of Mind

Theory of Mind is just that — theoretical. We have not yet achieved the technological and scientific capabilities necessary to reach this next level of artificial intelligence.

The concept is based on the psychological premise of understanding that other living things have thoughts and emotions that affect the behavior of one's self. In terms of AI machines, this would mean that AI could comprehend how humans, animals and other machines feel and make decisions through self-reflection and determination, and then will utilize that information to make decisions of their own. Essentially, machines would have to be able to grasp and process the concept of "mind," the fluctuations of emotions in decision making and a litany of other psychological concepts in real time, creating a two-way relationship between people and artificial intelligence.

[4] Self-awareness

Once Theory of Mind can be established in artificial intelligence, sometime well into the future, the final step will be for AI to become self-aware. This kind of artificial intelligence possesses human-level consciousness and understands its own existence in the world, as well as the presence and emotional state of others. It would be able to understand what others may need based on not just what they communicate to them but how they communicate it.

Self-awareness in artificial intelligence relies both on human researchers understanding the premise of consciousness and then learning how to replicate that so it can be built into machines.

V. AI CHALLENGES

1. Computing Power

The amount of power these power-hungry algorithms use is a factor keeping most developers away. Machine Learning and Deep Learning are the stepping stones of this Artificial Intelligence, and they demand an ever-increasing number of cores and GPUs to work efficiently. There are various domains where we have ideas and knowledge to implement deep learning frameworks such as asteroid tracking, healthcare deployment, tracing of cosmic bodies, and much more.

They require a supercomputer's computing power, and yes, supercomputers aren't cheap. Although, due to the availability of Cloud Computing and parallel processing systems developers work on AI systems more effectively, they come at a price. Not everyone can afford that with an increase in the inflow of unprecedented amounts of data and rapidly increasing complex algorithms.



2. Trust Deficit

One of the most important factors that are a cause of worry for the AI is the unknown nature of how deep learning models predict the output. How a specific set of inputs can devise a solution for different kinds of problems is difficult to understand for a layman. Many people in the world don't even know the use or existence of Artificial Intelligence, and how it is integrated into everyday items they interact with such as smartphones, Smart TVs, Banking, and even cars (at some level of automation).

3. Limited Knowledge

Although there are many places in the market where we can use Artificial Intelligence as a better alternative to the traditional systems. The real problem is the knowledge of Artificial Intelligence. Apart from technology enthusiasts, college students, and researchers, there are only a limited number of people who are aware of the potential of AI. For example, there are many **SMEs (Small and Medium Enterprises)** which can have their work scheduled or learn innovative ways to increase their production, manage resources, sell and manage products online, learn and understand consumer behavior and react to the market effectively and efficiently. They are also not aware of service providers such as Google Cloud, Amazon Web Services, and others in the tech industry.

4. Human-level

This is one of the most important challenges in AI, one that has kept researchers on edge for AI services in companies and start-ups. These companies might be boasting of above 90% accuracy, but humans can do better in all of these scenarios. For example, let our model predict whether the image is of a dog or a cat. The human can predict the correct output nearly every time, mopping up a stunning accuracy of above 99%.

For a deep learning model to perform a similar performance would require unprecedented finetuning, hyperparameter optimization, large dataset, and a well-defined and accurate algorithm, along with robust computing power, uninterrupted training on train data and testing on test data. That sounds a lot of work, and it's actually a hundred times more difficult than it sounds

VI. CONCLUSION

To better prepare for the future society in which artificial intelligences (AI) will have much more pervasive influence on our lives, a better understanding of the difference between AI and human intelligence is necessary. Human and biological intelligence cannot be separated from the process of self-replication. Therefore, a fundamental gap exists between human intelligence and AI until AI acquires artificial life. Humans' social and metacognitive intelligence most clearly distinguish human intelligence from nonhuman intelligence. Although advances are likely to improve the functioning of AI, AI will remain a function of human activity. However, if AI can learn to self-replicate and thus become a life form, albeit a man-made one, outcomes become uncertain.

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